

Chapter - 5
Analysis of Data

Chapter - 5

Analysis of Data

The implication of small tea growers on tea production was examined in the chapter preceding to this. It is found that the growth trend of tea production in Assam is similar to that of India and is not much compatible with the other leading tea producing countries in the world. Taking queue from earlier chapter an attempt has been made in this chapter to find the factors affecting tea production in Assam from field survey conducted in different sampled tea estates located in different parts of Assam during the period September 2016 to August 2017. Relation between total factor productivity and partial productivity for the tea estates of Assam has been obtained and a productivity measurement model for tea production in Assam has been developed.

Chapter - 5

Analysis of Data

5.1. Introduction

Tea production, cultivation of the tea plant, usually done in large commercial operations. A suitable climate, acidic soil, rainfall with proper distribution etc is required for growing of tea plants. There are different physical and non physical parameters like seed production, clonal selection, tea nursery management, transplanting, development of the bush, pruning, plucking, soil management, use of fertilizer use, replantation, use of technology, government policies, labour management, infrastructure etc affects the tea production. The Tea Board of India was established by Government of India under ministry of commerce through the Tea Act in 1953 to promote the cultivation, processing, and domestic trade as well as export of tea from India. Responsibility of the board includes certification tea merchants, endorsement of the diverse production and productivity of tea, financial support of research organizations, the monitoring of advances in tea packaging , coordinates research institutes, the tea trade and government bodies, ensuring the technical support of the tea trade in the global industry, disbursement of Government fund to the tea estates, undertake different policy initiative for upliftment of tea production etc. Productivity, measure efficiency production, is one of the most important terms for any business entity. It is the ratio of what is produced to what is used in producing it. A productivity model is a measurement method which is used in practice for measuring productivity which is able to compute *Output / Input* when there are many different outputs and inputs.

The following paragraphs present the analysis of data on the basis of proposed research approach. For the convenience of presentation, the chapter has been categorized into three sections. Section -I deal with the policy implementation, section -II has identified the factors affecting tea production and the productivity measurement model was developed in section -III.

5.2. Sample Design:

Exhaustive list of Tea Estates/Gardens of Assam registered with Tea Board of India having a size of more than 10.12 hectare taken as the universe of the study. The total number of tea estates as per aforesaid criteria i.e. plantation size above 10.12 hectare in Assam registered with Tea Board of India is 761. Hence, the universe of the present study is 761 estates. Universe for this study is spread in different geographical location of Assam. Most of the tea estates are located in the far flanged area. Considering these facts, convenience sampling method is used for the study.

The selection of the sample size is based on the following:

i) 10 percent of sampled Tea estates selected through judgment sampling method to meet the objectives of the study. Hence, total sample size is 76 tea estates. Two respondents taken from each sampled tea estates namely one as General Manager/Manager/ Asst. Manager/Deputy Manager wherever is applicable and another as factory manager. Hence, total size of respondents is 152 (76 estates × 2). Data collected through structured questionnaires in five point Likert scale indicated most important to not important indicating the intensity of the variables.

ii) Data related to objective number 5 is financial in nature. Most of the respondents are reluctant to provide financial data related to the organization. Considering this fact, researcher had taken 5 percent sampled tea estates from the universe to meet this objective. Hence, total sample tea estates are 38. Financial data collected from officials of sampled tea estates through structured questionnaires in tabular form.

Section -I

5.3. Policies of Tea Board of India implemented by Tea Estates of Assam:

The Tea Board of India is a Government of India organization established under an Act of Parliament under section 4 of Tea Act 1953 with its headquarter at Kolkata. It is a statutory body of the Central Government functioning under Ministry of Commerce, Govt. of India. The board constituted with members from Parliament of India, tea produces, tea traders, tea brokers, consumers and Government representative from different principal tea producing states. The Board established with an aim to promote cultivation of tea plant, processing of tea leaf, trade as well as export of tea from India, research and promotion. The responsibility of the Board also include endorsement of diverse tea production, distribution of grant –in- aid extending by Govt. of India to the different stake holder associated with the tea production, monitoring of advances in tea packaging, co-ordination with the different state as well as central government agencies, co-ordination with the research organization, ensuring technical support for tea trade in the nation as well as in the world, certification and registration to the tea growers and exporters. One of the prime functions of the Board is to encourage both financially as well as technically to the unorganized small tea grower sector. The Tea Board of India also responsible for maintain quality of tea produces by the different tea estates in India by way of monitoring different material use in plantation and processing of tea.

5.4. Different Policies and Schemes of Tea Board of India

i) Upgradation of Tea Quality and Product Diversification Scheme:

The main objective of the scheme is to provide financial assistance to tea estates for upgrading the processing capabilities for producing good quality tea. Financial assistance extended by Tea Board of India by way of subsidy @ 25% of the total cost. It include the basic cost of the machinery, taxes, freight, insurance and cost of installation, subject to a maximum of Rs. 25 lakh per factories. The subsidy is paid in a one instalment after the installation of the machinery. The Board undertakes pre

approval, post installation and evaluation inspection for the release of subsidy. Tea growers, manufacturers and others associated with value addition of tea like blending, packaging, etc and registered with Tea Board are eligible to get benefit of the scheme. Equipments eligible for subsidy are electronic and mechanical sorters, electronic monitoring devices for control of tea processing, purchase of tea machinery for orthodox, green tea and speciality tea manufacture, replacement of old CTC rollers and other allied machineries.

ii) Human Resource Development Scheme :

Objective of the scheme is to improve the skills of persons associated with tea plantations in different levels like workers to managers through extensive training. Trainings under this scheme are to be availed in (i) Indian Institute of Plantation Management,(ii) Training Centre for Small Growers and Manufacturers (iii) Comprehensive labour welfare schemes implemented by Indian Tea Association (ITA) and United Planters Association of Southern India (UPASI) and (iv) Imparting technical training by Tea Research Association(TRA) and UPASI may be availed of.

iii) Multi-Dimensional Welfare Measures:

Under this scheme, the welfare of the small tea growers concentrated in different parts of Assam, Tamil Nadu, Karnataka, etc. were covered in the Tenth Plan

Some of the measures are:

- Arranging training programmes for participating farmers on different aspects of tea growing in collaboration with Tea Research Association , Assam Agricultural University and North Bengal University,
- Arranging study tours for the growers to visit the developed areas especially in South India as well as foreign countries such as Kenya and Indonesia where considerable work has been done for the benefit of small tea growers. The Tea Board through its regional offices and in collaboration with respective State Government will carry out all activities.
- Formation of central nurseries for supply of right kind of planting materials to the small growers,

- Launching of advisory services in each state for periodic field visits and advising on practical aspects of cultivation and providing soil analytical survey,
- Demonstration plots have to be set up in each of the North East States for demonstrating all aspects of tea growing, in a more comprehensive manner (Banerjee and Banerjee, 2008)

iv) Tea Plantation Development Scheme : The scheme is for all types of growers regardless of the size of land grant area where 25 per cent of the approved unit cost per ha is provided as subsidy and 75 per cent has to be arranged by the growers as their own funds. The activities eligible for subsidy under this scheme are replanting, replacement tea plant, renewal, pruning and infilling, creation of irrigation facilities etc. For small tea growers, there are subsidy schemes for new plantation in North East and Uttranchal, setting up of tea producers societies, usage of mechanical aids for field operations.

v) Marketing Development Assistance Scheme:

The scheme is under operation through the Department of Commerce to support the following activities:

- Assist exporters for promotional activities abroad.
- Assist Export Promotion Councils (EPCs) to undertake export promotion activities for their product(s) and commodities.
- Assist approved stakeholder in undertaking exclusive nonrecurring innovative activities connected with export promotion (GoI, 2004).

vi) Orthodox Tea Production Subsidy Scheme: The Scheme was launched in 2005 which provides subsidy @Rs.3/- per kg of orthodox leaf grade teas and @ Rs.2/- per kg orthodox dust grade teas. An additional incentive @ Rs. 2/- per.kg provided for the incremental volume of tea produced over and above the volume of tea produced during the previous year. For computing the eligible amount of subsidy, the orthodox tea produced from 1st January 2005 has been taken into account. For the purpose of

comparing the incremental volume, the total orthodox tea produced during the period of year 2004 (January to December) was taken into account (TBI, 2006-07).

vii) Price Stabilization Fund Scheme : This Scheme was introduced w.e.f. 1st April 2003 by the Ministry of Commerce and Industry for the benefit of small farmers growing four commodities namely tea, coffee, rubber and tobacco. The scheme aims to provide some compensation as and when the prices of these commodities fall below a certain level. For this purpose, a Price Stabilization Fund with a corpus of Rs.500 crores has been set up by the Government.

viii) Special Purpose Tea Fund: The most important factor afflicting the tea Industry is the declining quality and productivity on account of the ageing of the Tea bushes. This senility leads to high cost of production. Hence the cost of production remains the highest amongst the major tea Exporting countries of the world. Hence it was recommended to set up a Special Purpose Tea Fund for replantation / rejuvenation of the Tea Industry. Under the programme the estimated total area to be replanted over a period of 15 years is 2.13 lac hectares. Out of the total area, 46% is in Assam, 28% in West Bengal and 22% in Kerala and Tamil Nadu and the rest 4% in other tea producing states. The total estimated cost of the scheme would be Rs. 4761 crores. During the 11th Plan period it is proposed to cover 85044 ha and the estimated investment up to the end of the Plan period would be in the region of Rs. 1900 crores comprising Rs. 950 crore as loan, Rs.475 crore as subsidy and Rs.475 crore as borrowers contribution. The cost of the programme would be funded by subsidy contribution from the Government, margin contributions from the growers and long term loans. This scheme was officially launched on 17th January 2007 and it has been received by the tea growers (SPTF, 2006).

ix) 12th plan scheme of Tea Board:

Modalities of Tea Board's Tea Development and Promotion Scheme were approved by the Government for implementation w.e.f. 10.12.2014. Prior to this date, the applications received under different plan schemes from 1st April 2012 onwards were processed in accordance with the XI plan guide

lines as per Government order upto 30.10.2014. For the applications received during this interim period a letter was sent to the Government for continuation of XI plan guidelines till 09.12.2014.

Table 5.1: XII plan Tea Development & Promotion Scheme

Sl. No.	Activity	2012-13	2013-14	2014-15	2015-16	2016-17	Total
1	Plantation Development						
		63.5	70	80	90	96.5	400
2	Quality Up-gradation and Product Diversification including Orthodox Production						
		52.5	38.25	65.35	69.45	74.45	300
3	Market Promotion						
		22.75	32.35	47.7	49.3	47.9	200
4	Research and Development						
		10.85	26	43.15	38	32	150
5	Human Resource Development						
		10.4	17.4	33.7	44.25	44.25	150
6	Small Grower's Development						
		0	5	54	65	76	200
7	National Programme of Tea Regulation						
		0	1	10	7	7	25
Total		160	190	333.9	363	378.1	1425

Source: Tea Board of India Report: 2016-17

Table 5.2: Tea Development & Promotion Scheme implemented during 2015

Sl. No.	Name of the component	Financial Outlay (Amount Rs. In Crore)	Actual Received (Amount Rs. In Crore)
1	Plantation Development	90.00	52.42
2	Quality Up-gradation and Product Diversification including Orthodox production	69.45	29.94
3	Developmental of Small Growers	65.00	5.02

Source: Tea Board of India Report: 2016-17

x)Physical and Financial achievements by TBI during the year 2015-16:

a)Plantation Development:

The main objective is to increase production and field productivity and quality of Tea by encouraging replantation/replacement planting/ rejuvenation pruning/ extension planting/ irrigation and mechanization. The nature of financial assistance that was made applicable and extended to the beneficiaries is as under:

Table.5.3. Nature of Financial Assistance by TBI during 2015-16

Replanting & Replacement Planting (Rs./ha)					
A. Conventional					
Sl No	Region	Unit Cost	Subsidy @30%	1st Installment @ 60% of Subsidy	2nd Installment @ 40% of Subsidy
1	Assam	1178630	353589	212153	141436
2	Dooars & Terai	648775	194633	116780	77853
3	Tripura	493224	147967	88780	59187
4	Darjeeling	873615	262085	157251	104834
5	Tamil Nadu Karnataka.	820188	246056	147634	98423
6	Kerala	853288	255986	153592	102395
B. Organic cultivation					
25% more than the conventional rate					
New Planting (Rs./ha)					
A. Conventional					
Sl no	Region	Unit Cost	Subsidy @25%	1st Installment @ 60% of Subsidy	2nd Installment @ 40% of Subsidy
1	Assam	1178630	294658	176795	117863

2	Dooars & Terai	648775	162194	97316	64878
3	Tripura	493224	123306	73984	49322
4	Darjeeling	873615	218404	131042	87362
5	Tamil Nadu &Karnataka	645055	161264	96758	64506
6	Kerala	662055	165514	99308	66206

Source: Tea Board of India Report: 2016-17

B. Organic			
25% more than the conventional rate			
Rejuvenation (Rs./ha)			
Unit Cost	Subsidy @30%	1st Installment @ 60% of Subsidy	2nd Installment @ 40% of Subsidy
203794	61138	36683	24455
Irrigation			
Unit Cost		Subsidy	Installment
Capital cost not exceeding Rs.80000/ha with the ceiling limit of 200 ha per garden in the plan period		25% of the actual cost	One installment
Field Mechanization			
Actual Cost		25% of the actual cost	One installment

Source: Tea Board of India Report: 2016-17

Table: 5.4: Physical and Financial Achievements under PDS during 2015-16.

Activities	Target		Achievement	
	Physical (Ha/No)	Financial (Amount in crore)	Physical (Ha/No)	Financial (Amount in Crore)
Replanting /Replacement Planting (Ha.)	9000	46	3282.32	39.58
Rejuvenation (Ha.)	1500		327.89	1.40
New Planting (Ha)	1500		0.26	0.0034
Irrigation (Ha)	1000		14343.70	7.48
Field mechanisation(No.)	—		25	0.37
Total				48.83

Source: Tea Board of India Report: 2016-17

Table 5.5: Replanting, Replacement Planting & Rejuvenation State wise Physical and Financial achievement under PDS during 2015-16

State	Replanting			Replacement Planting			Rejuvenation			Total
	No	Area (Ha.)	Amount (Rs. in Lakhs)	No	Area (Ha.)	Amount (Rs. in Lakhs)	No	Area (Ha.)	Amount (Rs. in Lakhs)	Amount (Rs. in Lakhs)
Assam	211	2112.44	2626.16	25	324.11	318.77	16	140.57	67.98	3012.91
Tripura	1	4.66	6.44	-	-	-	3	13.78	2.33	8.77
West Bengal	44	702.22	769.95	2	52.96	40.18	6	46.16	10.59	820.72
Karnataka	1	13.84	22.20	-	-	-	-	-	0.57	22.77
Kerala	6	31.33	114.68	-	-	7.88	2	35.83	15.03	137.59
Tamil Nadu	4	40.76	52.18	-	-	0.00	3	73.43	36.47	88.65
Himachal Pradesh	-	-	-	-	-	-	3	18.12	6.90	6.90
Grand Total	267	2905.25	3591.61	27	377.07	366.84	33	327.89	139.87	4098.32

Source: Tea Board of India Report: 2016-17

**Table 5.6: State wise Physical and Financial achievement under PDS during 2015-16
Irrigation, New Planting & Field mechanization**

State wise Physical and Financial achievement under - 2015-16									
State	Physical					Financial			
	Irrigation		New Planting		Field mechanisation	Irrigation	New Planting	Field mechanisation	Total
	No.	Area (Ha.)	No.	Area (Ha.)	No.	Amounts in lakhs.	Amount Rs. in lakhs.	Amount Rs. in lakhs.	Amount Rs. in lakhs.
Assam	101	10916.98			2	623.45		6.61	630.06
Tripura	1	37.21	-	-	1	1.97	-	0.29	2.26
West Bengal	25	2733.94	-	-	-	101.46	-	-	101.46
HO-West Bengal	6	655.57	-	-	-	20.78	-	-	20.78
Tamil Nadu	-	-	-	-	16	-	-	21.34	21.34
Kerala	-	-	-	-	5	-	-	8.72	8.72
Himachal Pradesh	-	-	1	0.26	1	-	0.34	0.2850	0.63
Grand Total	133	14343.70	1	0.26	25	747.66	0.34	37.25	785.25

Source: Tea Board of India Report: 2016-17

b) Quality Up-gradation and Product Diversification including Orthodox Production (QUPDS):

The main objective of the scheme is to enhance the quality of made by way of giving incentives for modernization of tea manufacturing units, warehouses, units dealing with value addition of tea such as blending, packing, tea bagging, flavor tea, setting up of specialty tea units/ orthodox or green tea manufacturing units to acquire quality certifications, organic tea production and production of orthodox/green tea. The nature of financial assistance that was made applicable and extended to the beneficiaries are as under:

Table: 5. 7: Type of Financial Assistance under QUPDS

Sl.No	Activity	Remarks
1	Factory Modernization by replacement of the old, worn out tea machineries of XI Plan/ large scale modernization initiatives during XII plan period	<p>For XI Plan spill over cases: @ 25% of total value or Maximum ceiling limit up to Rs.25 lakhs whichever is lower</p> <p>For XII Plan cases: i) minimum investment on any single machinery item shall not be less than Rs.5 lakhs; ii) the minimum investment to be made in a year shall not be less than Rs.25 lakhs iii) the total subsidy payable @25% shall not exceed Rs150 lakhs for the entire plan period v) For procurement and installation of machinery for manufacturing orthodox tea in 100% CTC factories subsidy shall be paid @40%subject to aforementioned conditions.</p>
2	Value addition by way of creating additional infrastructure for cleaning, blending, color sorting, packaging etc	Subsidy @ 40% on the actual cost provided the minimum investment on modernization is not less than Rs. 25 Lakh , subject to a ceiling of Rs.150 Lakhs per factory for the period of 5 years.
3	Setting up of new factories for production of green tea, orthodox tea and specialty teas etc (product	Subsidy @ 40% of the actual cost of plant and machinery (except land cost) subject to a ceiling of Rs 200lakhs/factory for the entire plan period.

	diversification):	
4	Quality assurance certification for ISO/HACCP and Organic Tea	Quality certification viz., for HACCP, certification for ISO 22000 and other food safety standard certifications. Subsidy @ 50% of the certification fee subject to a ceiling of Rs. 1.00 lakh per certificate including renewals per annum.
5	Warehousing for proper storage of tea	Construction of new warehouse or creation of additional space in the existing warehouse / renovation / allied infrastructure / weighing scales / weighing bridge/ forklifts/ cargo lifts etc., Subsidy @ 25% on the actual cost provided the minimum investment is not less than Rs. 25 Lakh , subject to a subsidy ceiling of Rs.150 Lakhs per warehouse for the period of 5 years.
6	Incentive for orthodox and Green tea production	Subsidy at uniform rate of Rs.3 per kg of actual production for both leaf and dust grades. For incremental production, the incentive will be determined by taking into account the moving average production over the five years immediately preceding the application year which will be treated as base production. If the actual production in the applied year is more than this base production, the difference is treated as increment volume eligible for additional incentive.

Source: Tea Board of India Report: 2016-17

Table 5.8: Physical and Financial Achievements under QUPDS during 2015-16

QUPDS Activities	Target		Achievement	
	Physical (Million Kg/No)	Financial (Amount in Crore)	Physical (Million Kg/No)	Financial (Amount in Crore)
Factory Modernisation	160	43	15	1.34
Value Addition	12		16	2.00
Certification	100		45	0.16
Administrative Charges etc for QUPDS	NA		NA	NA
Sub-Total QUPDS	NA		76	3.5
B. Orthodox Tea Production Subsidy Scheme	115		Achievement	
Coonoor			43.62	13.09
Guwahati			46.71	14.02
HO/Palampur			2.41	0.72
Siliguri			5.86	1.76
Administrative charge etc for Orthodox subsidy Scheme	NA	NA	NA	NA
Sub-Total Orthodox	115	NA	98.60	29.58
Grand Total(A+B)	387	43	174.60	33.08

Source: Tea Board of India Report: 2016-17

Table 5.9: State wise Physical and Financial achievement under QUPDS for the F Y 2015-16

QUPDS State Name	Factory modernisation		Value addition		Setting up of new factories		Certification		Total	
	No	Amount (Rs. in Lakhs.)	No	Amount (Rs. in Lakhs.)	No	Amount (Rs. in Lakhs.)	No	Amount (Rs. in Lakhs.)	No	Amount (Rs. in Lakhs.)
Assam	8	55.74	10	112.01	0	0	28	9.35	18	177.10
Tripura	-	-	-	-	-	-	-	-	-	-
West Bengal	-	-	2	28.42	-	-	-	-	2	28.42
Head Office (WB)	7	78.15	1	15.12			13	4.49	21	97.75

Tamilnadu	-	-	1	25.00	-	-	-	-	1	25.00
Kerala	-	-	2	19.69	-	-	-	-	2	19.69
Karnataka	-	-	-	-	-	-	-	-	-	-
Himachal Pradesh	-	-	-	-	-	-	2	1.36	2	1.36
Uttarakhand	-	-	-	-	-	-	2	0.73	2	0.73
Total	15	133.89	16	200.24	0	0	45	15.92	48	350.05

Source: Tea Board of India Report: 2016-17

Table 5.10: State wise Physical and Financial achievement under ORPD for the F Y 2015-16

ORPD	Orthodox		
State Name	No.	Prod.(MKG)	Amount (Rs. in Lakhs.)
Assam	361	46.4	1391.89
Tripura	2	0.30	9.18
West Bengal	80	5.865	175.95
Head Office (West Bengal)	15	1.61	48.28
Tamilnadu	88	31.62	948.47
Kerala	35	12	360.12
Karnataka	-	-	-
Himachal Pradesh	38	0.8	24.04
Uttarakhand	4	0.0164	0.4912
Total	623	98.60	2958.421

Source: Tea Board of India Report: 2016-17

5.5.Implementation status of Tea Board of India Scheme by Tea Estates of Assam (Chi Square test of field survey data):

Different schemes of Tea Board of India for tea estates were identified by the researcher from established literature, different issues of annual report of Tea Board of India. Questioner was prepared taking different schemes of Tea Board of India related to production of Tea as variables in the tabular form to collect data from the respondents of sample tea estates. Questioner were distributed to the 152 respondents during field visit and collected after one week or so as per their convenient time. Respondents were asked to mentioned implementation status of different schemes in terms of “No” or ‘Yes”. Collected tabular raw data were compiled in the excel sheet where “No” coded as “0” and “Yes” coded as “1”. Data were then transferred to SPSS software to execute Chi-square test. In this context, we have framed the hypothesis “*Policies of Tea Board of India are not being implemented by Tea Estates of Assam*”.

Result of Chi Square Test:

Table: 11(a): Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Tea Board Policies * Implementation Status	2584	100.0%	0	.0%	2584	100.0%

Table. 11(b): Tea Board Policies * Implementation Status Cross tabulation

			Implementation Status		Total
			Not Implemented	Implemented	
Tea Board Policies	Irrigation Facility	Count	89	63	152
		% within Tea Board Policies	58.6%	41.4%	100.0%
		% within Implementation Status	9.0%	4.0%	5.9%
		% of Total	3.4%	2.4%	5.9%
	Drainage Facility	Count	88	64	152
		% within Tea Board Policies	57.9%	42.1%	100.0%
		% within Implementation Status	8.9%	4.0%	5.9%
		% of Total	3.4%	2.5%	5.9%
	Transportation facility	Count	82	70	152
		% within Tea Board Policies	53.9%	46.1%	100.0%
		% within Implementation Status	8.3%	4.4%	5.9%
		% of Total	3.2%	2.7%	5.9%
New Plantation in Hill Area	Count	90	62	152	
	% within Tea Board Policies	59.2%	40.8%	100.0%	
	% within Implementation Status	9.1%	3.9%	5.9%	
	% of Total	3.5%	2.4%	5.9%	
Leaf Collection Centre	Count	49	103	152	
	% within Tea Board Policies	32.2%	67.8%	100.0%	
	% within Implementation Status	4.9%	6.5%	5.9%	

	% of Total	1.9%	4.0%	5.9%
Purchase of Weighing Carrying Bags	Count	56	96	152
	% within Tea Board Policies	36.8%	63.2%	100.0%
	% within Implementation Status	5.6%	6.0%	5.9%
	% of Total	2.2%	3.7%	5.9%
Purchase of leaf carrying bags	Count	49	103	152
	% within Tea Board Policies	32.2%	67.8%	100.0%
	% within Implementation Status	4.9%	6.5%	5.9%
	% of Total	1.9%	4.0%	5.9%
Purchase of Transportation Vehicles	Count	58	94	152
	% within Tea Board Policies	38.2%	61.8%	100.0%
	% within Implementation Status	5.8%	5.9%	5.9%
	% of Total	2.2%	3.6%	5.9%
Purchase of field inputs	Count	57	95	152
	% within Tea Board Policies	37.5%	62.5%	100.0%
	% within Implementation Status	5.7%	6.0%	5.9%
	% of Total	2.2%	3.7%	5.9%
Product diversification subsidy	Count	56	96	152
	% within Tea Board Policies	36.8%	63.2%	100.0%
	% within Implementation Status	5.6%	6.0%	5.9%
	% of Total	2.2%	3.7%	5.9%
Modernization of Buildings	Count	53	99	152
	% within Tea Board Policies	34.9%	65.1%	100.0%

	% within Implementation Status	5.3%	6.2%	5.9%
	% of Total	2.1%	3.8%	5.9%
Modernization Packaging unit	Count	56	96	152
	% within Tea Board Policies	36.8%	63.2%	100.0%
	% within Implementation Status	5.6%	6.0%	5.9%
	% of Total	2.2%	3.7%	5.9%
Certification Grant	Count	42	110	152
	% within Tea Board Policies	27.6%	72.4%	100.0%
	% within Implementation Status	4.2%	6.9%	5.9%
	% of Total	1.6%	4.3%	5.9%
Modernisation of factory	Count	42	110	152
	% within Tea Board Policies	27.6%	72.4%	100.0%
	% within Implementation Status	4.2%	6.9%	5.9%
	% of Total	1.6%	4.3%	5.9%
Up gradation of Machinerics	Count	45	107	152
	% within Tea Board Policies	29.6%	70.4%	100.0%
	% within Implementation Status	4.5%	6.7%	5.9%
	% of Total	1.7%	4.1%	5.9%
Subsidy for production of orthodox tea	Count	43	109	152
	% within Tea Board Policies	28.3%	71.7%	100.0%
	% within Implementation Status	4.3%	6.9%	5.9%
	% of Total	1.7%	4.2%	5.9%

Subsidy for production of CTC tea	Count	38	114	152
	% within Tea Board Policies	25.0%	75.0%	100.0%
	% within Implementation Status	3.8%	7.2%	5.9%
	% of Total	1.5%	4.4%	5.9%
Total	Count	993	1591	2584
	% within Tea Board Policies	38.4%	61.6%	100.0%
	% within Implementation Status	100.0%	100.0%	100.0%
	% of Total	38.4%	61.6%	100.0%

Table: 11(c): Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.380E2 ^a	16	.000
Likelihood Ratio	136.778	16	.000
Linear-by-Linear Association	99.245	1	.000
N of Valid Cases	2584		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 58.41.

Table: 11(d):Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.231	.000
Cramer's V	.231	.000
Contingency Coefficient	.225	.000
N of Valid Cases	2584	

The output of the Chi-Square test given in the table 11(a) mentioned above. Implementation status of different policies are given in the table 11(b) and it is observed from the table that the 41 percent of tea estates not implemented the policy “Irrigation Facility” while 52 percent have not implemented this policy of Tea Board of India. It is seen that 42 percent implemented “Drainage Facility” while 58 percent have not implemented this facility. The implementation status observed for Transportation facility, New Plantation in Hill Area, Leaf Collection Centre, Purchase of Weighing Carrying Bags, Purchase of leaf carrying bags, Purchase of Transportation Vehicles, Purchase of field inputs, Product diversification subsidy, Modernization of Buildings, Modernization Packaging unit, Certification Grant, Modernization of factory, Up gradation of Machineries, Subsidy for production of orthodox tea, Subsidy for production of CTC tea are 46percent ,41 percent,68 percent, 63 percent,62 percent,68 percent, 62 percent,63 percent, 63 percent, 65 percent, 63 percent ,72 percent, 70 percent, 72 percent and 75 percent respectively. Non implementation status of policies of Tea Board of India namely Transportation facility, New Plantation in Hill Area, Leaf Collection Centre, Purchase of Weighing Carrying Bags, Purchase of leaf carrying bags, Purchase of Transportation Vehicles, Purchase of field inputs, Product diversification subsidy, Modernization of Buildings, Modernization Packaging unit, Certification Grant, Modernization of factory, Up gradation of Machineries, Subsidy for production of orthodox tea, Subsidy for production of CTC by tea estates of Assam are 54percent ,59 percent, 32 percent, 37 percent, 38 percent, 32 percent, 38 percent, 37 percent, 37 percent, 35 percent, 37 percent ,28 percent, 30 percent, 28 percent and 25 percent respectively. The overall policy implementation status of Tea Board of India is observed the table is 61.6 percent and 38.4 percent policies are not implemented by the tea estates of Assam.

It is found from the Chi Square test table 11(c), that the test is significant at .001percent level($p < .001$). Hence there is strong co-relation exists between the implementation statues by tea estates and Policies of Tea Board of India. Therefore our hypothesis “*Policies of*

Tea Board of India are not being implemented by Tea Estates of Assam” has been rejected. This indicates that most of the policies of Tea Board of India are implemented by the tea estates of Assam.

Section - II

5.6. Factors Affecting Tea Production in Assam:

Tea grows in cloudy and rainy region at an altitude of 2000 to 7000 feet tropics at sloping terrain and lower elevation in temperature region. Moderately hot and humid climate is required for growing of tea plant. Climatic conditions influence yield, crop distribution and quality. The best tea produced in the region where there are dry days and cool nights. Therefore, before cultivating tea in a new area, the suitability of the climate is the first point to be considered. Tea grows best on well drained fertile acidic soil on high lands. Tea bushes are grown from cutting stem or from seeds. Initially the small plants are allowed to grow in nursery and during the age of six to eighteen months of small plants, these are planted in a row at the permanent plantation location. Small trees are planted at about four feet apart and about 3000 trees can be planted in hectare of land. Tree planted in a low region can be harvested after three years while that at high regions can be after five years.

The average annual rainfall in North East India ranges from 2000-4000 mm. Hilly terrain of land slope, cloudy weather, acidic soil, sufficient rainfall made Assam suitable for production of tea plant. Temperature affects tea yield by influencing rate of photosynthesis and controlling growth. In general, the temperature within 13°C to 32°C is conducive for growth of tea. Temperature above 32°C is unfavorable for optimum photosynthesis. Day length of tea producing region influences growth and dormancy in tea bushes. When the length of a day is of less than 11hr and continued for at least six weeks, it is seen that tea bushes become dormant. Hence the length of tea growing season

decreases with increasing distance from the equator. Seasonal dormancy appears from around 18° North and South latitudes. In the Northeast India (25°-27°N latitude), the tea bushes remain dormant about 3 months during the winter season due to the effects of short days and long temperature.

5.7: Tea Production Process:

Planting:

The plot of land where the tea tree is to be planted is cleared from the roots of the fallen trees. To conserve the soil, drains are taken at suitable intervals depending upon the slope. In the early days, up and down system of planting at 1.2x1.2m are followed. Presently, contour planting either in a single hedge or double hedge system is followed:

Sr. No.	Type	Spacing	Population/ha.
1.	Up and down	1.2 x 1.2m	6,800
2.	Contour planting single hedge.	1.2 x 0.75m	10,800
3.	Contour planting double hedge.	1.35 x 0.75 x 0.75m	13,200

The third method has advantages over other two viz., early and high yield, better soil conservation, less weed growth in the hedge and efficient cultural practices. Planting season is normally June/July and September/October due to South West monsoon and North East monsoon period. Pits of 30x30x45cm size are dug and tea plants of 9-15 months old are planted by removing the polythene sleeves. After planting, the soil surface around the plants is mulched. About 25 tonnes of grass is required to mulch one hectare. Mulch materials are to be kept away from the collar region as they may cause collar diseases. During dry weather, mud tubes may be buried with 15cm deep near the plant in a slanting position and one liter of water per plant may be injected at weekly intervals.

Shade Management:

Proper shading is essential for proper and uniform growth tea plants. Direct sunlight without filtered shade affects the growth of tea plants.

- It regulates the temperature.
- It minimise the effects of drought and radiation injury.
- It increases the soil fertility
- It helps in recycling of nutrients.
- It helps in getting even distribution of crop.
- It serves as windbreak.
- It reduces the incidences of pests.

Weed Control:

Weed control is an important task for proper growth of tea plant. Manual weeding as well as chemical weeding process are practice in tea field. Manual weeding may cause soil erosion and amage to surface roots of tea plants. Following are the process of chemical weed control is practice at tea estates:

Type of weeds	Herbicides	Dosage
Dicots	Paraquat (gramoxone)	1.12 lit. /ha.
Dicots	Sodium salt of 2,4-D (Fernozone)	1.4 kg. /ha.
Grasses	2,2-Dichloro propionic acid (Dalapon)	5.6 kg. /ha.
	Glyphosate	2.3 lit. /ha.

Training and Pruning

Training and Pruning

To induce secondary in the young tea plants, 8-10 mature leaves remove from the bottom of the plant. When secondary reach more than 60 cm, tea plants tipped at 50-55 cm height by removing 3 to 4 leaves and bud to induce tertiary. Therefore, plucking at mother leaf stage is continued for better structure development and it takes nearly 18 to 20 months from planting to reach regular plucking field stage. Pruning is done in tea plant to maintain to convenient height for plucking, to induce more vegetative growth, to remove dead and de funct wood and to remove the knots and interlaced branches.

Pruning is normally done 4 to 6 years interval depending upon the position of the tea estate , nature of the materials etc. the bushes marked for pruning should have adequate starch reserves in roots. This can be normally tested by the common Iodine test and if the starch reserve is less, bushes are allowed to rest for 2 to 3 months. The different types of pruning are as follows: -

Sl.No.	Type of pruning	Pruning height (cm)	Season	Remarks
1.	Rejuvenation pruning	20 – China Jat, 30 – Assam Jat	April - May	Done is old bushes affected with cankar and wood rot to invigorate the new healthy branches. Not done regularly.
2.	Hard pruning	30 – 45	Apr. – May	First formative pruning done to a young tea.
3.	Medium pruning	45 – 60	Aug. – Sept.	Normal pruning where ever frames are healthy.
4.	Light pruning	60 – 65	Aug. – Sept.	Normal pruning where ever frames are healthy.
5.	Skiffing	65	Aug. – Sept.	Mainly to postpone pruning and to encourage better frame development.

5.8: Tea Manufacturing Process:

Basically, there are two types of manufacturing of tea viz.,

1. Orthodox method in which the rolling operation is done in a series of rollers. The rollers have rotary tables with battens, jacket for loading the leaf and a pressure cup,
2. CTC method (cutting, tearing and curling) which has a CTC machine, consisting of series of a pair of rollers mounted in such a way they rotate in opposite directions and the clearance between them is so adjusted to crush and tear the leaves.

Harvesting or Plucking:

Plucking consists of harvesting 2 to 3 leaves and a bud. It is the most labour intensive operation in a tea industry and also decides the yield and quality of made tea. Normally, a pluckable shoot takes 60 to 90 days for harvesting since its sprouting from the auxiliary buds. When the shoot is plucked upto mother leaf, it is known as light plucking and if it is plucked below mother leaf, it is called hard plucking. Most of the work forces of a tea estate engage in plucking of tea leaf. Mostly female worker involve in the plucking system of tea estate. If they too big they are too tough; if they are too small they are not economically viable. Plucking is the one of the most important steps in tea manufacturing system as it involve lion share of labour expenditure as well as yield and quality of tea depnd on it. The tea pickers pluck new and tender "flush" (two leaves and a bud). Generally the buds near the end of a branch are considered to be the best quality. Lower quality one are found further down the branch. The flushes are flung over the shoulder of the pickers into baskets strapped onto their heads and backs. Good pickers pick around 160 pounds of leaves a day, form which about 40 pounds of finished tea is made.

Different steps involved in the manufacturing of Tea are:

Step 1: Withering: The objective of withering is to reduce the moisture content of leaves by spreading them in troughs which receive artificial air from fan fitted on one end. At the end of withering, the leaves attain a flaccid condition for which it may take 12 to 18 hours depending upon the weather condition. The green leaf comes into the factory twice a day (sometimes three times) and is immediately thinly spread on Hessian cloth placed over wire-mesh racks in what is called the Withering Shed where it stays until it loses some of its moisture content and become flaccid (only 4% moisture remains).

Step 2: Rolling or CTC: The leaf is collected and either rolled in Sirocco machines or, alternatively, put through a CTC machine which simultaneously crushes, tears and curls (CTC) the tea leaves.

Step 3: Fermenting: The next step in the tea processing is laying out the mashed up leaves on trays, thinly spreading them at a one inch depth layer. Here the leaves ferment and oxidise in their own juices. This process has to be monitored closely by an experienced tea planter as the fermentation process may take anywhere from an hour or two, sometimes even more, depending on the weather and other conditions that prevail.

Step 4: Drying: For the next step, the tea is taken to the drying machines where hot air is blown over the tea after it has been spread out thinly on trays. This is where the remaining moisture is removed from the leaves. If any moisture still remains, the leaves go through the drying procedure again. However care has to be taken not to scorch the tea.

Step 5: Sorting: After the leaves are completely free from moisture, they are sent to the sorting rooms where they are graded and then packed. The leaves are fed into conveyers with vibrating wire-mesh trays. Here the dust falls through to the bottom and the whole teas travel further. After sorting the tea is packed in tea chests made of plywood and lined with aluminium foil.

5.9: Influencing Factors on tea production:

An attempt has been made to find the factors affecting tea production in Assam after gone through established literature and field survey. Regarding the parameters influencing tea production in Assam, researcher identified twenty seven factors namely Rainfall, Temperature, Humidity, Windflow, Pressure, Soil Condition, Verity of Tea Leaf, Road Connectivity, Irrigation, Drainage, workers, Electricity, Fuel, Technology of Plantation, Technology of Plucking, Technology of Processing Green Leaf, Technology of Packaging, Pesticides, Fertilizer, Cultivating Material, Irrigation Material, Packaging Material, Worker Cost, Material Cost, Capital Cost, Welfare Cost and Subsidized ration. To find the factors affecting tea production in Assam, field data collected from sampled tea estates through structured questioner and are analysed through SPSS software.

Data Collection and Analysis:

A structured questionere was framed by the researcher with twenty seven identified variables to collect field data from respondents of the sampled tea estates. Five point Likert scale indicated most important (score =4), very important (Score=3), important (score=2), less important (score =1) and not important (score=0) was used to find out the strength of the variables. Data collected from 76 tea estates of different district of Assam; taking one respondent as tea General Manager/Manager/ Asst. Manager and another from Factory Manager with total 152 respondents. Data have been compiled in the excel sheet and then transfer to SPSS software for analysis. The factor analysis carried out by SPSS software and factors were extracted by principal component analysis method.

The result of the Factor Analysis done by SPSS software is given in the tables below:

Table: 5.12. Factor Analysis Result

	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7	VAR8	VAR9	VAR10	VAR11	VAR12	VAR13	VAR14	VAR15	VAR16	VAR17
VAR1	1.000	.029	-.076	-.047	-.038	.093	-.030	-.021	.005	.030	-.086	-.079	.099	.107	-.076	-.009	.058
VAR2	.029	1.000	.332	.116	.120	-.115	-.005	.026	-.023	-.007	.144	.096	-.010	.136	.039	.030	.041
VAR3	-.076	.332	1.000	.249	.238	-.121	.109	.091	-.032	.051	.124	.105	.027	.107	-.094	-.035	.092
VAR4	-.047	.116	.249	1.000	.987	-.239	-.131	.193	-.100	.062	-.044	.191	-.051	-.053	.002	-.002	-.119
VAR5	-.038	.120	.238	.987	1.000	-.249	-.117	.203	-.095	.098	-.046	.169	-.076	-.047	-.023	-.028	-.115
VAR6	.093	-.115	-.121	-.239	-.249	1.000	.126	-.435	.036	-.095	.046	-.053	.098	-.067	-.049	.011	.162
VAR7	-.030	-.005	.109	-.131	-.117	.126	1.000	.017	.038	-.020	-.050	-.122	.100	-.027	-.003	.029	.851
VAR8	-.021	.026	.091	.193	.203	-.435	.017	1.000	-.082	.068	-.218	.129	-.214	-.027	.016	.029	-.090
VAR9	.005	-.023	-.032	-.100	-.095	.036	.038	-.082	1.000	.088	.059	-.097	.022	.031	-.054	-.061	.095
VAR10	.030	-.007	.051	.062	.098	-.095	-.020	.068	.088	1.000	-.112	.081	-.099	.070	-.210	-.234	-.103
VAR11	-.086	.144	.124	-.044	-.046	.046	-.050	-.218	.059	-.112	1.000	-.060	-.134	.172	-.015	-.027	-.034
VAR12	-.079	.096	.105	.191	.169	-.053	-.122	.129	-.097	.081	-.060	1.000	-.010	-.053	-.147	-.080	-.134
VAR13	.099	-.010	.027	-.051	-.076	.098	.100	-.214	.022	-.099	-.134	-.010	1.000	.024	.152	.228	.130
VAR14	.107	.136	.107	-.053	-.047	-.067	-.027	-.027	.031	.070	.172	-.053	.024	1.000	.023	-.002	.015
VAR15	-.076	.039	-.094	.002	-.023	-.049	-.003	.016	-.054	-.210	-.015	-.147	.152	.023	1.000	.882	.016
VAR16	-.009	.030	-.035	-.002	-.028	.011	.029	.029	-.061	-.234	-.027	-.080	.228	-.002	.882	1.000	.071
VAR17	.058	.041	.092	-.119	-.115	.162	.851	-.090	.095	-.103	-.034	-.134	.130	.015	.016	.071	1.000
VAR18	.011	-.095	-.010	.122	.110	.044	.007	.097	.001	-.172	-.051	.140	-.089	-.066	-.032	-.035	.064
VAR19	-.087	.067	-.087	.098	.088	.024	-.103	.039	.017	-.146	.167	.049	-.146	.061	.041	.010	-.055
VAR20	-.061	.039	-.034	.040	.027	.091	.004	.044	.059	-.122	.160	.030	-.129	.011	.066	.041	.022

VAR21	-0.073	.101	-0.065	.048	.040	.043	-0.100	.005	.031	-0.054	.152	.059	-0.138	.073	-0.018	-0.054	-0.036
VAR22	.003	.051	-0.046	.087	.081	.084	-0.152	.000	-0.035	-0.219	.188	.068	-0.156	.072	.043	.024	-0.070
VAR23	.137	.106	-0.150	-0.074	-0.076	.267	-0.048	-0.129	.063	-0.111	.161	-0.058	.012	.017	-0.120	-0.117	.011
VAR24	.058	-0.034	-0.065	.018	.027	.177	.007	-0.095	-0.070	-0.047	-0.053	-0.077	-0.028	-0.149	-0.098	-0.138	-0.014
VAR25	.086	.017	.058	-0.028	-0.015	-0.164	-0.086	-0.002	.049	.085	.005	.055	-0.025	.130	.022	-0.006	-0.056
VAR26	-0.150	-0.025	-0.102	.041	.028	-0.184	.046	.107	-0.017	.035	.000	-0.062	.068	.034	.117	.029	-0.055
VAR27	-0.070	-0.016	-0.038	-0.004	.006	-0.028	.052	-0.047	-0.114	-0.007	.072	-0.023	-0.009	-0.021	-0.066	-0.118	-0.015

	VAR18	VAR10	VAR20	VAR21	VAR22	VAR23	VAR24	VAR25	VAR26	VAR27
VAR1	.011	-0.087	-0.061	-0.073	.003	.137	.058	.086	-0.150	-0.070
VAR2	-0.095	.067	.039	.101	.051	.106	-0.034	.017	-0.025	-0.016
VAR3	-0.010	-0.087	-0.034	-0.065	-0.046	-0.150	-0.065	.058	-0.102	-0.038
VAR4	.122	.098	.040	.048	.087	-0.074	.018	-0.028	.041	-0.004
VAR5	.110	.088	.027	.040	.081	-0.076	.027	-0.015	.028	.006
VAR6	.044	.024	.091	.043	.084	.267	.177	-0.164	-0.184	-0.028
VAR7	.007	-0.103	.004	-0.100	-0.152	-0.048	.007	-0.086	.046	.052
VAR8	.097	.039	.044	.005	.000	-0.129	-0.095	-0.002	.107	-0.047
VAR9	.001	.017	.059	.031	-0.035	.063	-0.070	.049	-0.017	-0.114
VAR10	-0.172	-0.146	-0.122	-0.054	-0.219	-0.111	-0.047	.085	.035	-0.007
VAR11	-0.051	.167	.160	.152	.188	.161	-0.053	.005	.000	.072
VAR12	.140	.049	.030	.059	.068	-0.058	-0.077	.055	-0.062	-0.023
VAR13	-0.089	-0.146	-0.129	-0.138	-0.156	.012	-0.028	-0.025	.068	-0.009
VAR14	-0.066	.061	.011	.073	.02	.017	-0.149	.130	.034	-0.021
VAR15	-0.032	.041	.066	-0.018	.043	-0.120	-0.098	.022	.117	-0.066

VAR16												
	VAR16											
		VAR17										
			VAR18									
				VAR19								
					VAR20							
						VAR21						
							VAR22					
								VAR23				
									VAR24			
										VAR25		
											VAR26	
												VAR27

VAR1: Rainfall; VAR2: Temp; VAR3: Humidity; VAR4: Windflow; VAR5: Pressure; VAR6: Soil Condition; VAR7: Verity of Tea Leaf; VAR8: Road Connectivity; VAR9: Irrigation; VAR10: Drainage; VAR11: workers; VAR12: Electricity; VAR13: Fuel; VAR14: Technology of Plantation; VAR15: Technology of Plucking; VAR16: Technology of Processing Green Leaf; VAR17: Technology of Packaging ; VAR18: Pesticides; VAR19: Fertilizer; VAR20: Cultivating Material; VAR21: Irrigation Material; VAR22: Packaging Material; VAR23: Worker Cost; VAR24: Material Cost; VAR25: Capital Cost; VAR26: Welfare Cost; VAR27: Subsidized ration

Table: 5.13. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.600
Bartlett's Test of Sphericity	Approx. Chi-Square	1.941E3
	df	351
	Sig.	.000

Table: 5.14.Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.670	13.593	13.593	3.670	13.593	13.593	3.545	13.130	13.130
2	2.707	10.026	23.619	2.707	10.026	23.619	2.142	7.932	21.062
3	2.174	8.053	31.672	2.174	8.053	31.672	2.073	7.677	28.739
4	1.851	6.857	38.529	1.851	6.857	38.529	1.959	7.257	35.996
5	1.664	6.161	44.690	1.664	6.161	44.690	1.587	5.878	41.874
6	1.584	5.866	50.556	1.584	5.866	50.556	1.530	5.668	47.542
7	1.346	4.983	55.540	1.346	4.983	55.540	1.514	5.609	53.151
8	1.185	4.388	59.928	1.185	4.388	59.928	1.353	5.013	58.164
9	1.150	4.259	64.187	1.150	4.259	64.187	1.316	4.875	63.039
10	1.083	4.010	68.197	1.083	4.010	68.197	1.240	4.593	67.632
11	1.037	3.842	72.039	1.037	3.842	72.039	1.190	4.407	72.039
12	.952	3.525	75.564						
13	.858	3.178	78.742						
14	.814	3.014	81.756						
15	.741	2.744	84.500						
16	.695	2.576	87.076						
17	.668	2.475	89.551						
18	.625	2.315	91.867						
19	.585	2.165	94.032						
20	.513	1.899	95.931						
21	.379	1.404	97.335						
22	.281	1.041	98.376						
23	.157	.581	98.957						

24	.121	.449	99.406					
25	.097	.359	99.765					
26	.052	.194	99.959					
27	.011	.041	100.000					

Extraction Method: Principal Component Analysis.

Table: 5.15. Rotated Component Matrix ^a											
	Component										
	1	2	3	4	5	6	7	8	9	10	11
VAR19	.965										
VAR21	.936										
VAR22	.888										
VAR20	.852										
VAR14		.941									
VAR16		.936									
VAR17		.933									
VAR15		.926									
VAR4			.967								
VAR5			.966								
VAR7				.945							
VAR8					-.825						
VAR6					.655						
VAR2						.762					
VAR3						.680					
VAR25							.733				
VAR24							-.617				
VAR23							-.426				

Scree Plot

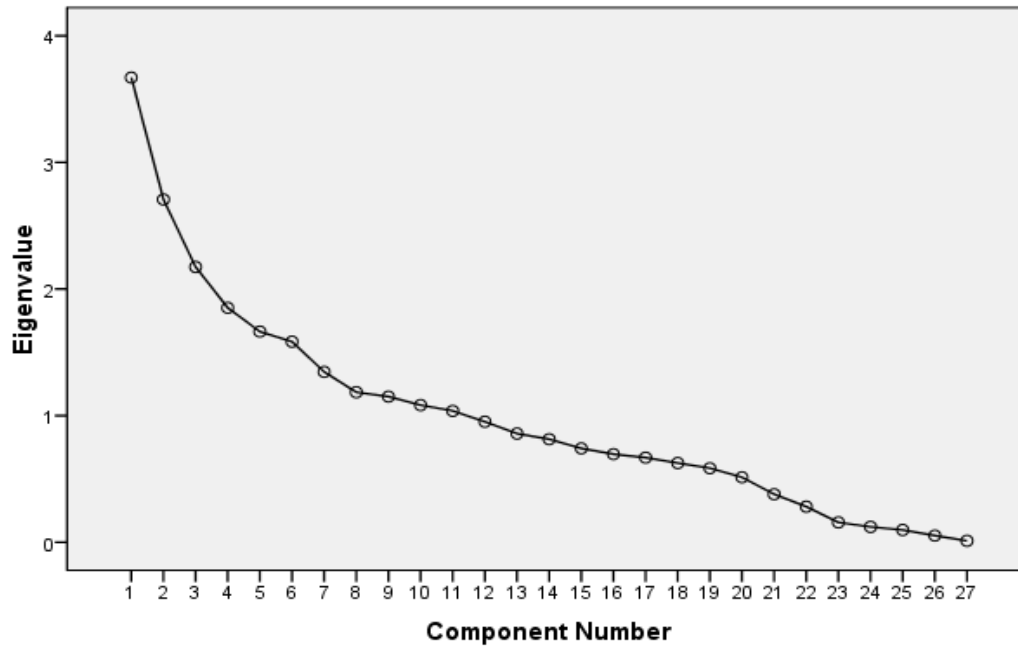


Table: 5.16. Component Transformation Matrix

Component	1	2	3	4	5	6	7	8	9	10	11
1	.961	.021	.148	-.140	-.090	.041	.077	-.058	.092	-.067	.051
2	-.201	-.181	.683	-.328	-.448	.233	.158	.023	-.235	-.118	.053
3	-.034	.924	.132	.216	-.134	.057	.189	.063	-.102	-.095	.028
4	.072	-.239	.272	.850	.024	.356	-.051	-.097	-.001	-.035	-.027
5	-.003	.192	.382	-.114	.292	-.119	-.702	-.437	-.100	.093	.043
6	-.073	.120	.046	-.271	.343	.702	.116	-.042	.428	.266	-.157
7	-.021	.010	.148	-.004	.137	.038	-.337	.665	.316	-.305	.456
8	.085	-.014	.328	.074	.252	-.271	.137	.457	-.192	.678	-.134
9	-.022	-.060	.046	-.032	.528	.006	.438	-.227	-.294	-.109	.610
10	.006	.029	-.231	.039	-.448	.181	-.166	-.101	.004	.567	.593
11	-.129	-.008	.294	.097	-.093	-.446	.269	-.277	.714	.078	.124

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

5.10. Interpretation of Factor Analysis:

Result of the analysis comprises with Correlation, KMO and Bartlett's Test, Total Variance Explained, Rotated Component Matrix and Component Transformation Matrix. Correlation table shows the well relation amongst all the variables under consideration. It can be revealed from KMO and Bartlett's Test that the KMO value is .6 which is above .5 and the analysis is significant at .01 level. There are eleven factors extracted by using Principal component analysis and Kaiser Normalization method. The factor loading .4 is taken as threshold limit and hence factor loaded with .4 and above has been extracted. The Eigen value of these eleven factors is greater than one and total cumulative percentage of Rotation Sums of Squared Loadings of these factors is 72% indicating good acceptability of result. The components are renamed as follows:

Table: 5.17. Extracted Components

Component 1 (FAC1)	Material	Component 7(FAC7)	Input Cost
Component 2 (FAC2)	Technology	Component 8 (FAC8)	Infrastructure
Component 3 (FAC3)	Weather Condition	Component 9 (FAC9)	Energy
Component 4 (FAC4)	Variety of Tea	Component 10(FAC10)	Rainfall
Component 5 (FAC5)	Soil type	Component 11(FAC11)	Welfare
Component 6 (FAC6)	Environment		

It is observed from the Table 5.17 that the extracted Component1 that renamed as “Material” has the highest loading 13.59 percent amongst all eleven components. Hence the material has the highest influence in the tea production in Assam. The component 2 that is renamed as Technology has loading 10.02 percent followed by “Weather Condition” loaded by 8.05 percent. The other components which are renamed as Variety of Tea, Soil type, Environment, Input Cost, Infrastructure, Energy, Rainfall and Welfare are loaded by 6.85 percent, 6.16 percent, 5.86 percent, 4.98 percent, 4.38 percent, 4.25 percent, 4.01 percent and 3.84 percent respectively.

FAC1, Material, has the highest impact of the production of tea in Assam. Different types of materials use for tea productions are nursery materials, shading materials, insecticides, pesticides, weedicides, fertilizers, irrigation materials, packaging materials etc. Availability of these items have major impact on the production of tea. These items are directly applied in the tea production process and hence the quality of these items has direct impact of the production.

FAC2, Technology, which includes technology for plantation, technology for irrigation, technology for weed control, technology for monitoring of different physical and chemical parameter of plantation field, technology for plucking, technology for processing of green leaf in the factory, technology of packaging of finished product etc. influence tea production. Use of technology shall increase production as well as quality of tea. Adoption and use of advanced technology can enhance tea production in Assam. Most the machineries in tea manufacturing factories of Assam are very old age and efficiency of such machineries are poor. As a result the gross production rate is not increasing at per level.

FAC3, weather, is one of the major influencing factors on tea production. It includes temperature, pressure, windflow, humidity, moisture, sunray etc. The rate of growth of tea plants and tea leaf by large extends depends on the weather condition of that particular location. Some time, change in weather may affect the quality of tea leaf. The growth and yield of tea decrease on attacking tea plants by pest in unfavorable weather conditions.

Tea production in Assam is also depends on the FAC4, variety of tea, use in tea estates. Tea producing region in Assam spreads across the state have different geographical positions. The growth of tea plants as well as quality of tea depends on the variety of tea plant planted in a particular tea producing region of Assam.

FAC5, soil type, is one of factors that affect tea production. As production of most of the crop depends on the quality of soil and the mineral present in the soil. Production of tea is

also by large depend on the types of soil which is rich with the requisite minerals required for grow of tea plants.

FAC6, Environment, is one of the factors which affect tea production.

Input Cost, FAC7, is one of the influencing factors of production of tea in Assam. Input costs are mainly include cost of purchased green leaf, cost of pesticides, cost of insecticides, cost of packaging materials, cost of irrigation materials, cost of fertilizers, cost of weedicides, cost of nursery materials, salary of executive staff, salary of office staff, salary of permanent workers, salary of temporary workers, bonus, contribution toward PF, leave encashment, overtime wages, incentives, extra duty allowance, electricity cost, furnace oil cost, diesel cost, coal cost, crude oil cost, cost of natural gas, cost of fuel etc.

FAC8, Infrastructure, is one of the influencing factors for all types industry. Similarly tea production also depends on the infrastructure of the tea producing region. It includes road connectivity, irrigation facility, tea leaf storage facility, tea godown, buildings etc.

FAC9, Energy, that includes electricity, crude oil, furnace oil, coal, natural gas etc., is one of the important factors which affect tea production in Assam. All machineries in tea manufacturing factories are run by the above mentioned energy source. Hence any deficiency of energy source may largely influence tea production process. Out of all energy sources, the unit cost of electricity is chip. But it is known that there is frequent load shading of electricity in different parts of Assam and it cause affects in tea manufacturing process.

FAC10, Rainfall, is one of the key factors which affect tea production in Assam. One of the major criteria for growing tea plant is abundant rainfall of 1000 – 3000mm annually. Hence any shortage or excess of rainfall in tea producing region impacts on the production of tea. Some time depending on the quantity of rainfall different types of pest attack tea plants which may cause decrease in production as well decrease in quality of tea leaf.

FAC11, Welfare, for the employee of tea estates, is also a influencing factors on production of tea. Different types of welfare activities extended to the tea garden worker motivate to give their best effort to the work field and as a result production increase.

Section - III

5.11.: Development of Productivity Measurement Model for Tea Production in Assam:

Productivity is defined by different authors in different ways by considering types of product and nature of production units.

i) Martinich (1997) defined productivity as the amount of output produced divided by the amount of input used. The greater the amount of output from a fixed quantity of inputs, higher the productivity. Similarly smaller the quantity of input required to produce a fixed amount of outputs, the higher the productivity.

ii) Bedi (2008) defined productivity as the ratio of output produced to the input used in its production. Following mathematical expressions on productivity given by him:

Productivity = output ÷ Input

Productivity = number of unit produced ÷ man-hour used

Productivity = number of unit produced ÷ capital employed

Productivity = number of unit produced ÷ machine -hour used

According to him, if inputs are of different resources for example, labour, material, power etc in productivity calculations, a common unit of these inputs has to be considered.

Productivity = number of unit produced ÷ (cost of labour + cost of material + cost of power)

iii)According to Chery (2013), productivity is known as the ratio between the output and input. Mathematical expression given by Chery is as follows:

Productivity = amount of output ÷ amount of input.

Multifactor productivity = Production at standard price ÷ (labour + material + overhead + capital) price

Labour Productivity = Worker output expressed in rupees ÷ worker salaries and wages in rupees.

Material Productivity = Production output in rupees ÷ (raw material + packaging material + supplies) in rupees

Capital Productivity = Total sales in rupees ÷ depreciation in capital assets in rupees

5.12: Modified Productivity Measurement Model:

This modified model proposed by the researcher using Productivity Accounting Model where all major inputs which affect the cost of tea production has been taken in to consideration is as follows:

$$\text{Total Productivity (T)} = Q_t / (L_i + E_i + M_i + C_i + W_i + S_i + Q_i)$$

Where,

Q_t = Total Monetary value of output,

L_i = Employee input, E_i = Energy input, M_i = Material input, C_i = Capital input, W_i = Welfare input,

S_i = Subsidized ration input, Q_i = Miscellaneous input. All the inputs are in monetary value.

Details description of the various input are as follows:

a) Employee input (L_i): It includes salary of executive staff, salary of office staff, salary of permanent workers, salary of temporary workers, bonus, contribution toward PF, leave encashment, overtime wages, incentives, extra duty allowance.

b) Energy input (E_i): It includes electricity cost, furnace oil cost, diesel cost, coal cost, crude oil cost, cost of natural gas, cost of fuel etc.

c) Material input (M_i): It include cost of purchased green leaf, cost of pesticides, cost of insecticides, cost of packaging materials, cost of irrigation materials, cost of fertilizers, cost of weedicides, cost of nursery materials etc.

d) Capital input (C_i): This input includes cost of land, buildings, machineries, vehicles, factory, tools & equipments, insurance, bank interest, depreciation on assets etc.

e) Welfare input (W_i) : welfare cost of worker include cost of education, health, crèche, safety, entertainment, maternity benefit etc.

f) Subsidized ration input (S_i) : It includes the cost subsidized ration issued to the worker and staff.

g) Miscellaneous input (Q_i) : It includes expenditure like repairing, head office expense, consultancy, audit, social overheads, telephone bills, mobile bills, internet bills, transportation charges, taxes, legal cost, guest expenditure, promotional activities etc.

Mathematical equations for partial productivities L, E, M, C, W, S, Q can be expressed as:

$$\text{Worker Productivity (L)} = Q_t / L_i$$

$$\text{Energy Productivity (E)} = Q_t / E_i$$

$$\text{Material Productivity (M)} = Q_t / M_i$$

$$\text{Capital Productivity (C)} = Q_t / C_i$$

$$\text{Welfare Productivity (W)} = Q_t / W_i$$

$$\text{Subsidised ration Productivity (S)} = Q_t / S_i$$

$$\text{Miscellaneous Productivity (Q)} = Q_t / Q_i$$

Data collected from the thirty eight sampled tea estates are regressed using regression software MINITAB-18 to see the correlation amongst the total productivity and partial productivity and also to established relation between total productivity and partial productivity.

The following multiple regression model has been employed for this purpose:

$$Y_t = \beta_1 + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + \beta_7 X_6 + \beta_8 X_7 + U_t$$

where,

Y_t is the Total Productivity

X₁ Employee Productivity

X₂ Energy Productivity

X₃ Material Productivity

X₄ Capital Productivity.

- X₅ Welfare Productivity
- X₆ Subsidized Ration Productivity
- X₇ Misc Productivity
- U_t is the error term.
- β₁ is the intercept.
- β_i (i = 1,2,37) is the regression coefficients.

5.13: Data Analysis for Total Productivity and Partial Productivity:

Data collected from thirty two sampled tea estates by the way of field survey during the period October 2015 to April 2017. Raw data were put in tabular form for individual tea estate for further compilation. Total Productivity, Partial Productivity viz. Employee Productivity, Energy Productivity, Material Productivity, Capital Productivity, Welfare Productivity, Subsidized Ration Productivity, and Miscellaneous Productivity calculated for respective tea estates. Total thirty two table thus obtained are given below:

Table: 5.18.: Total Productivity and partial productivity of Tea Estate - 1

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.05	5.33	6.93	10.03	10.24	26.41	11.79	16.06
2011	1.09	4.60	6.21	7.98	9.24	27.04	10.31	18.79
2012	1.04	3.99	6.85	9.54	10.55	30.28	11.65	18.11
2013	1.04	4.04	6.16	8.09	10.13	30.78	11.10	24.92
2014	1.02	4.60	7.53	10.96	13.27	45.57	16.04	22.74
2015	1.04	4.23	7.36	8.79	12.77	42.72	14.97	35.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -1, total productivity is the highest in the year 2011 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2014 and least in the year 2011, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2015 and least in the year 2011, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year

2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2014.

Table: 5.19 : Total Productivity and partial productivity of Tea Estate – 2

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.28	4.13	8.53	6.73	14.22	13.52	7.52	14.22
2011	1.36	4.25	8.24	9.06	16.36	13.12	6.8	16.58
2012	1.62	4.68	9.28	10.8	23.14	17.27	8.27	25.45
2013	1.47	4.49	8.21	9.14	20.21	19.83	7.92	20.22
2014	1.44	4.47	7.39	8.79	19.62	19.99	8.63	18.87
2015	1.50	4.51	7.06	9.58	21.31	21.65	10.08	19.13

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -2, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2010, Energy Productivity is the highest in the year 2012 and least in the year 2015, Material Productivity is the highest in the year 2015 and least in the year 2010, Capital Productivity is the highest in the year 2015 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2011, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.20: Total Productivity and partial productivity of Tea Estate – 3

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.36	4.69	5.91	12.36	19.23	9.2	11.33	13.29
2011	1.33	4.24	5.97	10.55	21.36	11.26	10.69	13.89
2012	1.21	3.86	5.26	9.32	22.25	10.25	9.64	14.45
2013	1.24	4.1	5.91	11	23.34	12.17	10.62	7.96
2014	1.19	3.88	5.51	10.02	25.13	12.33	9.98	8.30
2015	1.29	4.09	6.25	13.13	24.39	10.49	10	9.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -3, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.21: Total Productivity and partial productivity of Tea Estate – 4

Year	Total Productivity	Partial Productivity						
		Employed Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.15	3.23	6.23	10.13	9.24	25.41	12.79	16.06
2011	1.19	2.50	6.31	7.88	9.14	27.04	11.31	18.79
2012	1.14	3.89	6.75	9.44	10.55	33.38	12.65	18.11
2013	1.13	3.24	6.06	8.19	10.13	31.78	13.10	24.92
2014	1.23	3.70	7.43	10.36	13.27	42.57	15.04	27.74
2015	1.24	3.20	7.26	8.79	12.77	48.72	14.97	32.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -4, total productivity is the highest in the year 2011 and least in the year 2013. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2013, Energy Productivity is the highest in the year 2014 and least in the year 2011, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2011, Welfare Productivity is the highest in the year 2015 and least in the year 2013, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2012.

Table: 5.22: Total Productivity and partial productivity of Tea Estate – 5

Year	Total Productivity	Partial Productivity						
		Employed Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.36	5.69	6.91	12.36	19.23	9.2	11.33	12.29
2011	1.33	4.98	5.27	10.55	18.36	11.28	11.69	13.89
2012	1.21	3.96	6.26	9.32	19.25	10.27	10.64	14.45
2013	1.24	4.1	5.91	11	21.34	12.17	10.62	9.96
2014	1.19	3.78	6.51	10.02	22.13	12.33	9.98	8.31
2015	1.29	4.09	6.25	13.13	23.39	10.50	10.23	9.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -5, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2014, Energy Productivity is the highest in the year 2010 and least in the year 2011, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2015 and least in the year 2011, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2014 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2014.

Table: 5.23: Total Productivity and partial productivity of Tea Estate – 6

Year	Total Productivity	Partial Productivity						
		Employed Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.28	3.13	8.53	6.73	14.22	13.52	7.52	14.22
2011	1.36	3.27	8.24	9.06	16.36	13.12	6.8	16.58
2012	1.62	2.68	9.28	11.8	23.14	17.27	8.27	25.45
2013	1.47	3.49	8.21	10.14	20.21	19.83	7.92	20.22
2014	1.44	2.47	8.39	9.79	19.62	19.99	8.63	18.87
2015	1.50	3.51	8.06	9.58	21.31	21.65	10.08	19.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -6, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2014, Energy Productivity is the highest in the year 2012 and least in the year 2015, Material Productivity is the highest in the year 2012 and least in the year 2010, Capital Productivity is the highest in the year 2012 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2011, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.24: Total Productivity and partial productivity of Tea Estate – 7

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.35	3.33	6.93	10.03	10.24	26.41	11.79	16.06
2011	1.59	4.60	7.21	7.98	9.24	27.04	10.31	18.79
2012	1.84	3.99	7.85	9.54	10.55	30.28	11.65	18.11
2013	1.78	4.04	6.16	8.09	10.13	30.78	11.10	24.92
2014	1.68	3.60	6.53	10.96	13.27	35.57	16.04	22.74
2015	1.69	3.23	7.26	8.79	12.77	42.72	14.97	35.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -7, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2011 and least in the year 2015, Energy Productivity is the highest in the year 2015 and least in the year 2011, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2011, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2010 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2010.

Table: 5.25: Total Productivity and partial productivity of Tea Estate – 8

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.02	5.33	6.73	9.03	10.24	26.41	11.79	16.06
2011	1.03	4.60	6.21	7.98	9.24	31.04	10.31	18.79
2012	1.11	5.99	7.15	9.54	9.55	30.28	12.65	19.11
2013	1.04	5.04	6.16	8.09	9.13	30.78	12.10	25.92
2014	1.05	5.60	7.53	9.96	13.27	46.57	16.04	22.74
2015	1.08	5.23	7.26	8.79	12.77	42.72	14.97	35.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -8, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2011, Energy Productivity is the highest in the year 2014 and least in the year 2015, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2011, Welfare Productivity is the highest in the year 2014 and least in the year 2012, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2010.

Table: 5.26: Total Productivity and partial productivity of Tea Estate – 9

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.38	5.13	8.53	8.73	15.22	15.02	7.32	14.22
2011	1.39	4.27	9.24	9.06	16.36	15.12	7.8	16.58
2012	1.62	4.68	9.28	11.8	21.14	17.27	8.27	20.45
2013	1.77	4.49	8.91	11.14	20.21	19.83	7.92	19.22
2014	1.64	5.47	9.49	9.79	20.62	20.99	8.63	18.87
2015	1.50	5.51	8.56	10.58	20.31	21.65	10.18	19.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -9, total productivity is the highest in the year 2013 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2011, Energy Productivity is the highest in the year 2014 and least in the year 2010, Material Productivity is the highest in the year 2013 and least in the year 2010, Capital Productivity is the highest in the year 2012 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2010 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.27: Total Productivity and partial productivity of Tea Estate – 10

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.29	5.18	8.53	11.73	14.22	18.52	10.52	15.22
2011	1.36	4.27	8.24	12.06	18.36	18.12	11.8	16.58
2012	1.65	5.68	9.28	11.8	23.14	19.27	11.27	27.45
2013	1.47	4.59	8.22	10.14	23.21	19.83	10.92	20.22
2014	1.48	4.47	8.39	10.79	19.62	20.99	11.63	18.87
2015	1.50	4.51	8.76	11.58	21.31	21.65	11.08	19.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -10, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2011, Energy Productivity is the highest in the year 2012 and least in the year 2013, Material Productivity is the highest in the year 2012 and least in the year 2013, Capital Productivity is the highest in the year 2013 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2011, Subsidized Ration Productivity is the highest in the year

2011 and least in the year 2010 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.28: Total Productivity and partial productivity of Tea Estate – 11

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.25	4.13	6.93	10.03	10.24	26.41	11.79	16.06
2011	1.59	3.50	7.21	7.98	9.24	27.04	10.31	18.79
2012	1.84	3.79	6.85	9.54	10.55	30.28	11.65	18.11
2013	1.78	4.04	6.16	8.09	10.13	30.78	10.10	25.92
2014	1.62	5.60	6.63	10.96	13.27	35.57	16.04	22.74
2015	1.69	5.23	7.26	8.79	12.77	42.72	15.97	31.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -11, total productivity is the highest in the year 2012 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2014 and least in the year 2011, Energy Productivity is the highest in the year 2015 and least in the year 2013, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2011, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2013 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2010.

Table: 5.29: Total Productivity and partial productivity of Tea Estate – 12

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.26	4.69	5.91	12.36	19.23	9.2	11.33	13.29
2011	1.32	4.24	5.97	10.55	21.36	11.26	10.69	13.89
2012	1.20	3.86	5.26	9.32	22.25	10.25	9.64	14.45
2013	1.21	4.17	6.11	11.38	23.34	12.17	10.62	12.96
2014	1.19	3.88	5.81	10.02	25.13	12.33	9.98	11.30
2015	1.25	4.09	6.25	13.13	24.39	10.49	10.00	13.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -12, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2014, Energy Productivity is the highest in the year 2015 and least in the year 2014, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2010 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2014.

Table: 5.30: Total Productivity and partial productivity of Tea Estate – 13

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.28	3.23	8.53	8.73	15.22	15.02	7.32	14.22
2011	1.39	3.27	8.24	9.06	16.26	15.12	7.8	16.58
2012	1.62	2.68	9.28	11.8	21.14	17.27	8.27	20.45
2013	1.67	3.49	8.91	10.14	20.21	19.83	7.92	22.22
2014	1.64	3.47	10.49	9.79	20.62	20.99	8.63	24.87
2015	1.70	3.51	9.56	10.58	20.31	21.65	10.18	23.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -13, total productivity is the highest in the year 2015 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2015, Energy Productivity is the highest in the year 2014 and least in the year 2011, Material Productivity is the highest in the year 2012 and least in the year 2010, Capital Productivity is the highest in the year 2015 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year

2015 and least in the year 2010 and Miscellaneous Productivity is the highest in the year 2014 and least in the year 2010.

Table: 5.31: Total Productivity and partial productivity of Tea Estate – 14

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.12	5.33	7.73	9.43	11.24	31.41	11.79	19.06
2011	1.23	4.60	6.21	7.98	12.24	31.04	11.31	18.79
2012	1.21	5.99	7.15	9.54	11.55	30.28	12.65	19.11
2013	1.14	6.04	6.16	8.09	11.13	30.78	12.10	25.92
2014	1.32	5.80	7.53	9.96	13.27	46.57	16.04	27.74
2015	1.28	6.23	7.26	8.79	12.77	42.72	14.97	35.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -14, total productivity is the highest in the year 2015 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2011, Energy Productivity is the highest in the year 2010 and least in the year 2013, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2013, Welfare Productivity is the highest in the year 2014 and least in the year 2012, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2011.

Table: 5.32: Total Productivity and partial productivity of Tea Estate – 15

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.58	6.13	8.53	6.73	14.22	13.52	7.52	15.22
2011	1.46	6.27	8.24	9.06	16.36	13.12	7.8	16.58
2012	1.62	5.68	9.28	11.8	23.14	17.27	8.27	22.45
2013	1.57	4.49	8.21	10.14	20.21	19.83	7.92	20.22
2014	1.54	4.47	8.39	9.79	19.62	19.99	8.63	19.87
2015	1.60	5.51	9.06	10.58	21.31	21.65	9.08	20.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -15, total productivity is the highest in the year 2011 and least in the year 2012. Partial productivities namely Employee Productivity is highest in the year 2011 and least in the year 2014, Energy Productivity is the highest in the year 2012 and least in the year 2013, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.33: Total Productivity and partial productivity of Tea Estate – 16

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.55	4.33	6.93	10.03	10.24	26.41	11.79	21.06
2011	1.59	4.60	7.21	7.98	9.24	27.04	10.31	22.79
2012	1.64	4.99	7.85	9.54	10.55	30.28	11.65	21.11
2013	1.78	5.04	8.16	8.09	10.13	30.78	11.10	24.92
2014	1.58	5.60	8.53	10.96	13.27	35.57	16.04	22.74
2015	1.69	5.23	7.26	8.79	12.77	42.72	14.97	28.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -16, total productivity is the highest in the year 2013 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2014 and least in the year 2010, Energy Productivity is the highest in the year 2014 and least in the year 2010, Material Productivity is the highest in the year 2014 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2011, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2010.

Table: 5.34: Total Productivity and partial productivity of Tea Estate – 17

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.36	4.69	5.91	12.36	19.23	9.2	11.33	13.29
2011	1.33	4.24	5.97	10.55	21.36	11.26	10.69	13.89
2012	1.21	3.86	5.26	9.32	22.25	10.25	9.64	14.45
2013	1.24	4.1	5.91	11	23.34	12.17	10.62	11.96
2014	1.19	3.88	5.51	10.02	25.13	12.33	9.98	12.30
2015	1.29	4.09	6.25	13.13	24.39	10.49	10	13.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -17, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2014, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2010 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.35: Total Productivity and partial productivity of Tea Estate – 18

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.55	5.69	6.91	12.36	19.23	10.2	11.33	23.29
2011	1.42	6.24	5.97	10.55	21.36	11.26	10.69	24.89
2012	1.40	6.86	6.26	10.32	22.25	10.25	11.64	25.45
2013	1.61	6.17	6.11	11.38	23.34	11.17	10.62	22.96
2014	1.69	5.88	5.81	10.02	25.13	12.33	9.98	21.30
2015	1.65	6.09	6.25	13.13	24.39	11.49	10.12	24.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -18, total productivity is the highest in the year 2014 and least in the year 2012. Partial productivities namely Employee Productivity is highest in the year 2012 and least in the year 2010, Energy Productivity is the highest in the year 2010 and least in the year 2011, Material Productivity is the highest in the year 2010 and least in the year 2014, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2012 and least in the year 2014 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2014.

Table: 5.36: Total Productivity and partial productivity of Tea Estate – 19

Year	Total Productivity	Partial Productivity						
		Employed Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.42	6.33	7.73	9.33	15.24	21.41	11.79	19.06
2011	1.53	5.60	6.21	7.98	13.24	24.04	12.31	18.79
2012	1.41	6.99	7.15	9.44	15.55	27.28	12.65	29.11
2013	1.44	6.84	7.16	8.09	14.13	30.78	13.10	25.92
2014	1.52	6.80	7.53	9.26	13.27	29.57	15.04	26.74
2015	1.58	6.23	7.76	8.79	12.77	32.72	14.97	25.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -19, total productivity is the highest in the year 2015 and least in the year 2012. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2012 and least in the year 2013, Capital Productivity is the highest in the year 2012 and least in the year 2015, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.37: Total Productivity and partial productivity of Tea Estate – 20

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.48	7.13	8.53	6.73	15.22	13.52	17.52	16.22
2011	1.46	6.27	8.24	9.06	16.36	13.12	17.8	17.58
2012	1.62	7.68	9.28	11.8	22.14	17.27	18.27	22.45
2013	1.67	4.49	9.21	11.14	20.21	12.83	17.92	20.22
2014	1.54	6.47	8.39	10.79	19.62	19.99	18.63	21.87
2015	1.60	5.51	9.06	11.58	21.31	21.65	19.08	20.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -20, total productivity is the highest in the year 2013 and least in the year 2011. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2013, Energy Productivity is the highest in the year 2010 and least in the year 2013, Material Productivity is the highest in the year 2015 and least in the year 2010, Capital Productivity is the highest in the year 2015 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2011, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2010.

Table: 5.38: Total Productivity and partial productivity of Tea Estate – 21

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.25	4.23	7.23	10.13	9.24	25.41	12.79	11.06
2011	1.29	4.50	6.31	11.88	9.25	27.04	11.31	11.79
2012	1.34	3.89	7.75	10.44	10.05	23.38	12.65	10.11
2013	1.23	3.24	6.06	8.19	10.13	31.78	13.10	11.92
2014	1.33	4.70	7.43	10.36	13.27	32.57	15.04	12.74
2015	1.35	3.90	7.26	9.79	12.77	28.72	14.97	11.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -21, total productivity is the highest in the year 2015 and least in the year 2013. Partial productivities namely Employee Productivity is highest in the year 2014 and least in the year 2015, Energy Productivity is the highest in the year 2012 and least in the year 2013, Material Productivity is the highest in the year 2011 and least in the year 2013, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2012, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2014 and least in the year 2012.

Table: 5.39: Total Productivity and partial productivity of Tea Estate – 22

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.22	5.33	7.73	9.43	11.24	31.41	11.79	19.06
2011	1.23	4.60	7.21	7.98	12.24	31.14	11.31	18.79
2012	1.21	5.99	7.15	8.54	11.55	30.78	12.65	19.11
2013	1.14	6.04	6.16	8.09	12.13	30.72	12.10	25.92
2014	1.32	5.80	7.53	8.96	13.27	46.57	16.04	27.74
2015	1.28	6.23	7.26	8.79	12.77	47.72	14.97	25.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -22, total productivity is the highest in the year 2014 and least in the year 2013. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2011, Energy Productivity is the highest in the year 2010 and least in the year 2013, Material Productivity is the highest in the year 2010 and least in the year 2011, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2013, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2014 and least in the year 2011.

Table: 5.40: Total Productivity and partial productivity of Tea Estate – 23

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.38	5.13	8.53	8.73	15.22	15.02	7.32	15.22
2011	1.39	4.27	9.24	9.06	16.36	15.12	7.8	17.58
2012	1.52	4.68	9.28	11.8	21.14	17.27	8.27	20.45
2013	1.77	4.49	8.91	11.14	20.21	19.83	7.92	19.22
2014	1.74	5.47	9.49	9.79	20.62	21.99	9.63	19.87
2015	1.80	6.11	9.56	11.58	22.31	21.65	10.18	20.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -23, total productivity is the highest in the year 2015 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2011, Energy Productivity is the highest in the year 2010 and least in the year 2013, Material Productivity is the highest in the year 2012 and least in the year 2010, Capital Productivity is the highest in the year 2015 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.41: Total Productivity and partial productivity of Tea Estate – 24

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.32	6.33	7.63	9.43	15.24	21.41	12.79	19.06
2011	1.53	5.60	6.21	7.98	13.24	24.04	12.31	19.79
2012	1.43	5.99	7.15	9.44	15.55	27.28	12.65	29.11
2013	1.44	6.84	7.76	8.29	14.13	30.78	13.10	25.92
2014	1.52	7.30	7.83	9.26	14.27	29.57	15.04	26.74
2015	1.55	7.73	7.76	8.79	15.77	32.72	14.97	26.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -24, total productivity is the highest in the year 2015 and least in the year 2012. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2011, Energy Productivity is the highest in the year 2014 and least in the year 2011, Material Productivity is the highest in the year 2012 and least in the year 2011, Capital Productivity is the highest in the year 2012 and least in the year 2011, Welfare Productivity is the highest in the year 2015 and least in the year 2011, Subsidized Ration Productivity is the highest in the year 2014 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2014 and least in the year 2010.

Table: 5.42: Total Productivity and partial productivity of Tea Estate – 25

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.36	4.69	5.91	12.36	19.23	9.2	11.33	13.29
2011	1.33	4.24	5.97	10.55	21.36	11.26	10.69	13.89
2012	1.21	3.86	5.26	9.32	22.25	10.25	9.64	14.45
2013	1.24	4.11	5.91	11	23.34	12.17	10.62	7.96
2014	1.19	3.88	5.51	10.02	25.13	12.33	9.98	8.30
2015	1.29	4.09	6.25	13.13	24.39	10.49	10	9.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -25, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.43: Total Productivity and partial productivity of Tea Estate – 26

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.23	5.33	8.73	9.43	21.24	31.41	11.79	19.06
2011	1.28	5.60	7.91	7.98	22.24	31.14	12.31	18.79
2012	1.31	5.99	7.15	8.54	21.55	30.78	12.65	19.11
2013	1.24	6.04	7.16	8.09	23.13	30.78	12.10	25.92
2014	1.32	6.80	7.23	7.96	23.27	36.57	16.04	26.74
2015	1.28	6.23	8.26	8.79	22.77	37.72	14.97	25.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -26, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.44: Total Productivity and partial productivity of Tea Estate – 27

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.42	8.33	7.73	9.33	15.24	21.41	11.79	19.06
2011	1.63	7.60	6.21	8.98	13.24	24.04	12.31	18.79
2012	1.51	6.99	7.15	9.44	15.55	27.28	12.65	29.11
2013	1.54	7.84	8.16	9.09	14.13	30.78	13.10	25.92
2014	1.62	7.80	8.53	9.26	13.27	29.57	15.04	26.74
2015	1.68	8.23	7.76	10.79	13.77	32.72	14.97	25.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -27, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.45: Total Productivity and partial productivity of Tea Estate – 28

Year	Total Productivity	Partial Productivity						
		Employed Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.75	5.23	7.23	15.13	9.84	25.41	12.79	11.06
2011	1.79	5.50	7.31	16.88	9.64	27.04	12.31	12.79
2012	1.64	5.89	7.75	15.44	10.05	30.38	15.65	10.11
2013	1.73	4.24	6.06	18.19	10.23	31.78	13.10	12.92
2014	1.83	4.70	7.43	16.36	13.27	32.57	15.04	13.74
2015	1.84	5.90	7.26	19.79	12.66	31.72	15.97	13.46

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -28, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.46: Total Productivity and partial productivity of Tea Estate – 29

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.45	7.69	11.91	17.36	17.23	15.22	18.33	25.29
2011	1.42	7.24	12.97	17.55	18.36	14.26	18.69	24.89
2012	1.30	6.86	12.26	18.32	19.25	14.25	19.64	25.45
2013	1.61	7.57	13.11	18.38	18.34	15.17	18.62	25.96
2014	1.59	7.88	12.81	19.02	20.13	15.33	17.98	24.30
2015	1.65	8.09	13.25	19.13	19.39	15.49	18.12	25.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -29, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.47: Total Productivity and partial productivity of Tea Estate – 30

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.16	5.69	5.21	11.36	19.23	11.22	11.33	15.29
2011	1.23	4.34	5.97	10.55	12.36	12.26	10.69	19.89
2012	1.11	3.66	6.26	9.32	13.25	10.25	11.64	13.45
2013	1.24	4.12	5.91	10.23	13.34	12.17	10.62	21.96
2014	1.29	5.88	6.51	11.02	15.13	13.33	11.98	14.30
2015	1.31	4.09	6.25	11.13	14.39	13.49	12.12	16.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -30, total productivity is the highest in the year 2010 and least in the year 2014. Partial productivities namely Employee Productivity is highest in the year 2010 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2014 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2011 and least in the year 2012 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2013.

Table: 5.48: Total Productivity and partial productivity of Tea Estate – 31

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.44	7.13	8.53	6.73	15.32	17.52	19.52	20.22
2011	1.41	7.27	7.24	9.26	16.36	18.12	19.8	21.58
2012	1.52	7.68	7.28	11.82	21.14	17.27	18.27	22.45
2013	1.53	8.49	8.21	11.14	20.21	19.83	23.92	20.22
2014	1.54	8.47	8.39	10.79	19.62	19.99	21.63	21.87
2015	1.60	8.51	8.06	11.58	21.31	22.65	20.08	20.17

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -31, total productivity is the highest in the year 2015 and least in the year 2011. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2010, Energy Productivity is the highest in the year 2010 and least in the year 2012, Material Productivity is the highest in the year 2012 and least in the year 2010, Capital Productivity is the highest in the year 2015 and least in the year 2013, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2013 and least in the year 2010 and Miscellaneous Productivity is the highest in the year 2012 and least in the year 2015

. Table: 5.49: Total Productivity and partial productivity of Tea Estate – 32

Year	Total Productivity	Partial Productivity						
		Employee Wages	Energy	Material	Capital	Welfare	Subsidized Ration	Misc
2010	1.56	3.69	6.91	12.36	20.23	10.23	11.33	15.29
2011	1.63	3.24	6.97	10.55	23.36	11.26	10.69	16.89
2012	1.61	2.86	6.26	9.32	22.25	11.25	12.64	16.45
2013	1.64	3.17	6.91	11.22	25.34	12.17	12.62	17.96
2014	1.69	3.88	6.51	10.02	25.13	12.33	13.98	18.30
2015	1.59	4.09	7.25	13.13	24.39	13.49	14.23	18.98

Source: compiled by the researcher from field survey

It is observed from the above table that for Tea Estate -32, total productivity is the highest in the year 2014 and least in the year 2010. Partial productivities namely Employee Productivity is highest in the year 2015 and least in the year 2012, Energy Productivity is the highest in the year 2015 and least in the year 2012, Material Productivity is the highest in the year 2015 and least in the year 2012, Capital Productivity is the highest in the year 2014 and least in the year 2010, Welfare Productivity is the highest in the year 2015 and least in the year 2010, Subsidized Ration Productivity is the highest in the year 2015 and least in the year 2011 and Miscellaneous Productivity is the highest in the year 2015 and least in the year 2010.

5.14. Regression Result of MINITAB-18:

The tabular data indicating Total Productivity (T), Employee Productivity (L), Energy Productivity (E), Material Productivity (M), Capital Productivity (C), Welfare Productivity (W), Subsidized Ration Productivity (S) and Miscellaneous Productivity (Q) for all sampled tea estates are regressed to get the productivity Model. Following are the details of result of regression analysis:

Multiple Regression Analysis: T versus L, E, M, C, W, S, Q

Table: 5.50. : Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	7	0.267037	0.038148	176.36	0.000
L	1	0.017441	0.017441	80.63	0.000
E	1	0.006321	0.006321	29.22	0.000
M	1	0.005048	0.005048	23.33	0.001
C	1	0.013710	0.013710	63.38	0.000
W	1	0.002795	0.002795	12.92	0.005
S	1	0.002776	0.002776	12.83	0.005
Q	1	0.006797	0.006797	31.42	0.000
Error	10	0.002163	0.000216		

Table: 5.51: Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.0147076	99.20%	98.63%	96.18%

Table : 5.52.: Coefficients

Term	Coef	SE Coef	T-Value	P-Value
Constant	0.0132	0.0525	0.25	0.806
L	0.1238	0.0138	8.98	0.000
E	0.03028	0.00560	5.41	0.000
M	0.01575	0.00326	4.83	0.001
C	0.01107	0.00139	7.96	0.000
W	1.877	0.522	3.59	0.005
S	-3.97	1.11	-3.58	0.005
Q	0.005328	0.000950	5.61	0.000

Result of ANOVA test for all variables shown in table 5.50. The table implied that the worker productivity L ($p=.000 < .01$) is statistically significant related to the total productivity of tea. The energy productivity E ($p=.000<.01$) is showing statistically significant to the total productivity (T). The p value of material productivity (M) $p=.001$ is less than .01 implied that the it is statistically significant with the total productivity (T). Capital productivity C is also statistically significant with the total productivity as the p value .000 is less than .01. Welfare productivity (W) is also statistically significant to the total productivity (T) as the p value ($p=.005$) is less than .01. Similar pattern shows by the subsidized ration productivity (S) with the total productivity (T) as the $p=.005$ is less than .01. The table also revealed that the miscellaneous productivity Q ($p=.000 < .01$) is statistically significant related to the total productivity of tea.

Table 5.51 Shows the pearson correlation $R^2 = 99.2\%$. It implied strong correlations amongst all these seven variables L, E, M, C, W, S, and Q with T. It is shown that 99.2% of the weight age of T governed by these seven variables. The co-efficient for regression model is given in the table 5.52. It is seen that variables L, E, M, C, W, and Q are positively correlated with the total productivity T. While the variable “S” is negatively correlated with the total productivity T. The regression equation thus obtained for the analysis is as follows:

The total productivity and partial productivity is related through the regression equation

$$T = 0.0132 + 0.1238 L + 0.03028 E + 0.01575 M + 0.01107 C + 1.877 W - 3.97 S + 0.005328 Q$$
