

**PROBLEMS AND PROSPECTS OF ERICULTURE
IN ASSAM WITH SPECIAL REFERENCE TO
BARPETA DISTRICT**

by

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I, **Manjit Das**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

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CONTENTS

	Title	Page No.
	ACKNOWLEDGEMENTS	viii-ix
	LIST OF TABLES	x-xiii
	LIST OF DIAGRAMS	xiv-xv
	LIST OF MAPS & LIST OF APPENDIX	xvi
	LIST OF ABBREVIATIONS	xvii
	GLOSSARY	xiii-xx
Chapter-1	Introduction	1-24
	1.1. Background	
	1.2. Mode of Harvesting Activities	
	1.3. Present Position of World Silk Production	
	1.4. Silk Production in India	
	1.5. Silk Industry in North East India	
	1.6. A Brief Account of Ericulture in Assam and Barpeta	
	1.7. Objectives	
	1.8. Rational Behind Undertaking this Study	
	1.9. Hypotheses	
	1.10. Scope of the Study	
Chapter-2	Review of Literature	25-34
Chapter-3	Methodology and Collection of Data	35-45
	3.1. Introduction	
	3.2. Role of Ericulture in the Generation of Employment and Income in Assam	
	3.3. Spatio-temporal Variation in Ericulture in Assam	

- 3.4. Comparative Study of Eri, Muga, Mulberry and Tasar in Assam
- 3.5. Problems and Prospects of Ericulture in Assam and Role of Financial Institutions in Ericulture
- 3.6. Collection of Data
- 3.7. Limitations of Data

Chapter-4 Ericulture as a Source of Employment and Income 46-99

- 4.1. Introduction
- 4.2. Some Earlier Considerations and Mode of Analysis
- 4.3. Observations
 - 4.3.1. Contribution of Ericulture to Total Workforce of Assam
 - 4.3.2. Growth of Employment in Ericulture of Assam during 1990-91 to 2005-06
 - 4.3.3. Contribution of Ericulture to the NSDP of Assam during 1980-81 to 2004-05
 - 4.3.4. Employment of Families per hectare of Eri Feed Plantation and per unit of Production of Eri cut Cocoon in Assam
 - 4.3.5. Changes in Employment of Families in Sericulture in Barpeta District
 - 4.3.6. Labour Engaged for the Production of Eri Cocoons in the Sample Households
 - 4.3.7. Contribution of Ericulture to the Family Income of Sample Households
 - 4.3.8. Components of Income Generated from Ericulture by the Sample Households
 - 4.3.9. Generation of Employment and income in Eri silk Industry
 - 4.3.9.1. Generation of Employment and income in Eri silk Spinning in the Sample Households
 - 4.3.9.2. Generation of Employment and income in Eri silk weaving in the Sample Households
 - 4.3.10. Total Employment and Income Generated in the Whole Ericulture Activities
- 4.4. Role of Ericulture in Eradicating Rural Poverty
- 4.5. Conclusion

Chapter-5 Spatio-temporal Variation in Ericulture in Assam 100-118

- 5.1. Introduction
- 5.2. District-wise Variation in Contribution of Eri-cut Cocoon to Total State Production during 1990-91 to 2005-06
- 5.3. District-wise Variation in Contribution of Ericulture Proper to Employment Generation in Assam during 1995-96 to 2005-06
- 5.4. District wise Variation in Area under Eri Host Plant during 1993-94 to 2005-06
- 5.5 District-wise Variation in Output of Eri Cocoon per Hectare of Land under Eri Host Plant
- 5.6. Reasons for Inter-district Variation in Area, Production and Family Engaged in Ericulture
- 5.7 Conclusion

Chapter-6 Comparative Study of Eri, Muga, Mulberry and Tasar in Assam
119-158

- 6.1. Introduction
- 6.2. Temporal Variation in Eri, Muga, Mulberry and Tasar Raw Silk Production in Assam during 1980-81 to 2004-05
- 6.3. Contribution of Eri, Muga and Mulberry Culture to Total Workforce in Assam
- 6.4. Generation of Employment in Eri, Muga and Mulberry Culture in Assam during 1990-91 to 2005-06
- 6.5. Contribution of Eri, Muga and Mulberry Raw Silk to Net State Domestic Product of Assam during 1980-81 to 2004-05
- 6.6. Production of Eri, Muga and Mulberry Raw Silk per Hectare and per Family
- 6.7. Mode of Working and Cost, Revenue and Profit per Unit Output of Eri, Muga and Mulberry Cocoon among the Sample Families
- 6.8. Capital and Labour output ratio in Eri, Muga and Mulberry
- 6.9. Capital-Labour Substitution across the Rearing Families of Eri, Muga and Mulberry

- 6.10. Comparative Picture of Eri and Muga in the Earning of Foreign Exchange in Assam
- 6.11. Conclusion

Chapter-7 Problems and Prospects of Ericulture In Assam 159-192

- 7.1. Introduction
- 7.2. Problems associated with ericulture Proper
 - 7.2.1. Non-Economic problems
 - 7.2.1.1. Lack of Education among the Rearers
 - 7.2.1.2 Attitude of the Society
 - 7.2.2. Economic Problems of Ericulture Proper
 - 7.2.2.1 Lack of Healthy Seeds
 - 7.2.2.2. Shortage of Feeds of Silkworm
 - 7.2.2.3 Financial Problem
 - 7.2.2.4 Marketing Problem
 - 7.2.2.5 Lack of capital
- 7.3 Problems Associated with Endi Textile industry
 - 7.3.1. Non- Economic Problems
 - 7.3.1.1 Lack of Education
 - 7.3.1.2 Attitude of the Society
 - 7.3.2 Economic Problems of Eri Silk Industry
 - 7.3.2.1 Technological Improvement and Training
 - 7.3.2.2 Marketing Problem
 - 7.3.2.3 Financial Problem
- 7.4. Future Prospects of Ericulture in Assam

Chapter-8 Role of Various Financial Agencies in Ericulture of Assam 193-204

- 8.1. Introduction
- 8.2. Sources of Finance in Assam
 - 8.3.1. Institutional Sources of Finance in Barpeta District
 - 8.3.2. Non-Institutional Sources of Finance in Barpeta District
- 8.4. Ericulture and Financial Institutions in Barpeta district
- 8.5. Government Finance to Ericulture

8.6 Conclusion	
Chapter-9 Summery and Conclusions	205-218
9.1. Introduction	
9.2 Summary of Findings	
9.3. Conclusions and Policy Implications	
Bibliography	219-223

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The district of Barpeta is the fourth populous district in the state of Assam with population of 16.42 lakh covering an area of 3245 square kilometres. 5.70 and 7.48 per cent of its population belong to Schedule Castes and Schedule Tribes respectively. The density per square kilometre in the district is 508 and the sex ratio figured at 941. But the literacy rate is only 56.24 per cent. The literacy rate among the SCs and STs is however satisfactory with 62.96 and 60.87 per cent of total SC and ST population in the district are literate.

There are 1073 villages in total in the district under 12 community development blocks within two subdivisions Barpeta and Bajali. Out of these total villages, sericulture is practised only in 140 villages. The total number of households in the district is 290494 out of which 266524 are in rural area and 23970 in urban area. Out of

these total families, 3861 numbers of families belongs to sericulture families. The total area under host plant is 307 hectares of land, out of which 103 hectares of land are under eri host plant. In the year 2005-06, the district has produced only eri and muga. The production of cocoon is 22 M.T. of eri and three crores of muga.

Jalah CD block is within the Bajali sub-division of Barpeta district. Within the block, three villages namely, Salbari, Hahchara and Bhuyapara are selected. The total population of these villages is 1160, 1358 and 614 respectively (2001 Census). The major portion of inhabitants of these three villages belongs to SC and ST category. The percentage of SC and ST population to total population of the villages are 86.2 per cent, 99.41 per cent and 91.20 per cent respectively. The sex ratio in these three villages is 902, 974 and 943 respectively. The other two blocks namely, Sarukhetry and Gobardhana are in Barpeta sub-division. Three villages namely, Gahia, Agdia and Garartari from Sarukhetry Block and Nimua, Khusrabari and Bashbari from Gobardhana block are chosen for the present study. The total population of the three villages Gahia, Agdia and Garartari are 1430, 100 and 639 respectively. In Gahia and Garartari, 37 and 43 per cent of population belong to SC and ST category. The sex ratio in the three villages is 906, 961 and 954 respectively. Similarly total population of Nimua, Khusrabari and Bashbari villages is 1575, 1032 and 2487 of which 54, 41.48 and 48.98 per cent belong to SC and ST population respectively. The sex ratio in these three villages was 1003, 981 and 916 respectively.

LIST OF TABLES

Table No.	<i>Title</i>	Page No.
1.1.	Types of Silk and Its Respective Host Plants	1
1.2.	Over Time Changes in the Production of Silk in the Major Silk Producing Countries in the World (M. T.)	9
1.3.	Production of Raw Silk in the North-East India during 1951-52 to 1995-2006 (M. T.)	14
1.4.	Distribution of Raw Silk in North-East India during 1980-81 to 2005-06	16
4.1.	Contribution of Ericulture to Total Workforce of Assam	54
4.2.	Families Employed in Ericulture as well as Sericulture Total in Assam during 1990-91 to 2005-06	56
4.3.	Contribution of Ericulture to Net State Domestic Product of Assam at Market Price	59
4.4.	Employment of Families per Hectare of Eri Feed Plantation as well as per Kilogram of Eri cut Cocoons in Assam during 1990-91 to 2004-05	64
4.5.	Employment of Number of Families in Sericulture in Barpeta District	67
4.6.	Number of Broods per Family in the Sample Households during 2005-06	70
4.7.	Village wise Employment Generated in the Sample Households during 2005-06	71
4.8.	Contribution of Ericulture to the Income of Sample Households during 2005-06	73
4.9.	Income Generation through Ericulture in the Sample Households during 2005-06	75
4.10.	Generation of Employment and Income in Eri Silk Spinning in the sample Households during 2005-06	78-79
4.11.	Generation of Employment and Income in Eri Silk Weaving in the Sample Households during 2005-06	84
4.12.	Number of Families in Different Monthly per Capita Income	89

Groups	
with Income from Ericulture	
4.13. Number of Families in Different Monthly per Capita Income Groups without Income from Ericultural	91
4.14. Percentage Change in Poverty due to Ericulture	91
5.1. District-wise Variation in Contribution of Eri Cut Cocoon to Total State Production	103
5.2. Changes in Percentage of Top Five and Bottom Five districts in the Ranking of number of Families Engaged in Ericulture during 1995-96 to 2005-06	105
5.3. District wise Annual Exponential Rate of Growth of Families Engaged in Ericulture during 1995-96 to 2005-06	107
5.4. District-wise Variation in Area under Eri Host Plant to Total Ericultural Land of Assam during 1993-94 to 2005-06	110
5.5. District-wise Variation in Area under Eri Host Plant to Total Land of the District during 1993-94 to 2005-06	111
5.6. District wise Variation in Output of Eri Cocoon per Hectare of Land under Host Plant during 1993-94-2005-06	114
5.7. Impact of Population Size and its Characteristics, per Capita NDDP on the Inter-District Variation in Area under Feed Plants, Production of Eri Cocoon and Number of Families Engaged in Ericulture in Assam	115
6.1. Production of Eri, Muga, Mulberry and Tasar Raw Silk in Assam during 1980-81 to 2004-05	121
6.2. Contribution of Eri, Muga and Mulberry Culture to Workforce of Assam	126
6.3. Families Engaged in Sericulture in Assam during 1990-91 to 2005-06	128

6.4.	Contribution of Eri, Muga and Mulberry Raw Silk to NSDP at Market	133-134
	Price of Assam during 1980-81 to 2004-05	
6.5.	Production of Raw Silk per Family and per Hectare of Land under Host plants during 1990-91 to 2004-05	137
6.6.	Cost, Revenue and Profit in Eri Cocoon Production of the Sample Households during 2005-06	142
6.7.	Cost, Revenue and Profit of Mulberry Cocoon Production of the Sample Households during 2005-06	143
6.8.	Cost, Revenue and Profit of Muga Cocoon Production of the Sample Households during 2005-06	144
6.9.	Revenue, Cost and Profit per Kilogram of Cocoon Production (Rs)	145
6.10.	Revenue and Profit Rate per Investment of One Rupee in Eri, Muga and Mulberry	146
6.11.	Capital and Labour Output Ratio in Ericulture in the Sample Households during 2005-06	147
6.12.	Capital and Labour Output Ratio in Mulberry culture in the Sample Households during 2005-06	148
6.13.	Capital and Labour Output Ratio in Muga-culture in the Sample Households during 2005-06	149
6.14.	Capital Labour Ratio in the Production of Cocoon in the Sample Households	149
6.15.	Percentage Changes in Value of Exports of Eri and Muga Products by ARTFED to Total Export of Assam during 2001-02 to 2006-07	154

7.1.	Sex wise Distribution of Sample Households according to their Educational Status during 2005-06	161
7.2.	Distribution of Sample Families according to the Sources of Seeds during 2005-06	163
7.3.	Cost, Revenue and Profit per Kg of Eri Cocoon Production with and without Plantation of Host Plant during 2005-06	166
7.4.	Distribution of Sample Rearing Families according to their Sources of Finance during 2005-06	169
7.5.	Distribution of Sample Households according to the Reported Problems Faced by them in Rearing Silkworm for Different Reasons during 2005-6	173
7.6.	Brood-wise Actual, Profit Maximising and Lowest Possible Average Cost Output of Eri Cocoon and Scope of Increasing Output and Profit as Obtained from the Estimated Result by Using Sample Data	188
8.1.	Number of Bank Branches, their Deposits and Credits in Assam as on March 2005	195
8.2.	Sources of Finance of Ericulture in the Sample Household during 2005-06	199
8.3.	Number of Eri Beneficiaries under CDP in Assam during Tenth Plan	202
8.4.	Number of Eri Beneficiaries in Barpeta district during 2000-01 to 2005-06	202

LIST OF DIAGRAMS

No.	Title	Page No.
1.1	Growth of Production of Different Sericulture Sub-Sectors in North-East India during 1951-52 to 2005-06	15
4.1	Employment Generated in Ericulture as well as ericulture Activities in Assam during 1990-91 to 2004-05	57
4.2	Proportion of Ericulture Output to NSDP (at Market Price) of Assam during 1980-81 to 2004-05 (in percentage)	61
4.3.	Contribution of Eri Cocoon Output to NSDP of Assam at 1980-81 Prices during 1980-81 to 2004-05 (in percentage)	62
4.4.	Employment of Families per Hectare of Eri Plantation as well as per Kilogram of Eri cut Cocoons in Assam during 1990-91 to 2004-05	65
4.5.	Changes in Output of Eri cocoon per hectare with Respect to Variation in Area in Hectare per Family	65
4.6.	Changes in Output per unit of Land with Respect to Families per unit of Land	66
4.7.	Families Engaged in Various Sericulture Activities in Barpeta District of Assam during 1995-96 to 2005-06	68
5.1.	District-wise Production of Eri Cut Cocoon in Assam during 1991-92 to 2005-06	104
5.2.	District wise Variation in percentage Contribution to Total Families Engaged in Ericulture in Assam	106
6.1.	Production of Eri, Muga, Mulberry and Tasar Raw Silk in Assam during 1980-81 to 2004-05	123
6.2.	Families Engaged in Various Sericulture Activities in Assam during 1990-91 to 2005-06	129
6.3.	Changes in percentage of Eri, Muga and Mulberry to total Families in Sericulture of Assam during 1990-91 to 2005-06	130
6.4.	Percentage Contribution of Eri, Muga and Mulberry to NSDP at Market price of Assam during 1980-81 to 2004-05	132
6.5.	Comparative Picture of Processes of Production of Eri, Mulberry	150

	and Muga in the Sample Families	
6.6.	Scatter Diagram of Unit Isoquant in Eri Cocoon Production	151
6.7.	Scatter Diagram of Unit Isoquant in Muga Cocoon Production	151
6.8.	Scatter Diagram of Unit Isoquant in Mulberry Cocoon Production	151
6.9.	Percentage Contribution of Eri and Muga to Total Export of Assam during 2002-03 to 2006-07	155
7.1.	Average Revenue and Average Cost in Eri Cocoon Production among the Sample Households	186
7.2.	Average Revenue and Average Cost Curves of the Rearers who Practice One Brood of Eri Cocoon in a year	187
7.3.	Average Revenue and Average Cost Curves of the Rearers who Practice Two Broods of Eri Cocoon in a year	187
7.4.	Average Revenue and Average Cost Curves of the Rearers who Practice Three Broods of Eri Cocoon in a year	188
7.5.	Average Revenue and Average Cost Curves of the Rearers who Practice Four Broods of Eri Cocoon in a year	188

LIST OF MAPS

Sericultural Map of India	23
Map of Assam indicating Barpeta district	
Map of Barpeta district showing the study Community Development Blocks	45

LIST OF APPENDIX

4.1. Man-days Generated and Gross and Net Value Addition in Total Ericulture Activity	97-99
5.1. District-wise Variation in Contribution of Ericulture Proper to Employment Generation in Assam during 1995-96 to 2005-06	118

LIST OF ABBREVIATIONS

AGMC	Assam Government Marketing Corporation Limited
AKVIB	Assam Khadi and Village Industries Board
ARTFED	Assam Apex Weavers and Artisans Co-operative Federation Limited
CCC	Cocoon Collection Centre
CD Block	Community Development Block
CDP	Catalytic Development Project
CSTRI	Central Silk Technological Research Institute
DFL/dfls	Disease Free Layings
ECC	Eri Concentration Centre
ESG	Eri Seed Graingage
ICICI	Industrial Credit and Investment Corporation of India
IDBI	Industrial Development Bank of India
IFCI	Industrial Finance Corporation of India
ISEPC	Indian Silk Export Promotion Council
KGB	Khadi Gramodyog Bhandars
LICI	Life Insurance Corporation of India Limited
MCG	Mulberry Collective Garden
MT	Metric Tonne
NABARD	National Bank for Agriculture and Rural Development
NBFI	Non-Banking Financial Institutions
NC Hill	North Cachar Hill
NDDP	Net District Domestic Product
NEHHDC	North Eastern Handicrafts and Handloom Development Corporation Limited
NGO	Non- Government Organisation
NSDP	Net State Domestic Product
SC	Schedule Caste
SHG	Self Help Group
SIDBI	Small Industrial Development Bank of India
TSP	Tribal Sub Plan
SCCP	Scheduled Caste Component Plan
ST	Scheduled Tribe
VGR	Village Grainage Reserve

GLOSSARY

Ambar Charkha	A mechanised wheel for spinning cocoons, silk waste etc.
Bio-voltine	Silkworm races, which give two generations in a year.
Brood	The complete life cycle of a silkworm.
Cake	Dried up flattered eri cocoons after boiling in alkaline and extracting pupae.
Caterpillars	Larvae of moths.
Chandraki	A bamboo mountage used for spinning of mulberry and eri silkworms.
Charkha	Spinning wheel for cotton, eri and silk wastes.
Cocoon	Silken enclosure of the pupae from which silk is derived.
Degumming	The process of removing natural gum from the silk yarn by boiling in a soap solution.
Eri	Local name (in Assam) for silk producing worm.
Filament	An individual strand of fibre – the smallest unit in any type of fabric.
Food plants	Plants on the leaves of which different varieties of silkworms grow.
Grainage	Establishment, which produces eggs on a large scale for the purpose of distribution among the rearers.
Hibernation	Wintering of the pupae in a resting stage.
Incubation	The act of stimulation of eggs for hatching.
Instar	Stage between two moults of the larval life.
Jugi	A class of persons engaged by the Ahom kings to rear mulberry silkworms, who used to supply silk cloths to king's family and nobles. This class was known as <i>katoni</i> .
Kharika	Bundle of lean thatch or straw on which moth lay eggs.
Larva	Caterpillar stage.
Laying	Cluster of eggs of a moth.
Loom	A frame for holding the wrap ends under tension, so weaving can take place.
Metamorphosis	Transformation of one stage to another.
Muga	The silkworm for producing muga fabrics.

Multi-voltine	Silkworm having continuous life cycle all the year around, i.e. many brooded.
Mulberry	Plant on the leaves of which mulberry silkworm feeds.
Philosamia	Genetic name of eri silkworm.
Pierced cocoon	Cocoon from which the moth has emerged after softening the end of the cocoon and forcing the way out. It is used as waste silk.
Raw silk	Silk as reeled from the cocoons. It contains its original sericin coating.
Rearing house	Well protected house where in silkworms are reared from hatching to maturity.
Reeling	Process of unwinding yarn from cocoons or bobbins and rewinding on to revolving reel, in the form of hand making suitable for marketing, sizing etc.
Seed cocoons	Quality cocoons of pure race from which moths are allowed to emerge for preparation of eggs layings.
Sericulture	The art and science of rearing of silk worms for production of cocoons.
Shuttle	The instrument that carries the weft thread or yarn.
Silk	Fluid substance which is secreted by silkworms and which in exposure to air hardens in the form of a yarn.
Spinning	a) The process of producing single yarn out of discontinuous filament of silk. b) Process by which silkworms produce cocoons.
Spinning wheel	Wheel or Charkha used for spinning of eri or waste silk.
Spun yarn	Yarn made from silk waste.
Stage	The phase of larval life in between two moults.
Takli	A single rod like metal stick to which a small round load is appended just above bottom end and used for spinning of eri silk.
Tanties	The professional weavers who were known as <i>tanties</i> during the Ahom rule, had to meet the requirements of fabrics of royal families, chiefs and nobles.
Tasar	Tasar silkworm, which give tasar silk.
Tray	Flat bamboo equipment with round shape, used for rearing of silkworms, locally known as <i>Dola</i> .

Uni-voltine	Single brooded silkworm, especially applicable to mulberry silk worms.
Voltine	Number of generation.
Waste silk	The short un-reelable filaments of cocoons including the waste produced during the various processes of silk reeling and throwing.

Introduction

1.1. Background:

Sericulture also known as “Industry of the Poor” is an agro-based industry, the end product of which is silk, “the queen of fabrics”. There are four major varieties of silk, each of which is produced by a distinct variety of silkworm feeding on a specific host plant. Table-1.1 shows the names of silk varieties with the corresponding silkworm and the main host plants on which they are grown.

Table–1.1
Types of Silk and Its Respective Host Plants

Variety of Silk	Name of Silkworm	Main Host Plant/Plants
Mulberry Silk	Mulberry Silkworm	Mulberry
Tasar Silk	Tasar Silkworm, Oak Tasar Silkworm	Asan, Arjun, Oak
Muga Silk	Muga Silkworm	Som, Soalu
Eri, Endi, or Errandi Silk	Eri Silkworm	Castor, Kesseru

India has the unique distinction of producing all the four major varieties of silk. The country is the second largest producer of mulberry and tasar silk in the World. The most important point to note is that India enjoys the sole monopoly in the production of golden coloured muga silk and eri silk of Assam (Ullal and Narasimhannan, 1994). Among the chief eri cocoon growing areas in India are entire Assam, north Tripura, west Manipur, Meghalaya, Arunachal Pradesh, Muzaffarpur, Bhagalpur and Purnia in Bihar, Cooch Behar and Jalpaiguri in West Bengal and some parts of Gujarat and Andhra Pradesh.

Eri silk, originated from a proteinous fibre secretion of a lepidopteron insect (scientifically known as *Samia ricini*) is one of the popular natural fibres of animal origin. It has a unique appearance and aesthetic appeal. Eri silk has wool like finish, look of cotton and softness of silk, yet has no dazzle and rustling sound that is

associated with the other varieties of silk. It is highly durable and has a specific thermal property, which renders it as an alternate fibre to wool. It is regarded as an ideal fabric for cold season (Singh and Benchamin, 2001).

Eri fabric is called “Poor man’s Silk” because it is much cheaper than muga and mulberry silk. So, it can appeal to a wide range of population. It is also known as “Ahimsa silk”, because eri pupae are not killed in the process; whereas, in rearing of muga, tasar and mulberry raw silk cocoon splitting process is followed and killing of cocoon is a must for the harvesting (Thangavelu and Borah 1986).

Like other sericulture activities, the ericulture activities can be distinctly separated into two parts. One is ericulture proper and the other is eri silk industry or eri silk weaving. The first part consists of rearing of worm; which feeds on the foliage of castor (Eranda or Endi in Assamese). The silkworm too is therefore known as eri silkworm. The eri worm is multi-voltine and can be reared indoors. Maximum six broods can be harvested in succession in a year, if sufficient food leaves are available. The temperature between 24⁰ to 28⁰ Celsius and humidity between 85 to 90 per cent are ideal for the rearing of eri silkworm.

Castor is the primary food plant of eri worms. Castor is either cultivated or it is wildy grown. The castor plant can be cultivated in diverse climates and on poor sandy as well as rich alluvial soils. In the hilly areas (as is seen in Karbi Anglong and North Cachar Hill district of Assam) where jhum cultivation is practised, castor is sown along with other crops. In the plains, the plant is found growing in patches of unoccupied land around the rearers’ homestead or in the road sides. Those who cultivate host plant collect leaves from it and those who do not cultivate collect leaves moving around different places where it is grown wild. In the absence of castor, kesseru leaves are also used. However, if kesseru is used as food-leaves of the silkworms, when castor

becomes available the worms can easily be shifted from kesseru to castor leaves but those feed on castor earlier cannot be readily shifted to kesseru at the time of scarcity of castor. Worms fed on kesseru leaves are said to produce smaller but more compact cocoons than those fed on castor leaves. *Barkesseru*, *Bhotera*, *Payam*, *Champa*, *Simolu Alu*, *Gomari*, *Papaya* etc are the other secondary host plants for ericulture.

1.2. Mode of Harvesting Activities:

The life cycle of eri silkworm has four stages- eggs (*koni*), larva (*polu*), pupae (*leta*) encaged in a cocoon and adult moth. A complete life cycle lasts for about 44 days in summer and 85 days in winter. The cocoons, which are preserved for breeding purpose, are kept in a bamboo basket (*kharahi*). Emergence of moths requires 15 to 17 days in the summer and maximum of 21 days during winter season. After emergence, moths crawl on to the edges of the receptacle and rest hanging from the outer edges in a vertical position till wings and limbs are fully stretched and strengthened. Generally, the moths flutter their wings just before dusk, the males then fly around for sometime and pair with females. Eri moths have very good coupling attitude. Maximum pairing takes place at 16.00 to 18.00 hours in the afternoon and the moths may remain coupled for 24 hours, although 3 to 6 hours are adequate. The male moth can be utilised for a second coupling. The sexes of the moths may be distinguished easily by the large size of abdomen of the female and the tapering of the male. The decoupled fertilised females are left on a straw stick (*kharikas*). The fertilised females start yielding eggs after 01 to 02 hours and that continue for 03 to 04 days. On an average, one moth lays 450 to 500 eggs and mostly on the very first day (F.A.O., 1987).

The cluster of eggs on the *kharika* is collected and wrapped in a piece of cloth. The eggs are then preserved in a safe place till hatching. The minimum number of days

required from the day of oviposition to the day of hatching is about nine. It may be extended to a maximum fifteen days depending on climatic temperature. The worms hatch out, usually in the morning. At this infancy stage of larvae, they are placed on the rearing bamboo trays (*Dola*). Soft leaves of castor or kesseru are given to them to eat. At first stage, the larvae are greenish yellow. The body colour changes gradually to pure yellow by the end of the third day. From the third day onwards, the body colour changes into cream, green, blue or white. The eri silkworms feed ceaselessly except during shedding their skins. In the entire larval period, worms moult four times. This state may last for 24 to 48 hours. The larvae are supplied with fresh leaves four to five times in a day at a regular interval till the last stage is attained. It is also necessary to give them leaves once at night. In advanced stage to maturity, they eat voraciously. At this stage they are given only matured leaves. At that time, they are transferred to bunch of leaves tied together by the stalks (*Joka*) and hung saddle-wise on horizontal bamboo poles (*Dang*). An experienced ericulturist never provides wet, dirty, dusty, worn-out, diseased, fried or ripe yellow leaves to the worms due to the fear of silkworm being affected by any disease and thereby resulting in productivity loss. On attaining maturity, the worms stop to eat and crawl up to the top of bundles. They produce a hollow sound when it is rubbed gently between fingers. The mature worm ripens mostly during morning hours between 9.00 A.M. to noon.

The next step is spinning. The matured and ripe worms are transferred to “*Jalis*” for spinning cocoons. The bamboo basket (*Pachi*) used for spinning cocoons are filled with dry leaves of mango, jackfruits etc. The worms begin to spin as soon as they are placed on *Jali* and completed cocooning within 3 to 6 days and transform into a pupae. The cocoons are soft, woolly and open mouthed. The quality of the cocoons greatly depends on the quality of food plants. Various eri food plants, in order of

efficacy are castor, kesseru and tapioca. As there is also the seasonal effect, the cocoons produced in late spring and in late autumn are the best. They look like either brick red or creamy white. During the entire rearing period proper care is taken to protect the worms from the attacks of flies, rats, monkeys etc and probable diseases. Moreover, cleaning of bed is also equally important for the maintenance of health and progress of the worms.

The important rearing appliances are made of locally available bamboo and cane. The rearing house should be ideally located and should have veranda on all the four sides and adequate number of doors, windows and ventilators to ensure cross circulation of air and good light. But in most cases, for rearing the poor and small entrepreneurs use a portion of their dwelling houses.

Most of the rearers sell eri cocoons to the middlemen traders called “*Dallal*” and some in the weekly market called “*Hat Bazar*” in kilogram. Sometime cocoons are sold to the government officials (Cocoon Marketing Inspector) of sericulture department also. However, a part of produced cocoon is also used by the rearers themselves for spinning and weaving at home.

The open-mouthed eri cocoon is spun like cotton. The eri moth emerges without disturbing the cocoon and its fibre. Hence, all cocoons can be utilised for spinning after proper cleaning. Most rearers stifle the cocoons, unless they are to be preserved for breeding purpose. Cocoons are stifled by exposure to sun for few days. This method helps to preserve the cocoons longer and also to avoid the discolouration of cocoons, which happens in case of stifling by fire. The staple of eri cocoon obtained from first draft operation is glossy, long and fine. Nothing is wasted in eri cocoon by spinning. The yarn spun out of cocoon is regular and fine, if the spinning is done with a little care.

Prior to spinning, eri cocoons are required to be de-gummed in an alkaline solution. For preparation of the solution, an indigenous process is extensively used. Ashes of certain leaves or straw are used for the preparation of such solution. The quantity of alkaline ash required is half the weight of the cocoon used. Boiling for two or three hours in an alkaline solution is sufficient for de-gumming and the fibre comes off easily when pulled.

The boiled eri cocoons are wrapped in a green arum or plantain leaf for 3 to 4 days. The process loosens the inner content of the cocoon. The well-treated cocoons are thoroughly washed in water and the inner dirt, if any, is removed. The flattened cocoons in the form of cakes are then dried and preserved for spinning at a suitable time (Choudhury, 1982).

In the spinning process, generally traditional devices like *Takli* and Charka (*Zatar*) are used. Spinning by *Takli* is very slow and tedious. But the expert spinner prefers to use *Takli* because the yarns can be twisted satisfactorily. Modern spinning equipments like N.R. Das type, Choudhury type, Central Silk Technological Research Institute (CSTRI) pedal operated (old model) spinning machines as well as CSTRI motor cum pedal operated etc are also available in the market. The CSTRI motor cum pedal operated spinning machine is the most efficient one. But they have not gained popularity in rural areas because of technical and financial constraints. On an average, one can get 50 grams yarn in 08 hours by using *Takli* whereas, one can have 200-250 grams yarn by using CSTRI motor cum pedal operated machine during the same period (Kariyappa, *et al*, 2003). On an average, one kilogram of cut cocoons yields about 750 grams of fine yarn. After the completion of spinning, weaving starts.

Eri yarn is full of loose fibres sticking out of the thread. The yarn, which is to form the wrap, has to be sized in order to bind all floating and loose fibres into the body

of the thread and also to strengthen the thread. Badly spun thread requires more sizing. Sizing required for weft is much less than warp yarn.

Starch made into gruel or some mucilaginous substance is used for sizing of eri yarn. The application is done by a brush to the warp of the loom. Very often an additional sizing is applied to the cloth after it is taken out of the loom. This is necessary in case of inferior variety of cloth. Thus the inner spaces between the threads are filled up to give the cloth a smooth and fine appearance. The cloth is washed and stretched fully (Choudhury, *op cit*).

In Assam, usually throw shuttle loom is used for the weaving of eri fabric. The loom is hung freely from upright bamboo poles. Sometimes, a wooden frame is also used. The shuttle is thrown with hand from side to side and beating is done by pulling slay with hands. However, productivity of throw shuttle is lesser than that of fly shuttle or power loom. The productivity of fly shuttle loom is two and half times higher than that of throw shuttle loom. Moreover, productivity of power loom is six to eight times higher than that of fly shuttle (Choudhury, *op cit*). But use of power loom is very much limited in Assam because of financial and technical problems. Weavers prefer yarn produced by *Takli* due to its appropriate twists and uniformity. However, sometimes weft yarn prepared by spinning wheel is also used by the weavers.

Eri weavers of Assam prepare a special type of shawl for both male and female suitable in winter. The average size of a shawl used by male in Assam is 2.75 metres of length and 1.35 metres of width. Similarly, the average size of a shawl used by female in Assam is 2 metres of length and 1 metre of wide. An expert weaver can prepare one male shawl in one day (8 hours) whereas she can weave two ladies shawl during the same period of time.

1.3 Present Position of World Silk Production

In the global textile parlance the term “silk” refers to the silk of mulberry origin, as almost 95 per cent of the world total silk production consists of mulberry silk (Ullal and Narasimhana, 1986). Basically, silk industry has been an industry of the temperate region and as such, it was mainly localised in Japan, China, South Korea and former Russia. These countries produced 78.78 per cent of the total world silk production during 1990. India is the only major silk producing country in the tropical belt contributing 15.76 per cent to the global output of silk (1990).

The technique of mulberry host plant cultivation, the method of mulberry silkworm rearing and the art of silk reeling and weaving originated in China nearly 3000 years back during the period of Emperor Hwang-Ti. All the operation including silk weaving was kept a secret and China monopolised the silk trade for nearly 2000 years. The path through which silk fabric from China reached Europe especially Rome was known as the “Silk Road”. The technique of sericulture finally found its value to other countries through smuggling, through artisans captured prisoners of war, through monks and various other ways. At present, 58 countries all over the world are engaged in various sericulture activities. But, China maintains its glorious first position in the raw silk production, while India superseded Japan in this regard and occupies prestigious 2nd position in 1987. The other three top raw silk producing countries in the world are former Russia, Japan and Brazil.

The total production of raw silk in the world has been steadily increasing in spite of an increase in man-made synthetic fibres. Due to the texture, lustre, quality, comfort, adaptability to all climatic conditions and ability to take up dyes natural silk occupies a special position among all the textile materials. Table-1.2 shows over time changes in the production of silk in some major silk producing countries in the world.

From table-1.2, it is clear that raw silk production in China and India has increased by several times during 1938 to 1992. Japan, which stood first among all the countries in the silk production up to 1978 lost its position due to continuous fall in the production of silk and stood 3rd in the ranking in 1992. Though both India and China recorded faster growth in the production of silk, the gap between the production of India and China widened due to relatively faster growth in China than in India and now India's silk production is about ¼th of China.

Table-1.2
Over Time Changes in the Production of Silk in the Major Silk Producing Countries in the World (M.T.)

Country	1938	1978	1987	1992
China	4855	19,000	35,800	54500
India	690	3473	8455	13000
Japan	43150	15957	7864	5085
Russia	1900	3200	4000	4000
South Korea	1825	4235	1608	1200
Brazil	35	930	1780	2373
Thailand	----	----	----	1700
*Others	4045	1905	2874	2210
Total	56,500	48,700	62,381	84,068

Source: *Silk Review*, various issues

Note: *Estimated figure.

The productivity of food leaves and thus raw silk per unit of area in China is very high as compared to India and thus cost of production in China is the lowest among all the silk producing countries. This is mainly due to the extensive use of organic manure and irrigation to the mulberry fields by the Chinese rearers. Moreover, highly productive silkworm races suitable to specific region across all the seasons are available to the rearers of China and scientific measures have also been adopted by majority of the producers during silkworm rearing to prevent diseases as they take up silk production as their primary occupation unlike the major producers of Assam (Dandin, 1994). Since 1938, rapid growth of population in China on the one hand and lack of job opportunities in rural areas on the other hand forced people to adopt

sericulture as their means of livelihood. The same case has also been observed in many places of India.

There has been a tremendous fall in production of silk in Japan during 1938 to 1992 specifically in Kinki, Kyushu, Shikoku, Chukoku and Tokai regions (Aruga, 1990). The drastic decline after the 2nd World War is attributed to the severe shortage of food supply in Japan and hence many of the silk rearers switched over to the cultivation of food crops. Besides, the advent of nylon and other synthetic as well as many chemical fibres also caused decline in raw silk production there (Aruga, *op. cit.*). In recent past, two tropical countries, viz. Brazil and Vietnam recorded significant increase in the production of raw silk. Interestingly, the entire quantity of silk produced in Brazil and Vietnam is of superior quality (bi-voltine) and thus they are now able to compete with China fully in the international market (Dutta, 1995).

From the demand side of silk in the world markets, it is worth mentioning that in the past few years, some sort of “silk craziness” has been developed world wide among the consumers and this has encouraged the South-Asian countries of third world to expand their sericulture activities. Among these countries India and Thailand have made positive efforts in developing technologies for manufacturing classic and quality silk products, which has enhanced their export potential substantially.

1.4 Silk Production in India

India has the unique distinction of being the only country in the world, producing all these four major varieties of silk mulberry, tasar, eri and muga commercially. Silk has been an inseparable part of Indian culture, tradition and economy over thousands of years. On social and religious occasions silk apparels are used, particularly by the women folk. The fine quality Indian finished silk products are

well known worldwide. The development of modern printing technology has created a new dimension for diversification of Indian silk products. These printed silk goods have increased the market demand for bulk of Indian export along with the masterly designed traditional handloom products.

At present, silk is produced in almost all the states of India. Among those Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal, Assam, Jammu and Kashmir and Jharkhand are the traditional silk producing states while the others are non-traditional sericulture states. Indian sericulture is distributed both in the temperate and tropical zones. Temperate sericulture is limited to Kashmir, sub-Himalayan and other hilly regions. The rest of India practises tropical sericulture.

Sericulture is an ideal practice for rural poor Indians because of quick and high returns with minimum investment. Earlier, sericulture was considered to be a subsidiary occupation in India. But this notion has been changed and today it is considered to be one of the most remunerative occupations in India as reflected from the increased land under host plant cultivation and higher raw silk production every year. This has been made possible through the development and introduction of new technology in all the phases of sericulture activities. Also, the infrastructure facilities in India for silk reeling, twisting and weaving were also made available. A total of 9 spun silk mills were also set up in India for the production of spun silk yarn from silk wastes. Two of them, Channapatana (Karnataka) and Bhagolpur (Bihar) are under public sector and the remaining seven are under private ownership. Another two spun silk mills are under construction in Assam. Major silk printing centres are located in Mumbai, Vanarasi, Delhi and Bangalore.

The sericulture in India is widely scattered over different states of the country. Production of mulberry raw silk is mainly confined to the states of Karnataka, Andhra

Pradesh, Tamil Nadu, West Bengal which together account for about 98.45 per cent of the country's total mulberry raw silk production (Central Silk Board, 2005). Karnataka is leading among all the mulberry silk producing states that followed by Andhra Pradesh and Tamil Nadu.

Tasar industry has been a traditional practice of tribal and hill folks inhabiting the forest of Central India. The rich production potentialities within the country and a steady demand for products outside the country have promoted commercial exploitation of this craft. This culture provides substantial income to the tribal people of India, so it indirectly prevents them from destroying forests for their livelihood. Tasar industry today has also encouraged growth of natural resources (food plants) and generation of employment (mainly among the tribal people) in keeping with their traditions and way of life (Sengupta, 1986).

Tropical tasar growing area forms a distinct belt of humid and dense forest sprawling over the Central and Southern India. It covers Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Jharkhand, Bihar and West Bengal where Arjun and Asan food plants are abundantly available. Temperate tasar growing areas extends from Jammu and Kashmir in the west to Manipur in the east including Assam, Meghalaya and Nagaland.

India enjoys the world monopoly for the fabulously famed golden yellow muga silk, which is not found anywhere on a large scale except Assam. Of course, it is produced in negligible quantity in Mizoram, Meghalaya, Arunachal Pradesh and Nagaland. It is to be noted that the Baisaguri village of Cocha Bihar district of West Bengal also established itself as muga producing area (Singha, *et al*, 1991). Efforts have also been made to introduce muga culture in Mysore, Muradabad (U.P.), which

have not yet met with success. This may be either due to lack of suitable food plants or climate (Thangavellu, *et al*, 1988).

The production of eri silk is mainly confined to the state of Assam, while on a small scale it is also produced in Meghalaya, Manipur, Mizoram, Arunachal Pradesh, Nagaland, Bihar and Orissa. Assam occupies the pivotal position in the production of eri silk.

1.5 Sericulture in North-East India

The North-Eastern region of India has been traditionally practicing sericulture particularly mulberry, muga and eri from time immemorial. North Eastern region started practicing oak tasar culture only from 1975-76. Now, this area produces all the four major varieties of silk. The production of different varieties of silk in different states of North-East India is shown in table-1.3.

From table-1.3, it is observed that North East India contributed 16.44 per cent of total raw silk production in India in 1951-52, which has declined to 9.17 per cent in 2005-06 due to relatively faster growth of production in other parts of the country. Out of four components of silk, North Eastern region enjoys monopoly in muga-culture. Its production has gone up from 45 MT in 1951-52 to 110 MT in 2005-06 with a little fall in production during 1981-82 due to unfavourable climate. Like muga silk, North Eastern region has been enjoying partial monopoly in eri producing more than 90 per cent since 1951-52. In case of mulberry, contribution of North-Eastern region to total production of India is insignificant. Though production in North Eastern region increased from 9.00 M.T. in 1951-52 to 71 M.T. in 2005-06 through various ups and down, its share to total Indian mulberry silk production has declined from 1.44 per cent 1951-52 to 0.46 per cent in 2005-06.

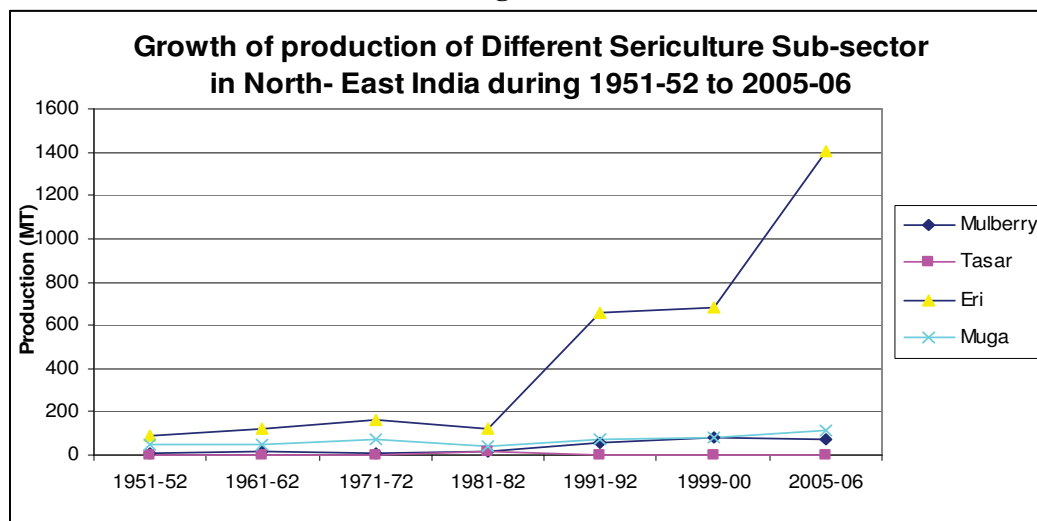
Table-1.3
Production of Raw Silk in the North-East India during 1951-52 to 2005-06 (M.T.)

Year	Mulberry			Tasar			Eri			Muga			All India Total	Total silk production in NER	% silk production in NER
	India	NER	% of NER to India	All India	NER	% of NER to India	India	NER	% of NER to India	India	NER	% of NER to India			
1951-52	625	9.00	1.44	124	0.00	0.00	100	93.00	93.00	45.00	45.00	100	894.00	147.00	16.44
1961-62	1308	13.07	1.00	202	0.00	0.00	132	120.00	90.91	52.64	52.64	100	1694.64	185.71	10.96
1971-72	2046	12.00	0.59	314	0.00	0.00	168	166.00	98.81	72.00	72.00	100	2600.00	250.00	9.62
1981-82	4801	16.00	0.33	257	20.00	7.78	147	125.00	85.03	44.00	44.00	100	5249.00	205.00	3.91
1991-92	10658	60.30	0.57	329	1.00	0.30	704	655.80	93.15	73.52	73.52	100	11764.52	790.62	6.72
1999-00	13944	80.64	0.58	211	1.14	0.54	974	682.56	70.08	84.70	84.70	100	15213.70	849.04	5.58
2005-06	15445	71.00	0.46	308	3.00	0.97	1442	1403.2	97.31	110	110	100	17305.00	1587.2	9.17

Source- Office of the Directorate of Central Silk Board (North Eastern Region), Guwahati, Assam.

Lastly, in case of tasar, production of North-East India and its contribution to total production of the country is negligible. Its contribution has always been less than one per cent to the production of all India. Still this practice is at infancy stage in this region.

Diagram-1.1



Distribution of silk in North-Eastern states can be understood from the table-1.4. From the table it is noticed that Assam ranked first in the production of muga and eri raw silk among all the North Eastern states. It is due to both extensive and intensive cultivation of muga host plant (which is discussed later). In the case of mulberry raw silk, although Assam stood first initially, it was relegated to second position by Manipur in the year 1985-86 and since then it remained in that position. Similarly in case of tasar raw silk Manipur has always been at the top among all the North Eastern States.

Table-1.4
Distribution of Raw Silk in North-East India during 1980-81 to 2005-06

Year	Silk Variety	Assam	Meghalaya	Manipur	Mizoram	Nagaland	Tripura	Arunachal Pradesh
		Raw Silk (MT)	Raw Silk (MT)	Raw Silk (MT)	Raw Silk (MT)	Raw Silk (MT)	Raw Silk (MT)	Raw Silk (MT)
1980-81	Mulberry	7	NEG	05	NEG	02	NA	NA
	Muga	48	NA	NA	NA	NA	NA	NA
	Eri	95	34	NA	NA	NA	NA	NA
	Oak Tasar	NA	NA	NA	NA	NA	NA	NA
1985-86	Mulberry	15	0.37	23	0.4	0.45	0.24	NEG
	Muga	52	NA	NA	NA	NA	NA	NEG
	Eri	226	69	23	NA	09	NA	01
	Oak Tasar	NA	NA	NA	NA	NA	NA	NA
1990-91	Mulberry	13	01	23	0.4	01	02	01
	Muga	69	NA	NA	NA	NEG	NA	0.05
	Eri	335	115	189	NA	21	NA	05
	Oak Tasar	NA	NA	0.5	NA	0.35	NA	NA
1995-96	Mulberry	23	01	45	01	01	01	01
	Muga	86	0.8	0.52	NA	0.92	NA	0.1
	Eri	418	130	140	NA	18	NA	10
	Oak Tasar	0.01	NA	0.52	NA	NA	NA	NEG
2000-01	Mulberry	16.89	1.45	56.5	20.7	0.36	3.6	6.15
	Muga	94.32	13.85	0.111	NA	0.07	NA	0.334
	Eri	432	110	163	NA	26.1	NA	0.389
	Oak Tasar	NA	NA	0.054	0.08	NA	NA	0.10
2005-06	Mulberry	8.00	3.00	48	6.00	1.00	4.00	1.00
	Muga	104	5.40	0.06	0.07	0.18	NA	0.24
	Eri	745.00	280.00	235.00	3.20	130.00	NA	10.00
	Oak Tasar	NA	NA	3.00	NA	NEG	NA	NA

Source: Office of the Directorate (North Eastern Region), Central Silk Board, Guwahati, Assam

Notes: (i) NA means Not Available

(ii) NEG indicates production is less than 50 kilograms.

1.6 A Brief Account of Ericulture in Assam and Barpeta

Sericulture has been a practice of the village folk of Assam since time immemorial. The erstwhile undivided Assam is known to be the original home of eri and muga silk in the world. Nature has endowed Assam with favourable climatic and environmental conditions, which make her the natural homeland of various silk producing worms and their food plants. However, mulberry and tasar are not produced extensively in Assam (Dutta, 1983).

Out of four sericulture products, eri occupies the first position in terms of production and generation of employment in Assam, though at all India level mulberry occupies the first position and followed by ericulture (Directorate of Sericulture, Government of Assam, 2006). Ericulture has always been a subsidiary occupation of the rural women folk of Indo-Mongoloid and Tibeto-Burman races of the Brahmaputra valley. Largely the Misings, Kacharis, Bodos, Mikirs, Rabhas, Karbis, Garos tribes practise this culture during their leisure time but it helps to improve their economic condition a lot especially of women. Though ericulture is practised in almost all the districts of Assam, it is highly concentrated in the districts of Karbi Anglong, North Cachar Hills, North Lakhimpur, Demaji, Barpeta, Kokrajhar, Sibsagar, Darrang etc.

In the undivided Barpeta district also, eri occupies the first position in terms of production and generation of employment among all the varieties of sericulture activities (Directorate of Sericulture, Government of Assam, 2006). It is widely practised in the northern part of the district. It is a traditional practice of the *Bodo* people of this district. Out of 12 (twelve) Community Development (C.D.) blocks of Barpeta district, production of ericulture is highly concentrated in Gobardhana, Jalah and Sarukhetri development blocks though it is also produced in Bhawanipur, Chenga, Bajali, Barpeta, Chakchaka, Paka-Betbari and Gomaphulbari development block. But

production of eri silk is almost nil in Mandia and Rupsi development block (as shown in the ericulture map of the district). In 2005-06, ericulture was practised in 140 villages out of total 1073 villages of the district. Out of 307 hectares of land under different sericulture host plants, 103 hectares were under eri host plant in 2005-06 (Directorate of Sericulture, Government of Assam, 2006). Out of 290494 families in the district (Census Report, 2001) 3421 families were engaged in this occupation in 2004-05 (Directorate of Sericulture, Government of Assam, 2005). It seems that very few families in the district are engaged in such activities. But if the percentage of Schedule Caste and Schedule Tribe population is considered it is clear that majority of Schedule Caste and Schedule Tribe population are engaged in it. Only 5.70 and 7.48 per cent of its population belong to Schedule Castes and Schedule Tribes respectively and a major portion of them is Muslim who lives mainly in Mandia and Rupsi development block and is not engaged in ericulture. The production of eri cut cocoon in 2004-05 was 38 MT (Directorate of Sericulture, Government of Assam, 2005).

1.7 Objectives:

Though the main objective of the proposed study is to investigate the problems and prospects of ericulture in Assam, the specific objectives of the study are to:

- (i) explain the importance of ericulture in the economy of Assam,
- (ii) examine the role of ericulture in the generation of employment and income in Assam, and finally to
- (iii) investigate the problems and prospects of ericulture in Assam.

1.8 Rationale behind Undertaking this Study

Ericulture has been playing an important role in the development of the economy of Assam since time immemorial. Its contribution to income, employment

and domestic and international trade has been significant. Also, over time growth of production of eri cocoon has been faster than any other sericulture activity. During 1980-81 to 2004-2005, production of eri raw silk has increased from 95 MT to 527 MT, i.e. by more than 500 per cent. In comparison to eri, production of muga has increased from 48 MT to 80.75 MT and that of mulberry has increased only from 7 MT to 7.71 MT during the same period (Directorate of Sericulture, Government of Assam).

In 1990-91, 1.18 lakh families were engaged in ericulture, which has increased to 1.35 lakh in 2005-2006. Land under ericulture in the state of Assam has also increased from 2055.37 hectares in 1990-91 to 7279 hectares in 2005-2006 (Directorate of Sericulture, Government of Assam), which is also the highest among all the sericulture activities.

Nowadays, Assam Apex Weavers and Artisans Co-operative Federation Limited (ARTFED) has also taken several steps for the promotion of export of eri-products like curtains, wall coverings, cushion covers, place mat, upholstery, etc. to USA, Japan and European countries like Turkey, Israel and South Africa. In 1997-98, export of eri and muga abroad by ARTFED was worth Rs 22.75 lakhs, which increased to Rs 253.6 lakhs in 2006-2007 (ARTFED, 2007).

In spite of the importance of ericulture in Assam, there has been no systematic study about the economic aspects of this activity in India or in the state of Assam and thus the literature in this field is scanty. Although there is sufficient study on the zoological aspects of eri and also on other sericulture activities there is no systematic analysis of economics of ericulture in Assam and thus there is much scope for research on the economic aspects. A careful study in this field would provide some useful insights that may help in policy formulation towards the proper growth of ericulture in Assam.

Though the contribution of Barpeta to total production of eri raw silk of Assam is low as compared to the districts of Karbi Anglong, N. Lakhimpur and N. C. Hills, considering the size and population of the district, the concentration of ericulture is much higher in the district of Barpeta. Moreover, the growth rate of area under eri host plant and family engaged in ericulture is the second highest in Assam. Moreover, the productivity per hectare of eri raw silk has increased over time in the district though it has declined in most of the other districts (will be seen later). Thus, in the present study a special attention has been given to the district of Barpeta.

1.9 Hypotheses

The following hypotheses have been tested in the present study:

- (i) Ericulture has grown significantly in Assam since 1980.
- (ii) Ericulture in Assam is more effective in the generation of employment than the other ventures of sericulture.
- (iii) Profitability of ericulture is significantly higher than that of any other sericulture activities in Assam at the present technological set up.

1.10 Scope of the Study:

The whole study is divided into nine chapters. Besides the chapter on introduction, review of literature and methodology of the study, chapter-4 examines the role of ericulture proper in the generation of employment and income over time in Assam in general and the district of Barpeta in particular. Also the scope of income and employment in endi-textile industries is estimated and analysed on the basis of primary data collected from Barpeta district. Spatio-temporal variation in area under ericulture proper, its output, employment and yield per hectare in Assam has been

discussed in chapter-5. Chapter-6 is devoted to the comparative analysis of eri, muga, mulberry and tasar in terms of production, employment and contribution to NSDP and export earnings of Assam, profitability etc. A brief description of problems and prospects of ericulture have been incorporated in chapter-7. The role of different financial agencies in the promotion of ericulture in Assam is discussed in chapter-8. Chapter-9 provides summary of observations and policy conclusions emanated from the whole study.

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Chapter-2

Review of Literature

The history of ericulture in India, particularly in North-East India is as old as Indian culture per-se. Former Assam, the undivided North-East region of today, is supposed to be the original home of eri silk from time immemorial (Devi, 1999). The art of sericulture was known in the ancient Kamrupa as early as the Vedic age (Chowdhury, 1981). Through the passage of history, it had been popularly identified as “Assam silk”. Only the British people called it as “Palma Christie” silk (Sarkar, 1988).

Till today no detailed study, covering all the aspects of silk culture (sericulture) especially, on ericulture of Assam has been made. Of course, references of the practice of ericulture as well as sericulture in ancient Assam have been found in the Valmiki’s “Ramayana” (Das, 2000); Veda Vyasa’s “Mahabharata” (Nanavaty, 1965); Kalika Puran (Barua, 1986); Kautilya’s “Arthasastra” (Baishaya, 1999); Banbhatta’s “Harshacharitra”; Francis Hamilton’s “An Account of Assam”; William Robinson’s “Descriptive Account of Assam”; Edward Gait’s “A History of Assam” etc that proves the existence of sericulture in Assam since ancient time.

The Sericulture and Weaving Department of Government of Assam conducted a survey during 1975-76 in 598 Gaon Panchayats of the plain districts of Assam to assess the position of the silk industry relating to production, employment etc. The survey report reveals that the people pursuing silk culture in Assam belong to both General and

Scheduled Castes and Tribes though majority of them belong to Schedule Tribes. Large number of families was found to carry on these activities as leisure time occupations¹.

Dutta (1983) conducted a study entitled “Economics of Silk Production in Assam”, which provides a brief note about the silk production and its related aspects in Assam. He gave an in depth analysis and tried to find out the prospects of it through the assessment of the net income per family of silkworm rearer with the help of primary data. But the sample used in his study was inadequate, which he himself admitted later (Dutta, 1988). In his Ph. D. thesis entitled “Problems and Prospects of Silk Production in Assam with Special Reference to Sibsagar District”. Dutta (*op. cit.*) also discussed the problems and future prospects of eri, muga and mulberry silk industry in Assam with special reference to Sibsagar district. However, the most important drawback of that study was that he did not take into account transport cost associated with the collection of leaves in case of ericulture and imputed labour cost in the estimation of income and profit while explaining the prospects of it.

Dookia (1984) in his study entitled “Studies on Ericulture for Exploitation as a Cottage Industry” analysed the position of eri silk industry in Indian economy as a cottage industry and discussed its role in the generation of employment and income in the rural economy. He concluded that agro-based endi textile industry could be used as a remedy to remove unemployment from the rural economy, as it is highly labour intensive.

Choudhury (1984) attempted to assess the economic importance of each variety of silk by drawing out gross and net return per hectare of land under host plant and per family of silkworm rearers. This assessment seems to be based on mere experiment rather than field study. Borthakur (1986) discussed the importance of handloom

¹As there is disguised unemployment in agriculture, the rural people, especially the women folk have been engaged in such occupation. Also the male people during the lean agricultural season take part in such activities for raising a part of their family earning.

industries including endi textile in the economy of Assam, especially in the rural economy of Goalpara district. Here he focused on the marketing and financial problems of the handloom weaving in Assam. But he remained silent about the other problems faces by these industries.

Das (2000) also analysed the importance of ericulture in the economy of Assam and its related problems in his study “Problems and Prospects of Ericulture in Assam: A case study in Barpeta district. But he did not examine it through any field study and thus the study is a superficial one. His analysis was completely based on secondary data that suffers from the limitation of incompleteness. Later, Das (2006) in his paper entitled “Empowerment of Women through Ericulture: A case study in Sarukhetry Community Development Block”, studied the importance of ericulture as a means of women empowerment in rural areas dominated by the tribal Bodo population. In his study, he found that literacy rate as well as social status of women was relatively higher among the women who have been practising ericulture than those who do not practice ericulture.

Siddique (2000) also discussed about the potentialities of sericulture (mulberry, eri and muga) in the employment and income generation in Assam. But he has not discussed the various problems that the sericulture has to face, like technological problem, marketing problem etc and thus he has not given any suggestion for the solution of these problems. Again, in his discussion he used only the secondary data and completely overlooked the primary data.

Thereafter “A Study of Muga-culture with Reference to Income and Employment Generation in Kamrup District” by Paresh Chandra Das (2002) may be mentioned, where he discussed the problems of muga-culture in Kamrup district of Assam and means to revive the thousand years old industry. He also tried to find out the share of muga-culture in employment generation through the analysis of data

collected from a sample of 736 families in Kamrup district during January 1999 to December 2002. Out of 736 families, 26.87 per cent of the respondent households were found to adopt muga-culture as a source of livelihood in his study. But, he did not estimate the capacity of muga-culture to generate employment per unit of output or area under the growth of host plant i.e., the efficiency of muga-culture in the generation of employment and income has not been checked.

Baishya (1986) studied the role of various small and cottage industries including sericulture in the development of the economy of Assam especially in the district of Kamrup through employment and income generation. He also revealed that cottage industries were decaying and dying while the small-scale industries were developing in the Kamrup district during 1970-71 to 1980-81. It is because of increasing demand of eri product and shortage of alternative jobs for the fast growing rural people. Moreover, it could be carried on by the poor people with a very low investment. The study also tested the function and problem of small scale and cottage industries and suggested measures for improvement. But he paid very little attention to the endi textile industries. Baishya (2005) also analysed the nature of investment, employment and generation of income in various sericulture activities, especially muga and mulberry in the Sualkuchi village of Kamrup district. Apart from that, he focussed on the problems of silk industry from different angles like irregular supply of yarn, distress sale of fabrics by poor weavers during seasonal fall in demand, financial problems, space for workshop, shortage of labour, electricity; marketing problem etc. But, here also he paid very little attention on ericulture.

Ratnala *et al* (1990) studied the employment of human labour in sericulture across different size of the farms especially of the mulberry farms in Andhra Pradesh. In their study, they found that human labour utilisation was more in smaller farms where the attention on each activity was more than the bigger farms. They observed a

direct relationship between hired labour use and the size of land holding. Also there was an inverse relation between the human labour use and the size of land under cultivation, which is very common from the point of standard agricultural economic theory. They concluded that the higher employment potentialities of sericulture were well suited to exploit the abundant human resources in rural India. The presence of disguised unemployment was more in case of smallholdings but the big holdings were generating comparatively less employment in their sericulture farms. In order to engage the family labourer effectively and use the labour rationally, holding size of 1.01 to 1.5 acres was of optimum size for cultivation and silkworm rearing.

Shamachary, Laksmipathalah and Jolly (1985) tried to determine the best possible price for mulberry cocoon. In determining the price of cocoon, they included weight of cocoons in the lot; cocoon shell ratio of the lot; defective cocoon percentage of the lot; silk recovery percentage of cocoon shell; weight of cocoons unsuitable for reeling and weight of cocoons suitable for reeling.

Mattigatti *et al* (2000) tried to evaluate the share of different intermediaries in the value addition, market margins and price spread in the process of production of soft silk fabric. The value addition, market margin and price spread were worked out for 10 metres of soft silk fabric weighing 60 grams per metre produced in Mysore, Bangalore and Kolar of Karnataka. The wholesale market price of 10 metres of fabric was about Rs.1513.35 during the time of survey. They observed that the price was distributed to different intermediaries. Out of the total price, rearers used to get a share of 48.3 per cent followed by traders (21.6 per cent), weavers (11.2 per cent), reelers (9.6 per cent) and twistors (8.1 per cent). The dyers received a meagre share of 1.1 per cent of the total price. Therefore, the different producers of various stages from rearers to dyers together used to receive about 78.3 per cent of the total price, while the traders used to have a share of about 22 per cent.

Gogoi and Goswami (1998) in their paper entitled “Studies on Certain Aspects of Wild Eri Silk (*Philosamia Cynthia Drury*) With Special Reference to Its Rearing Performance” tried to find out the viability of *digloti* as an alternative to castor food plant. They established *digloti* as a new host plant of the wild eri silkworm. Digloti can be raised in the same farm both for muga and ericulture for commercial and seed cocoon production as well as for maintaining various domesticated and wild silkworm races for the breeding programs. *Philosamia Cynthia Drury* can serve well as a resourceful material for breeding muga and eri to evolve ever-important disease resistant, genetically stable, improved bi-voltine silkworm races.

Kumaresan and Vijaya Prakash (2001) also found that the revenue generated from sericulture was comparatively higher than all other major crops like paddy, sorghum, pulse crops, groundnut, sugarcane, cotton, tobacco and chilly cultivated in the area except that of turmeric. The major reasons for practicing sericulture by the farmer were higher profitability and continuous income received from sericulture throughout the year.

Kariyappa, *et al* (2003) studied the efficiency of different spinning machines like Takli, Charkha, NR Das type², Choudhury type³, Central Silk Technological Research Institute (CSTRI) pedal operated (old model) spinning machines as well as CSTRI motor cum pedal operated etc used by the spinner. He found that the CSTRI motor cum pedal operated spinning machine is the most efficient one. On an average, one can get only 50 grams of yarn in 8 hours by using *Takli* whereas the same individual can produce 200-250 grams of yarn by using CSTRI motor cum pedal operated machine during the same period of time.

²N. R. Das type eri spinning charkha is built on a wooden frame and is operated by pedal. It is fitted with automatic traverse motion. In this machine, feeding of fibres can be controlled with ease.

³Choudhury type spinning charkha is pedal driven, durable and can be operated easily. The machine moves on ball bearing or still bushing and can be mended easily.

From the review of all available studies on sericulture or ericulture and different aspects of it in India or Assam it is clear that there are scarce studies on economic aspects of ericulture. Though ericulture has been a source of employment and income to the rural poor people, especially the women folk, it has so far not been able to attract much attention from the researchers. Therefore, an attempt is made here to analyse all the economic aspects of ericulture including employment, income, export, problems and its probable future prospects.

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Chapter-3

Methodology and Collection of Data

3.1. Introduction

Investigation about the problems and prospects of ericulture in Assam with special reference to Barpeta district has been made in five major parts. First of all, role of sericulture especially of ericulture in the generation of employment and income in Assam has been analysed. Thereafter, spatio-temporal variation of ericulture in Assam has been described. Then, comparative analysis of different silk cultures in terms of their capacity to generate employment and contribution to income, profitability etc has been examined rigorously. Next, problems and future prospects of ericulture in Assam have been highlighted. Finally, a brief discussion on the scope and role of different financial agencies in the development of ericulture in Assam has been provided.

3.2. Role of Ericulture in the Generation of Employment and Income in Assam

First of all, the contribution of ericulture as well as sericulture as a whole to the total workforce of Assam and its variations during 1990s is explained by tabular method. The growth of production of eri cocoons and its price and also the contribution of eri cocoons to the NSDP of Assam during 1980-81 to 2004-05 has been estimated by running semi-logarithmic regression of the form $\text{Ln}Y_t = a + b.t + U_t$, where Y_t represents either production, price or contribution to NSDP at time t ; t is the time in year; a and b are the two parameters. Here, U is the random disturbance term and b represents the annual exponential rate of growth of the concerned variable. The annual

average exponential rate of growth of employment generated in Assam due to ericulture and broadly sericulture total during 1990-91 to 2005-06 (for which the data were available) has also been estimated by the regression method. After careful examination of the scatter diagram and trial of various spline functions (Gujarati, 2004) finally the semi log-linear equation $\text{Ln}Y_t = \alpha + \beta.t + \gamma.D + V_t$ is estimated. Here, Y_t is the number of families engaged in sericulture/ ericulture at time t ; t is the time in year and V is random disturbance term; α , β and γ are the three parameters. Here, dummy variable D is introduced that takes value 1 for any year from 1990-91 to 1995-96 and 0 from 1996-97 to 2005-06.

From 1995-96 to 1996-97, a sudden fall in number of families engaged in sericulture and particularly in ericulture is observed, which may be partly due to the conversion of *Somanies*¹ into highly remunerative tea gardens and also due to the devastating flood in some areas of Assam mainly in the districts of North Lakhimpur and Kokrajhar. Many of the families practising various sericulture activities were affected and displaced to the safe areas where they could not run their sericulture activities. However, in the following years (since 1997-98) due to rigorous efforts on the part of the Government in the form of grants in aid to the rearers, gradually the number started increasing². As it drifted down in 1996-97 but started increasing again from a lower base (almost parallel to that of earlier trend) it is better to introduce a dummy variable rather than fitting an exact spline function. Also the changes in intensity of ericulture during the same period are estimated through the variation in area under eri feed plantation per family associated with such activity.

¹ Somanies is the garden of Som tree, the primary host plant of Muga silkworm

² Though the number of families engaged in various sericulture activities declined severely from 1995-96 to 1996-97, the production has not declined rather than increased (but at a slower rate). The reason is that the rearers of some districts especially Karbi Anglong, Marigaon, Barpeta, Darrang, Dhubri produced more and overcompensated the loss in other districts viz. North Lakhimpur, Kokrajhar, Nalbari etc.

Thereafter, employment of families per hectare of eri feed plantation and per unit of production of eri cut cocoon in Assam is shown by using tabular method. Changes in output of eri cocoon per unit of area (hectare) with respect to variation in area (hectare) per family and also the changes in output per unit of land with respect to families per unit of land are estimated by running the similar semi logarithmic regression as used earlier. After computing the average contribution of ericulture to the family income of the sample households in the study villages, an equation of the form $\text{Ln}Y_i = \alpha + \beta \text{Ln}X_i$ is estimated to know the elasticity of contribution of ericulture to average total family income with respect to the variation in average family income across the villages; i.e., to know whether there is any variation in dependence on ericulture with the changes in affluence of the families or incidence of poverty. Here Y_i represents average percentage contribution of ericulture to family income of i^{th} village and X_i represents average family income of i^{th} village. Similar method is also followed to examine the relationship between economic standard of the families and the adoption of weaving activity across the study villages. In addition to that, the relation between revenue generated annually from ericulture proper and the annual family income is examined by using coefficient of correlation between them. Impact of ericulture on the reduction in poverty is examined by tabular method. Moreover, the correlation between the reduction in incidence of poverty and the adoption of weaving across the villages is calculated to know, whether there is any significant change in incidence of poverty with the increase in adoption of weaving along with ericulture proper.

3.3. Spatio-temporal Variation in Ericulture in Assam

Spatio-temporal variation in ericulture in Assam is discussed in chapter-5. First of all, district-wise variation in contribution of eri-cut cocoon to total state production

during 1990-91 to 2005-06 is described. Inter-district disparity of contribution of eri cocoon production to state total is measured by the co-efficient of variation. Thereafter, exponential rate of growth of number of families engaged in ericulture in different districts has been estimated. Estimation has been done for the whole period as well as for different sub periods. District-wise variation in proportion of area under eri host plant to total ericultural land of the state during 1993-94 to 2005-06 is also measured by the coefficient of variation. Finally, district-wise over time variation in output of eri cocoon per hectare of land under host plant is shown by tabular method.

3.4. Comparative Study of Eri, Muga, Mulberry and Tasar in Assam

First of all, temporal variation in eri, muga, mulberry and tasar raw silk production in Assam during 1980-81 to 2004-05 has been analysed by tabular method. Also, annual exponential rate of growth of production during 1980-81 to 2004-05 has been estimated by running semi logarithmic regression of the form $\text{Ln}Y_t = \alpha + \beta.t + U_t$, as used in chapter-4, where Y_t is the quantity of output at time t ; t is the time in year; α and β are the two parameters. U is the random disturbance term with usual classical regression properties and β represents the annual exponential rate of growth of Y_t . However, for estimating the annual exponential growth rate of production of mulberry raw silk during 1980-81 to 2004-05, polynomial of degree three has been used. Thereafter, contribution of eri, muga and mulberry culture to total workforce in Assam has been discussed with the help of tabular method. Next, the role of eri, muga and mulberry culture in employment generation and their respective contributions to NSDP at market prices in Assam has also been estimated by using the similar regression method. Comparative analysis of production of eri, muga and mulberry raw silk per hectare and per family is done by using tabular method. For the comparison of

differences in impact of area per family on output per hectare is done by using the following test statistics.

$$F_{n-2, n-2} = \frac{(\beta_1 - \beta_2)}{\{(n_1 - 2) s_1^2 + (n_2 - 2) s_2^2\} / (n_1 + n_2 - 4)}$$

Finally, cost, revenue and profit per unit of output of eri, muga and mulberry cocoon as well as per unit of investment (rupee) have been computed from the sample observations and compared. Also capital and labour output ratio as well as capital intensity in eri, muga and mulberry production is calculated and compared by tabular method to have an idea of the technology used for the production of the respective sericulture output. In addition to that, contribution of eri, muga and mulberry-culture to the foreign exchange earnings of the state are also discussed by tabular method.

3.5. Problems and Prospects of Ericulture in Assam and Role of Financial Institutions in Ericulture

Problems and prospects of ericulture in Assam have been discussed in chapter-7. Educational level of the members of sericulturist families, problems faced by the ericulturists is discussed by tabular method. Similarly, distribution of sources of fund of the ericulture practising families, government assistance to the ericulturists in the 10th plan under Catalytic Development Project in Assam and in the district of Barpeta has been shown in tabular method. In order to examine the prospects of ericulture, average revenue and cost functions are estimated and also plotted graphically for different level of broods practised by the sample rearing families. From that the profit function is also examined and estimated the level of profit maximising level of output. Also, the level of output at which average cost would be minimum is estimated by minimising the best fitted average cost curve with respect to the level of output of eri cocoon. Those are also compared with the existing level of output to see how much expansion is possible

and thereby to maximise profit or minimise the average production cost and that indicates the scope for the expansion of the activity at the existing level of technology.

3.6. Collection of Data

The study is based on both primary and secondary data. For the purpose of analysis, secondary data on distribution of workforce, family engaged in eri, muga and mulberry and sericulture as a whole, production of cocoon or raw silk, area under respective host plants, Net State Domestic Product of Assam, export of eri products to abroad etc have been collected from various Census Reports, Directorate of Sericulture, Government of Assam, Directorate of Economics and Statistics, Government of Assam, Economic Survey of Government of India, Office of the Directorate of Central Silk Board (North-Eastern Region), Government of India, ARTFED and other official reports. Consultations with the experts of the said fields were also made for gathering relevant information.

Also for the study, primary data have been collected from 180 families chosen by multistage sampling procedure from the district of Barpeta,³ the fourth populous district in Assam with 16.42 lakhs population covering an area of 3245 square kilometres. Out of the total population of the district, 5.70 and 7.48 per cent belong to Schedule Caste and Schedule Tribes respectively. The literacy rate is only 56.24 per cent (2001 Census Report). There are 12 community development (CD) blocks in the district consisting of 1073 villages. Sericulture is practised in 140 villages, which are mainly concentrated in the CD blocks of Gobardhana, Jalah and Sarukhetry. Therefore, these three CD blocks were selected out of total 12 CD blocks of the district of Barpeta.

³ Though contribution to total ericulture output of the state and number of families engaged in ericulture is much larger in Karbi Anlong, North Lakhimpur, N. C. Hills and Dhimaji district, growth rate of number of families engaged in ericulture and area under host plant is the second highest in the district of Barpeta. Moreover, growth of production per unit of land is the highest in Barpeta during the last decade.

Within these three community development blocks, nine villages namely Bashbari, Nimua and Khusrabari from Gobardhana CD block, Salbari, Hahchara and Bhuyapara from Jalah CD block and Gohia, Agdia and Garartari from Sarukhetri CD block were selected by stratified random sampling method. From the nine villages, total 180 sample families are selected (23, 10 and 17 from Gahia, Agdia and Garartari villages under Sarukhetry block; 14, 21 and 35 from Salbari, Hahchara and Bhuyapara villages under Jalah block and 18, 32 and 10 from Bashbari, Nimua and Khurabari villages under Gobardhana block respectively) on the basis of the proportion of families of the three blocks engaged in such activities in the respective villages. From each village, the sample families are picked by simple random sampling without replacement from all the families practising sericulture.

From each selected family, information regarding number of broods reared and production of cocoons and pupae in a year, number of people engaged in this occupation, average daily working hours used in rearing, spinning and weaving, cost of appliances of rearing, price of pupae and cocoons at which these are sold, production of yarn, labour hour required in spinning and shawl production, cost of handloom, price of yarn and final endi-products, the problem faced by rearers, other occupations of the family members, total annual family income, their educational status etc have been collected through a pre-tested questionnaire. Interview method was adopted in the collection of data. The survey was conducted during July 2005 to June 2006. Several subsequent visits were also made to some of the sample households to clarify some doubts and confirm some findings.

Information on the market prices of eri cut cocoon, muga, mulberry and tasar raw silk were not available from the secondary sources, which were also collected from the respondents and verified with the field officers of Sericulture Department of

Government of Assam. Though the rearers could inform about the price of current and recent previous years, they were unable to respond from their memory of much earlier years (like 1980). These were taken from the field officers' personal record. Of course, a trend of procurement price of eri cut cocoons was available from the secondary sources (Directorate of Sericulture, Government of Assam), but there was a wide gap between the procurement price and market price. As per record, the procurement price of eri cut cocoon has been pegged at only Rs 80 per kg since 1997. Where as the market price has increased from Rs 80 per Kg during 1980-81 to Rs 320 per Kg during 2004-05. Therefore, hardly anybody sells her product to the government authority, as the procurement price has been much lower than the market price.

Similarly, information on number of families engaged in eri, muga and mulberry and as a whole sericulture is available from the Directorate of Sericulture, Government of Assam. But the number of people engaged in these occupations is not available. Therefore, the average number of rearers found in the sample households is considered here to estimate the number of individuals engaged in such activities. Total number of rearers is estimated by multiplying the number of families by three, the average number of rearers engaged in sericulture in the sample families.

In the same way, as silkworm rearing is a part time occupation of the family members in most cases and the members are not fully engaged throughout the day, the number of people engaged cannot be equated with the number of man-days generated in this occupation. Here generation of employment (man-days) is estimated through the number of man-hours (working hours utilised every day) required from the collection of leaves to the production of cocoons.

Normally everyday three hours are required for the maintenance i.e., collection of leaves, supply of food leaves to the worms and clearing of the rearing trays

(removing of odour and unconsumed leaves) of a brood. Usually 20 days of gestation period are there for the harvesting of one brood of eri or mulberry cocoon during the summer. However, the gestation period extends to maximum 28 days (four weeks) during winter season. Therefore, the total man-hours required for harvesting one brood of eri or mulberry cocoon is 60 man-hours ($= 3 \times 20$) during summer. Considering 8 hours of work as equivalent to one man-day, it becomes 7.5 working days. Whereas during winter season, number of equivalent man-days required for harvesting a brood of cocoon (eri or mulberry) is about 10.5. But, in case of muga-culture, constant engagement of labour is necessary from the time of placing tiny worms on the feed plants till maturity stage. The rearers have to stay round the clock in the *somanies* to protect the silkworm from the attack of birds, monkeys etc and to shift the worm from one plant to another as they crawl down in search of feed leaves. In general, the gestation period of muga worm is 23 days during summer and 42 days in winter. Accordingly, man-days required for harvesting one brood of muga cocoon vary from 23 during summer to 42 in winter. Mainly the adult male members of the family perform these jobs. Generally, wages are not required to be paid directly as most of the eri; mulberry and muga-culture activities are done by the household labourers. But to find out the implicit labour cost and net profit, prevailing wage rate in the similar other occupation is collected from the sample areas during that period and considered for the analysis of the present study. Sometimes, hired labourers are also engaged in rearing muga cocoon at the going wage rate.

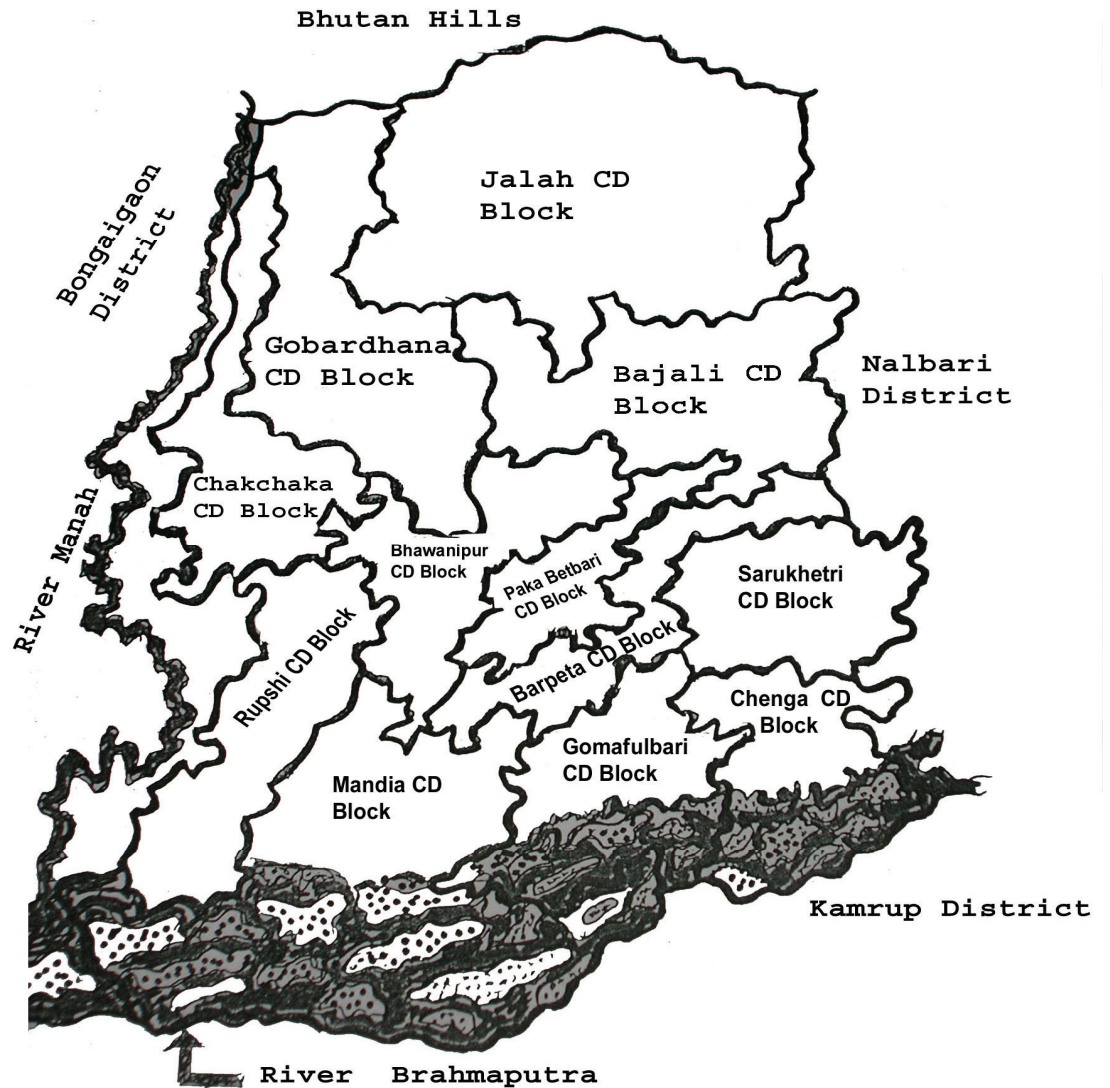
3.7. Limitations of Data

Majority of rearers have provided some quantitative information such as figures of annual eri cut cocoon production, annual sales proceeds from ericulture, amount of

investment in plantation and collection of leafs etc, from their memory other than from books of accounts. The rearers whether rich or poor are found to be unwilling to divulge some basic information relating to grants received from government and have a tendency to exaggerate their poverty. Some of them even are not aware of the modern weight and measures system. Most of the rearers have not maintained proper books of accounts. Great care was, however, taken to smoothen to these tendencies in filling up the questionnaires.

Sometimes, the available secondary data specifically relating to production of cocoon and endi products differs from Central Silk Board and Directorate of Sericulture. During the survey, it is observed that the Directorate of Sericulture, Assam, Central Silk Board, Guwahati, have not maintained proper annual accounts as regards to various incentives provided by them from time to time to the eri growers of various blocks which is mentioned earlier. This has created a lot of problems in studying the generation of income and employment in the district of Barpeta through eri culture.

Map of Barpeta District indicating Community Development Blocks and the Survey Areas



Chapter – 4

Ericulture as a Source of Employment and Income

4.1. Introduction

India is the second largest country in terms of population with around 103 crores (2001 Census Report) following China in the world. Assam has provided shelter to 2.58 per cent (2.66 crores) population of India according to 2001 Census Report. The economy is basically agriculture and plantation based. The slow pace of economic development marked by about 1.27 per cent annual exponential rate of growth of per capita Net State Domestic Product during 1990-91 to 2005-06 at 1993-94 prices (Government of India, *Economic Survey*) along with sluggish industrial development and rapid population growth (that increased from about 2.24 crores in 1991 to around 2.66 crores in 2001) has resulted in massive unemployment in the state (Mali, 1982). Agriculture is the primary occupation of the majority of population (64 per cent in 1991). Still now, about $\frac{3}{4}$ th of the main workforce are engaged in primary sector. Whereas per capita availability of land has declined severely from 0.54 hectare in 1971 to merely 0.35 hectare in 1991 and then further to 0.29 hectare in 2001(De, 2006); which is also the lowest among all the North-Eastern states and also marginally below the all India average (0.30 hectare per capita). This sector is thus already overburdened with surplus labour. According to World Bank Report (2000), the size of operational holdings per family has shrunk to less than 0.05 hectare while the cropping intensity has gone up to 125 per cent. Percentage of labour force to total population remain unemployed during 1983 was 2.2, which increased to 5.6 per cent in 1993-94. Though it declined thereafter to 4.6 per cent in 1999-2000, at present, it is the highest among all the North-Eastern states (as per *National Human Development Report*, 2001). The state is also one of the poorest states in India with around 36.09 per

cent (1999-2000)¹ of its population still living under poverty line. Total number of unemployment in Assam as per registration in Employment Exchanges was over 1.63 lakh in 2004². But the situation of unemployment is more severe as all the unemployed persons do not register their names in the office of Employment Exchanges of the state. It is thus necessary to have alternative avenues that can immediately provide some viable scopes for employment to the increasing unemployed labour force. Here lies the importance of ericulture. Ericulture, being a labour intensive activity has been acting as antidotes to the problem of unemployment and reduction in poverty in Assam for a long period of time without which the rural poverty in Assam would be more severe. Benchamin and Jolly (1987) also identified ericulture as an occupation of “low investment and high output” source of employment and income.

Ericulture can generate employment for a large number of unemployed people especially of females partially or fully in its various stages of activities. The scope is increased further when ericulture proper and endi textile industries are undertaken on scientific and commercial lines. Thousands of families in Assam have been engaged directly or indirectly in various ericulture activities like sowing of seeds; plantation of host plants; maintenance of plants; plucking of leaves from the planted and wildy grown trees; feeding and rearing of silkworm up to cocoon stage; spinning of yarn; weaving of fabrics; marketing of cocoons (intermediate product) and cloths etc (Das, 2006).

4.2. Some Earlier Considerations and Mode of Analysis

Till today no detailed study, covering all the aspects of the silk culture (sericulture) especially on ericulture of Assam has been made. Of course, the Sericulture and Weaving

¹Government of India (2001-02), *Economic Survey*.

²Directorate of Economics and Statistics, Government of Assam (2005), *Statistical Handbook*, P-168, Table-19.05.

Department, Government of Assam conducted a survey during 1975-76 in 598 Gaon Panchayats of the plain districts of Assam to assess the position of the silk industry relating to production, employment etc. The survey report reveals that the majority of population pursuing the silk culture in Assam belong to both General and Scheduled Tribes. Large number of families was found to carry on these activities as leisure time occupations³. Dutta (1983) conducted a study entitled “Economics of Silk Production in Assam”, which provides a brief note about the silk production and its related aspects in Assam. He tried to analyse in depth the prospects of it through the assessment of the net income per family of silkworm rearer with the help of primary data. But the sample used in his study was inadequate. Later, Dutta (1988) also discussed the problems and future prospects of eri, muga and mulberry silk industry in Assam with special reference to Sibsagar district through another study entitled “Problems and Prospects of Silk Production in Assam with Special Reference to Sibsagar District”. The most important drawback of that study was that he did not take into account transport cost associated with the collection of leaves in case of eri and imputed labour cost in the estimation of income and profit while explaining the prospects of it. Dookia (1984) in his study entitled “Studies on Ericulture for Exploitation as a Cottage Industry” analysed the position of eri silk industry in Indian economy as a cottage industry and discussed its role in creating employment and income in the rural economy. Choudhury (1984) attempted to assess the economic importance of each variety of silk by drawing out gross and net returns per hectare of land under host plant and per family of silkworm rearers. This assessment seems to be based on experiment rather than field study.

Ratnala et al (1990) studied the employment of human labour in sericulture across different size of the farms especially of the mulberry farms in Andhra Pradesh. In their

³As there is disguised unemployment in agriculture, the rural people, especially the women folk have been engaged in such occupation. Also the male people during the lean agricultural season take part in such activities for raising a part of their family earning.

study, they found that human labour utilisation was more in smaller farms where the attention on each activity was more than the bigger farms. They observed a direct relationship between hired labour use and the size of land holding. Also there was an inverse relation between the human labour use and the size of land under cultivation. They concluded that the higher employment potentialities of sericulture were well suited to exploit the abundant human resources in rural India. The presence of disguised unemployment was more in case of smallholdings but the big holdings were generating comparatively less employment in their sericulture farms. In order to engage the family labourer effectively and use the labour rationally, holding size of 1.01 to 1.5 acres was of optimum size for cultivation and silkworm rearing (Ratnala, et al, 1990).

Das (2000) also analysed the importance of ericulture in the economy of Assam and its related problems in his study “Problems and Prospects of Ericulture in Assam (A case study in Barpeta district). However the main drawback of his study was that he did not examine it through any field study. His analysis was completely based on secondary data that suffers from the limitation of incompleteness.

Thereafter “A Study of Mugaculture with Reference to Income and Employment Generation in Kamrup District” by Paresh Chandra Das in 2002 may be mentioned. Here, he discussed the problems of muga-culture in Kamrup district of Assam and means to revive the thousand-years-old industry. He also tried to find out the share of muga-culture in employment generation through the analysis of data collected from a sample of 736 families in Kamrup district during January 1999 to December 2002. Out of 736 families, 26.87 per cent of the respondent households were found to adopt mugaculture as a source of livelihood in his study. But, he did not estimate the capacity of mugaculture to generate employment per unit of output or area under the growth of host plant i.e., the efficiency of mugaculture in the generation of employment and income has not been checked.

The role of sericulture, especially of ericulture in the generation of employment in Assam and spatio-temporal variation of it has been analysed in this chapter. First of all, over time changes in contribution of sericulture and ericulture to the employment and income of the state has been discussed. Thereafter the employment and income generated in Barpeta district and its temporal variation has been discussed. Along with ericulture proper, the role of eri textile industry in the generation of employment and income has also been analysed, which has been done into two different parts: eri spinning activity and eri weaving activity. It is done through a case study in Barpeta district to estimate the potential of employment and income generation from unit production of eri cut cocoons in ericulture proper and eri textile industry. As the cultivation is not practiced totally and a part of feed plants are collected from the naturally grown areas it is very difficult to suitably estimate and compare the generation of employment across different farm size. However, a comparison may be made between the contribution to employment and income of the families across different areas with variation in level of development through sample observations.

For the purpose of analysis, data on distribution of workforce, family engaged in sericulture as a whole and ericulture, Net State Domestic Product of Assam etc have been collected from various Census Reports, Directorate of Sericulture, Government of Assam, Directorate of Economics and Statistics, Government of Assam, Economic Survey and other official reports. Also for the study of Barpeta district, primary data have been collected from 180 families chosen by multistage sampling procedure.⁴ At the first stage, three Community Development Blocks out of total twelve blocks in the district are chosen purposively on the basis of the concentration of ericulture activities. Three villages have been chosen from each of the chosen blocks (total nine villages) also purposively

⁴ Though contribution to total ericulture output of the state and number of families engaged in ericulture is much larger in Karbi Anlong, North Lakhimpur and Dhimaji district, concentration of activities is much more in Barpeta, where over 16 per cent of the inhabited families are engaged in such activities.

depending upon the concentration of such activities. From the nine villages, total 180 sample families are selected (23, 10 and 17 from Gahia, Agdia and Garartari villages under Sarukhetry block; 14, 21 and 35 from Salbari, Hahchara and Bhuyapara villages under Jalah block and 18, 32 and 10 from Bashbaari, Nimua and Khurabari villages under Gobardhana block respectively) on the basis of the proportion of families of the three blocks engaged in such activities in the respective villages. From each village, the sample families are picked by simple random sampling without replacement from all the families practising sericulture.

From each selected family, information regarding number of broods reared and production of cocoons and pupae in a year, number of people engaged in this occupation, working hours in rearing, spinning and weaving, cost of appliances of rearing, price of pupae and cocoons at which these are sold, production of yarn, labour hour required in spinning and shawl production, cost of handloom, price of yarn and endi-products, the problem faced by rearers, other occupations, total annual family income etc have been collected through a pre-tested questionnaire. The survey was conducted during the period June 2005 to July 2006. Information on the market price of eri cut cocoons was not available from the secondary sources, which was also collected from the respondent and verified with the field officers of Sericulture Department of Government of Assam. Though the rearers could inform about the price of current and recent previous years, they were unable to respond from their memory of much earlier years (like 1980). These were taken from the field officers' personal record. Of course, a trend of procurement price of eri cut cocoons was available from the secondary sources (Directorate of Sericulture, Government of Assam), but there was a wide gap between the procurement price and market price. The procurement price of eri cocoon has been pegged at Rs 80 per kg since

1997. Thus, hardly any body sells her product to the government, as the procurement price is much lower than the market price.

Contribution of sericulture in total and ericulture to the total workforce of Assam and its variations during 1990s is shown by tabular method. The growth of production of eri cocoons and its price and also the contribution of eri cocoons to the NSDP of Assam during 1980-81 to 2004-05 has been estimated by running semi logarithmic regression of the form $\text{Ln}Y_t = a + b.t + U_t$, where Y_t is either production, price or contribution to NSDP at time t ; t is the time in year; a and b are the two parameters. Here, U is the random disturbance term and b represents the annual average exponential growth of the concerned variable. The annual average exponential rate of growth of employment generated in Assam due to ericulture and broadly sericulture total during 1990-91 to 2005-06 (for which the data were available) has also been estimated by the regression method. After careful examination of the scatter diagram and trial of various spline functions (Gujarati, 2004) finally the semi log-linear equation $\text{Ln}Y_t = \alpha + \beta.t + \gamma.D + V_t$ is estimated. Here, Y_t is the number of families engaged in sericulture/ ericulture at time t ; t is the time in year and V is random disturbance term; α , β and γ are the three parameters. Here, dummy variable D is introduced that takes value 1 for any year from 1990-91 to 1995-96 and 0 from 1996-97 to 2005-06.

From 1995-96 to 1996-97, a sudden fall in number of families engaged in sericulture and particularly in ericulture is observed, which may be partly due to conversion of *Somanies*⁵ into highly remunerative tea gardens and also due to the devastating flood in some areas of Assam mainly in the districts of North Lakhimpur and Kokrajhar. Many of the families practising various sericulture activities were affected and displaced to the safe areas where they could not run their sericulture activities. However,

⁵ Somanies is the garden of Som tree, the primary host plant of Muga silkworm

in the following years (since 1997-98) due to rigorous efforts of Government in the form of grants in aid to the rearers, gradually the number started increasing⁶. As it drifted down in 1996-97 but started increasing again from a lower base (almost parallel to that of earlier trend) it is better to use a dummy rather than an exact spline function. Also the changes in intensity of ericulture during the same period are estimated through the variation in area under eri feed plantation per family related to such activity.

Contribution of ericulture to income and employment in Barpeta district and of the sample households is analysed by tabular method. Also the contribution to income and employment generated due to the endi textile operations (spinning and weaving) is analysed by tabular method. The observations are given below.

4.3. Observations:

4.3.1 *Contribution of Ericulture to Total Workforce of Assam*

In Assam, number of dependents in the total population is very high. In the year 2001, only 95.38 lakh population (35.78 per cent) of the total population of 2.66 crores was belonging to working class (2001 Census). In this working class, thousands of people have been engaged in sericulture and a major part of which have been engaged in ericulture proper. Secondary data on number of people engaged in sericulture total and ericulture in particular in Assam is not available. Only number of families engaged in sericulture and ericulture is available. On an average, three persons of a family are found to be engaged (fully or partially) in different sericulture activities in the sample families. On the basis of that the contribution of sericulture and ericulture to the total workforce in Assam is estimated and presented in table-4.1 for the last two census years.

⁶Though the number of families engaged in various sericulture activities declined severely from 1995-96 to 1996-97, the production has not declined rather than increased (but at a slower rate). The reason is that the rearers of some districts especially Karbi Anglong, Marigaon, Barpeta, Darrang, Dhubri produced more and overcompensated the loss in other districts viz North Lakhimpur, Kokrajhar, Nalbari etc.

Table-4.1
Contribution of Ericulture to Total Workforce of Assam

Year	Workforce (Number)	Percentage of Workforce to Population	
1991	8088935	36.09	
2001	9538591	35.78	
Year	Number of Families Practicing Sericulture	*Number of Individual Sericulturists	Percentage of Sericulturists to Total Workforce
1991	186836	560508	6.93
2001	172918	518754	5.44
Year	Number of Families Practicing Ericulture	*Number of Individual Ericulturists	Percentage of Ericulturists to Total Workforce
1991	122672	368016	4.55
2001	125420	376260	3.94

Sources: (i) Directorate of Economics and Statistics, Government of Assam (1997), *Statistical Handbook*, Table-1.13, P-30.

(ii) Directorate of Economics and Statistics, Government of Assam (2005), *Statistical Handbook*, Table-1.10, P-28

(iii) Government of India, Directorate of Census operation, 1991 and 2001, *Census of India*, 1991 and 2001.

Note: *Total numbers of rearers is estimated by multiplying the number of families by 3 (the average number of rearers in a family as observed in the study area).

From table-4.1 it is observed that in the year 1991, 36.09 per cent of total population of Assam were belonging to the working force. Out of these, 6.93 per cent was in sericulture sector and 4.55 per cent was engaged in ericulture alone. It indicates that the contribution of sericulture to total workforce was limited, but within sericulture, ericulture occupied an important position. That is, 65.65 per cent of employment in sericulture total is constituted by the ericulture alone. Although total number of workforce increased in absolute terms during 1991 to 2001, percentage of workforce to total population declined to 35.78 per cent in 2001. It was because of the fact that the growth rate of population was higher than that of total workforce in Assam. During 1991 to 2001, in sericulture total, number of rearers declined both in absolute and in percentage terms. It is noticed that some educated youths instead of taking sericulture as a source of livelihood, are moving towards towns and cities in search of white-collar jobs, as they dislike the odour emitted from the worms and cocoons. Moreover, the educated youths who acquired some social status have a fear of losing social status and the rich traditional rearers gradually dropped

such activities and switched over to some other activities, as it is a low paid occupation. In case of ericulture, in spite of increase in number of rearers in absolute terms, it declined in terms of percentage from 4.54 in 1991 to 3.94 in 2001. It was because of the relatively higher rate of growth of employment in other sectors of the economy.

4.3.2 Growth of Employment in Ericulture of Assam during 1990-91 to 2005-06.

Sericulture provides immense scope for self-employment as majority of the rearers of Assam are poor and there the question of hired labour hardly arises. Generally, all the members of the rearing families work together to complete the rearing processes. It is a well-known fact that the rearing families take silk culture, primarily as their part time (not full-time) occupation⁷. Hence, it is very difficult to assess the extent of employment in sericulture. During the rearing period of eri and mulberry worms, constant watch is not necessary as they are reared indoor. The family members engage themselves in works connected with rearing, e.g., collection of leaves, cleaning of leaves and rearing trays, which require 2 to 4 hours everyday. But in case of mugaculture, continuous and careful watch is necessary from the time of keeping tiny worms on the feed plants just after breeding till maturity stage. Therefore, the members of the rearing families have to stay in the *Somanies* throughout day and night. Sometimes, hired labourers are also employed. Thus it is very difficult to estimate man-days accurately. The changes in number of families engaged in ericulture and sericulture (eri, muga and mulberry)⁸ as a whole in Assam during 1990-91 to 2005-06 is presented in table-4.2.⁹

⁷Many of the family members are disguisedly unemployed and they also use their leisure time in ericulture activities. Though it is a low paid job, with the existing skill those people especially the women would not have scope to be employed in any other relatively more remunerative occupation.

⁸Families engaged in Tasar are not considered as it is practiced by a limited number of families in a limited area of North Cachar and Karbi Anglong district of Assam.

⁹Though the figures of production of sericulture/ericulture in Assam is available since 1980-81 from the secondary sources, data on number of families engaged in sericulture/ericulture is available only for the period 1990-91 to 2005-06, which is considered here.

Table-4.2
Families Employed in Ericulture as well as Sericulture Total in Assam
during 1990-91 to 2005-06

Year	Ericulture (Number)	Sericulture Total (Number) (Eri+Muga+Mulberry)	Percentage of Ericulture to Sericulture Total
1990-91	118410	181549	65.22
1991-92	122672	186836	65.65
1992-93	123327	187807	65.66
1993-94	124024	188868	65.66
1994-95	128021	196111	65.27
1995-96	128186	196417	65.26
1996-97	113492	153230	74.07
1997-98	116580	152998	76.19
1998-99	121003	162114	74.64
1999-00	119534	168801	70.82
2000-01	119320	166854	71.51
2001-02	125420	172918	72.54
2002-03*	128727	179105	71.87
2003-04	132033	185291	71.26
2004-05	135216	190166	71.11
2005-06	135237	195152	69.29

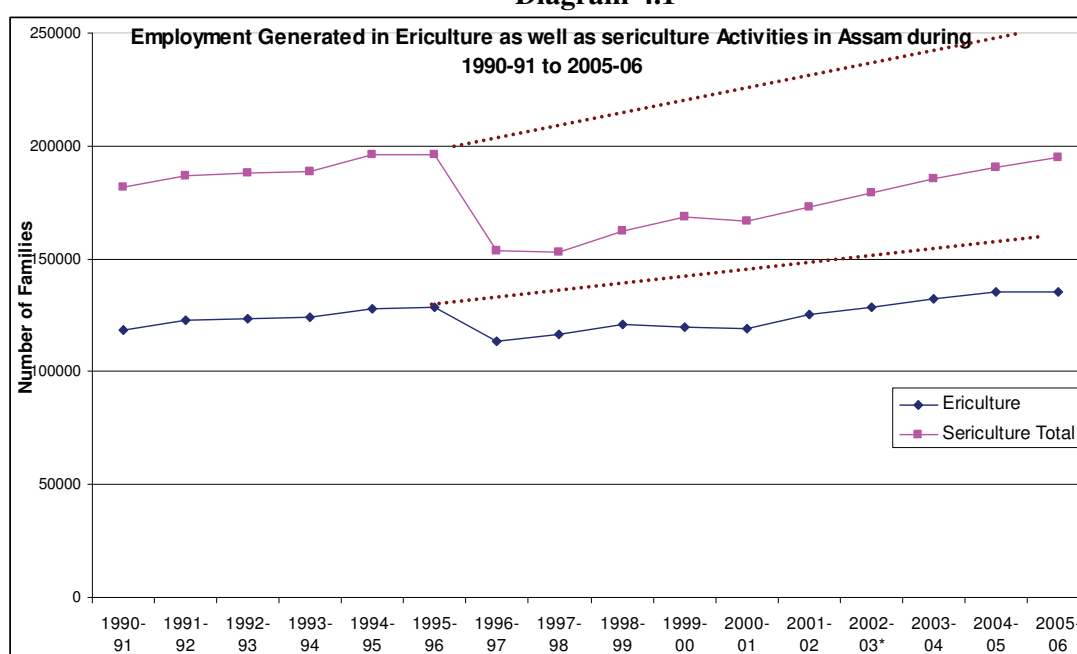
Source: Directorate of Sericulture, Government of Assam, Guwahati, Assam.

Note: * Interpolated figures for 2002-03 are considered, as those were not available from the secondary sources.

Table-4.2 shows that the number of families associated with sericulture in Assam has increased from 181549 in 1990-91 to 195152 in 2005-06 with some ups and downs in the middle years. Both the number of families associated with sericulture as a whole and ericulture in Assam exhibit almost a similar trend. Though initially continuous increase in number of families both in sericulture and ericulture is observed up to 1995-96, it declined sharply in 1996-97 and started increasing again up to 2005-06. The setback in 1996-97 was mainly due to the conversion of large number of *Somanies* into highly remunerative tea gardens in Upper Assam as mentioned earlier. Moreover, during 1996-97 due to severe flood occurred in Assam. Large number of muga rearers specifically, from Dhemaji and North Lakhimpur, the two major muga raw silk producing districts had to take shelter in tents and also abandon their traditional activities. Where as ericulture was largely practised in Karbi Anglong, Bongaigoan, Marigoan districts etc, which was, affected less due to the

occurrence of flood. Moreover, due to continuous efforts of government in the form of grants in aid to the rearers, the number of families engaged in these activities increased in the subsequent years. From the data it also appears that the other forms of sericulture, i.e. muga and mulberry were worse hit in 1996-97 and 1997-98 due to devastating flood than the ericulture but in the later part growth of those were relatively higher than that of ericulture. However due to higher fluctuations of trend in other activities ultimately percentage of ericulture slightly increased.

Diagram-4.1



Note: * indicates that the figure is provisional.

Within the sericulture sector, ericulture has been practised by majority of families. Number of families engaged in ericulture increased from 118410 in 1990-91 to 128186 in 1995-96 and then declined to 113492 immediately in the following year and it started increasing continuously and reached a figure of 135237 in 2005-06. Eri-culture requires comparatively less investment, involve less risk and hence can be easily carried out by the poor villagers. Moreover, eri pupae are popular delicacy and source of nutrition to the rearers. Annual average exponential rate of growth of number of families engaged in

sericulture during 1990-91 to 2005-06 was 2.56 per cent, which was highly significant. Where as the number of families engaged in ericulture has grown significantly at 1.93 per cent annual average exponential rate during 1990-91 to 2005-06, which has been slightly lower than that of sericulture as a whole. These are shown in the estimated regression equations-4.1 and 4.2.

$$\text{Ln } Y_t^S = 11.76^* + 0.0256 t^* + 0.301D^* \dots\dots R^2 = 0.962; \text{Rbar}^2 = 0.956\dots (4.1)$$

(0.021) (0.002) (0.0170)

$$\text{Ln } Y_t^E = 11.51^* + 0.0193 t^* + 0.151D^* \dots\dots R^2 = 0.932; \text{Rbar}^2 = 0.922\dots (4.2)$$

(0.017) (0.001) (0.014)

Notes: Y_t^S and Y_t^E represent number of families engaged in sericulture total and ericulture activities at time t respectively.

Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two tailed test.

The terms in the brackets represent standard error of corresponding coefficient.

During 1990-91 to 1995-96, the share of ericulture in total sericulture in generating employment opportunities to families was around 65 per cent. But in the year 1996-97, its share jumps up to 74.07 per cent in spite of fall in number of families in ericulture. It was because of drastic fall in number of families engaged in muga and mulberry. During 1997-98 to 2004-05, ericulture contributed more than 70 per cent to sericulture total in terms of families engaged in sericulture but the proportion declined slightly to about 69 per cent in 2005-06 due to the continuous recovery of other sericulture activities in Assam.

4.3.3 Contribution of Ericulture to Net State Domestic Product of Assam during 1980-81 to 2004-05

The economy of Assam is primarily agriculture and plantation based and agriculture forms the backbone of the state economy as mentioned earlier. The share of agriculture and its allied activities in Net State Domestic Product (NSDP) at market price was 34.7 per cent in 1998-99¹⁰. Though ericulture does not contribute much to NSDP in

¹⁰ Government of India (2001-02), *Economic Survey*.

terms of percentage, a large number of rural people have been engaged in such activities over a long period of time. As mentioned earlier it has been providing employment to the disguisedly unemployed people who utilise their leisure time (during which other remunerative activities are not available to them) and earn some income to meet their daily needs. Also, over the years significant growth in area and production of cocoon has been observed in the state. The variation in output of eri cocoon and its contribution to the total NSDP during 1980-81 to 2004-05 is shown in table-4.3.

Table-4.3
Contribution of Eri culture to Net State Domestic Product of Assam at Market Price

(1)	(2)	(3)	(4)	(5)	(6)
Year	NSDP of Assam at Market Price (Crore)	Production of Eri Cocoon (MT)	*Price of Eri-Cocoon (Rs per kg)	Total Value of Eri-Cocoon (Crore)	(5) as Percentage of (2)
1980-81	2356	100	80	0.8	0.03396
1981-82	2978	116	85	0.986	0.03311
1982-83	3398	142	90	1.278	0.03761
1983-84	3766	182	90	1.638	0.04349
1984-85	3725	187	100	1.87	0.05020
1985-86	5118	226	110	2.486	0.04857
1986-87	5476	226	125	2.825	0.05159
1987-88	5993	288	130	3.744	0.06247
1988-89	6563	321	135	4.3335	0.06603
1989-90	7741	327	140	4.578	0.0591
1990-91	8905	335	150	5.025	0.0564
1991-92	10632	375	150	5.62	0.0528
1992-93	11543	389	160	6.22	0.0538
1993-94	13477	411	165	6.78	0.0503
1994-95	15615	437	180	7.866	0.0504
1995-96	17170	418	200	8.36	0.0486
1996-97	18465	439	210	9.219	0.0499
1997-98	20211	407	230	9.361	0.0463
1998-99	22710	493	230	11.339	0.0499
1999-00	26273	467	245	11.4415	0.0435
2000-01	28262	432	260	11.232	0.0397
2001-02	29418	434	260	11.284	0.0383
2002-03	33516	489	280	13.69	0.0408
2003-04	35700	544	300	16.32	0.0457
2004-05**	38624	527	320	16.864	0.0436

Sources: (i) Directorate of Sericulture, Government of Assam, Guwahati, Assam.

(ii) Government of India, *Economic Survey*, Various Issues.

Notes: (i) * Price of cocoons is the average price collected from the rearers of sampling area of Barpeta District and field officers of Sericulture Department, Government of Assam.

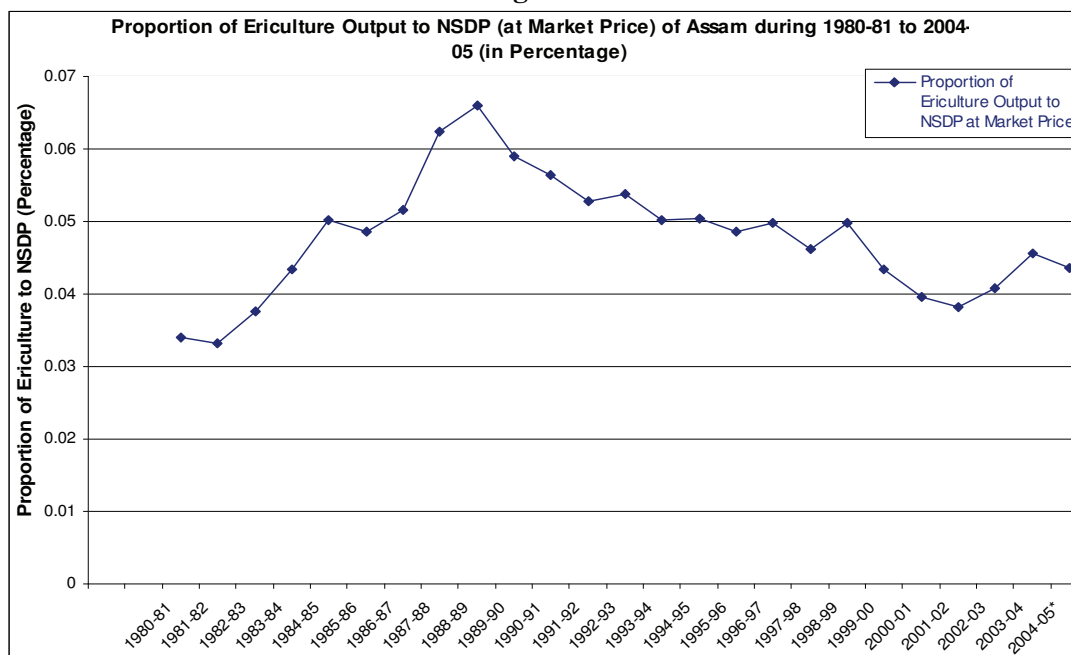
(ii) ** Figure of NSDP of Assam during 2004-05 is provisional.

From table-4.3, it is observed that NSDP at market price of Assam has increased in absolute term from Rs.2356 crores in 1980-81 to Rs.38624 crores in 2004-05. During this period NSDP has increased continuously except a slight decline in 1984-85, which is primarily due to the political disturbances that were at the pick at that time¹¹. Production of eri cocoon, its market price and therefore the total market value of eri cocoon have increased with some ups and downs during these 25 years. Total output of eri cocoon has increased from 100 M.T. in 1980-81 to 527 M.T. in 2004-05, i.e. increased to five times of its 1980-81 figure. Similarly, total value of output also increased from merely Rs.0.8 crores in 1980-81 to around Rs.17 crores in 2004-05. However, in terms of percentage the contribution of eri cocoon to NSDP of Assam is not very significant. The percentage contribution to NSDP had increased initially from 0.034 to 0.066 during 1980-81 to 1988-89 with little variations (as shown in diagram 4.2) because of continuous increase in production of eri cocoons along with increase in market price of it. But in subsequent years, in spite of increase in production and its price, its contribution to NSDP has declined excepting some years of marginal increase. This was because of the higher rate of growth of other sectors specially, tertiary sector in the state.

The regression result represented by equation-4.3 shows that the annual average exponential rate of growth of NSDP of Assam at market price during 1980-81 to 2004-05 was 11.7 per cent, while it was 5.9 per cent in case of production of eri cut cocoon (equation-4.4). The price of eri cocoons and total market value of eri cocoons increased by annual average exponential rate of 5.7 per cent and 11.72 per cent respectively (equations-4.5 and 4.6).

¹¹ The political disturbance was marked by the student movement of Assam where agitation, bandh, lockout, violence were common phenomenon during 1979 to 1985 that retarded economic growth of the state. But, when the student leaders came to power in the form of regional political party *Asom Gana Parisad* in the year 1985 the economy started to recover.

Diagram-4.2



Note: * indicates that the figure is provisional.

$$\ln Y_t^{\text{NSDP}} = 7.78 + 0.117t^* \dots \dots \dots R^2 = 0.992 \dots \dots \dots (4.3)$$

(0.002)

$$\ln Y_t^{\text{Eri Cocoon Production}} = 4.98 + 0.05995 t^* \dots \dots \dots R^2 = 0.837 \dots \dots \dots (4.4)$$

(0.0055)

$$\ln Y_t^{\text{Price of Eri Cocoon}} = 4.348 + 0.0573t^* \dots \dots \dots R^2 = 0.992 \dots \dots \dots (4.5)$$

(0.001)

$$\ln Y_t^{\text{Value of Eri Cocoon}} = 0.118 + 0.1172 t^* \dots \dots \dots R^2 = 0.944 \dots \dots \dots (4.6)$$

(0.0059)

Notes: Y_t^{NSDP} , $Y_t^{\text{Eri Cocoon Production}}$, $Y_t^{\text{Price of Eri Cocoon}}$ and $Y_t^{\text{Value of Eri Cocoon}}$ represent NSDP of Assam at market price, production of eri cocoon, price of eri cocoon and value of eri cocoon at time t respectively.

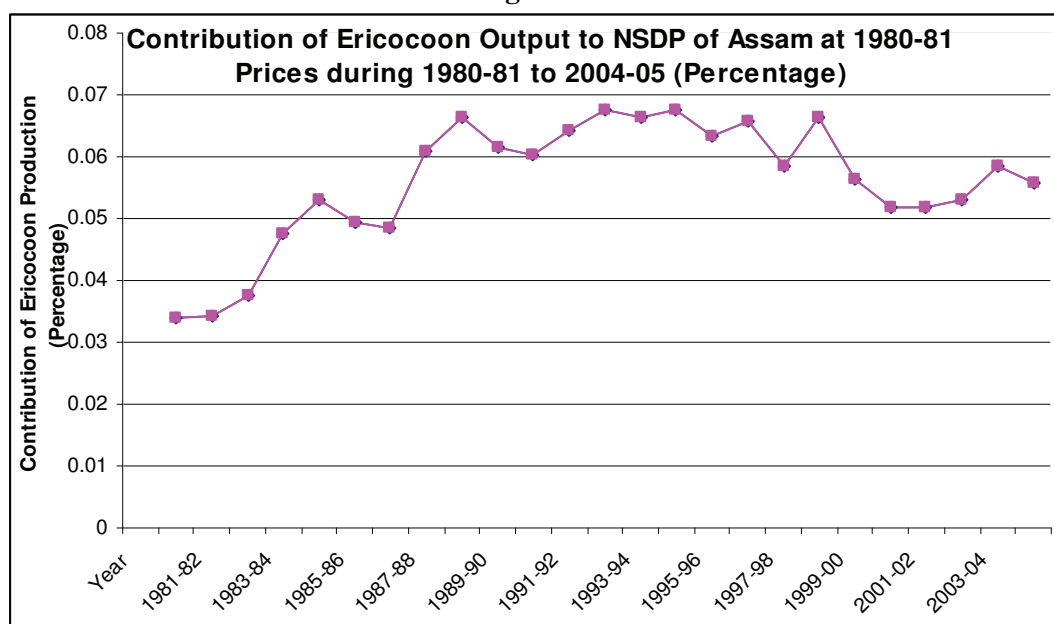
Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two-tailed test.

The terms in the brackets represent standard error of the corresponding coefficient.

However, if we look at the figures at constant (1980-81) prices the contribution has (as shown by diagram-4.3) increased from about 0.034 per cent in 1980-81 to around 0.056 per cent in 2004-05, but it has not increased significantly over time, which is clear from the estimated regression equation-4.7. Here $\ln Y_{t-1}$ is introduced as an explanatory variable because the random disturbance follows a first order autoregressive scheme. It represents that every year production is significantly affected by the previous years output;

i.e. more production in one year generates positive externality for the next year. It increased during 1980-81 to 1988-89 significantly at 8.8 per cent annual exponential rate but declined at 2.5 per cent annual exponential rate during sub-period 1988-89 to 2004-05 (equations-4.8 and 4.9).

Diagram-4.3



$$\ln Y_t = -0.794^* - 0.0023 t + 0.076 \ln Y_{t-1} \dots \dots R^2 = 0.694; Rbar^2 = 0.664 \dots (4.7)$$

(0.347) (0.003) (0.113) Dw = 2.24

$$\ln Y_t = -3.52^* + 0.088 t^* \dots \dots R^2 = 0.954; Rbar^2 = 0.948 \text{ and } Dw = 2.14 \dots (4.8)$$

(0.04) (0.007) for the period 1980-81 to 1988-89

$$\ln Y_t = -2.59 - 0.0255 t^* \dots \dots R^2 = 0.792; Rbar^2 = 0.778 \text{ and } Dw = 1.06 \dots (4.9)$$

(0.06) (0.0034) for the sub-period 1988-89 to 2004-05

Notes: Y_t represents percentage contribution of eri cocoon to NSDP at 1980-81 prices at time t .

Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two tailed test.

The terms in the brackets represent standard error of corresponding coefficient.

4.3.4 Employment of Families per Hectare of Eri Feed Plantation and per Unit of Production of Eri cut Cocoon in Assam

After analysing the contribution of ericulture to total workforce, NSDP and to total sericulture in Assam here, an attempt is made to examine the number of families engaged

in ericulture per hectare of land under eri feed plant and per kilogram production of eri cut cocoon and its changes over time in Assam. This is done to know the impact of changes in area under eri feed plant or production of cocoon on the direct employment¹². From table-4.4, it is observed that the total land under eri feed plants in Assam went up from 2005.37 hectares in 1990-91 to 7279 hectares in 2004-05. It was primarily due to the setting up of some Eri Concentration Centres¹³ (ECCs) and Eri Seed Grainages¹⁴ (ESGs) and the expansion of existing ECCs and ESGs by Directorate of Sericulture, Government of Assam where eri feed plants have been grown and nourished by the Government employees to supply leaves and disease free seeds to the rearers respectively. Number of families engaged in ericulture has increased in absolute sense from 118410 in 1990-91 to 135216 in 2004-05. With the increase in land under feed plants and number of rearing families, production of total eri cocoons also increased from 335 M.T. in 1990-91 to 527 M.T. in 2004-05¹⁵. But the employment of families per hectare has declined continuously from 0.059 in 1990-91 to 0.0185 in 2004-05. It indicates that the rearers are getting more and more land for plantation and collection of leaves. At the same time, number of families engaged for the production of one kilogram eri cut cocoon also declined from 0.353 in 1990-91 to 0.256 in 2004-05. It indicates that the average area per family has increased and hence they get wider scope of collecting leaves and they also have some more leisure time that is used for this purpose leading to rise in per family output, i.e. per family output of cocoon increased. This is also presented in diagram-4.4. However, we

¹²Also it generates indirect employment as the cocoon is processed and used for spinning and weaving cloths in the industries, marketing etc.

¹³Eri Concentration Centres are set up to grow eri feed plants in order to supply leaves regularly to the rearers. At present, there are 94 ECCs in Assam covering 733.49 hectares of land (Directorate of Sericulture, Government of Assam).

¹⁴Eri Seed Grainages have been established to produce and supply disease free seeds of eri silkworm to the rearers. At present, 26 ECGs are operating in Assam covering 196.59 hectares of land (Directorate of Sericulture, Government of Assam).

¹⁵Though data on production of eri cocoon is available since 1980-81, data on area under feed plants and number of families engaged in such activities are available from 1990-91 only. Hence the period of 1990-91 to 2004-05 is considered for the present analysis.

observe that with the increase in average area per family, output of eri cocoon per unit of land has declined significantly (though output per family has increased) as represented by the estimated equations-4.10 and 4.12 and diagram-4.5. This may be due to the fact that most of the ericulturists are poor and work on the basis of their family labour. They adopt it as a secondary occupation to utilise their unutilised working hour and activity obviously increase with the rise in area under plantation but they cannot rigorously use the increased land (a part of which is under natural growth process) with their residual time and they also do not want to hire labour as it is not a high remunerative activity. They earn only nominal profit and use it for their subsistence. Also equation-4.11 (shown in diagram-4.6) indicates that if number of families engaged in a unit of area increase output will also increase but at a declining rate that supports the law of diminishing returns.

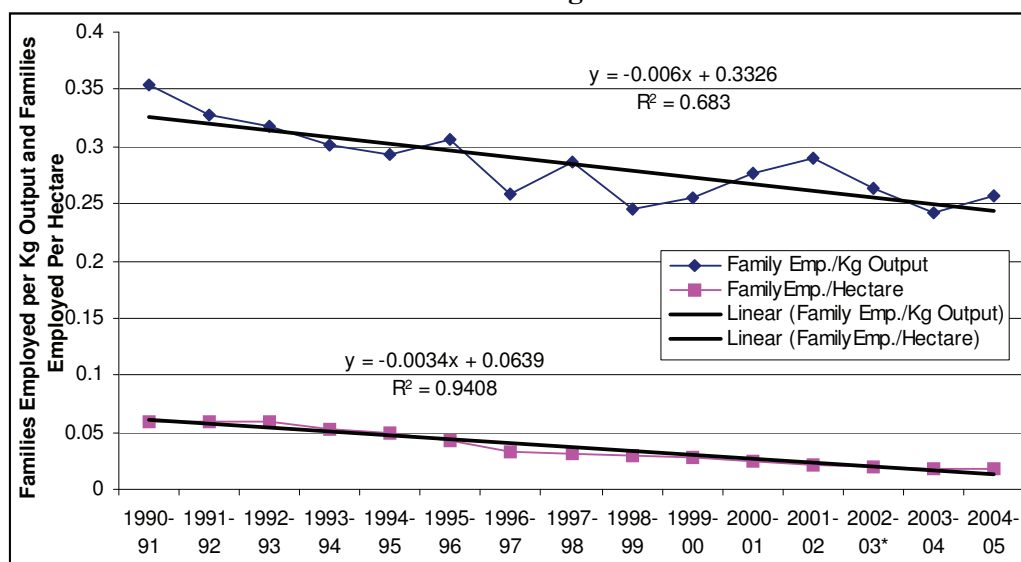
Table- 4.4
Employment of Families per Hectare of Eri Feed Plantation as well as per Kilogram of Eri cut Cocoons in Assam during 1990-91 to 2004-05

Year	Eri Cocoons (M.T.)	Plantation (Hectare)	Families Employed (Number)	Family Employed (Per Kg)	Family Employed (Per Hectare)
1990-91	335	2005.37	118410	0.353463	0.059046
1991-92	375	2048.83	122672	0.327125	0.059874
1992-93	389	2103.64	123327	0.317036	0.058626
1993-94	411	2325.06	124024	0.301762	0.053342
1994-95	437	2574.45	128021	0.292954	0.049728
1995-96	418	2993.07	128186	0.306665	0.042828
1996-97	439	3489.02	113492	0.258524	0.032528
1997-98	407	3792.55	116580	0.286437	0.030739
1998-99	493	4042.63	121003	0.245442	0.029932
1999-00	467	4312.61	119534	0.255961	0.027717
2000-01	432	4978.31	119320	0.276204	0.023968
2001-02	434	5694.38	125420	0.288986	0.022025
2002-03*	489	6371.19	128727	0.263245	0.020205
2003-04	544	7048.00	132033	0.242708	0.018733
2004-05	527	7279.00	135216	0.25674	0.01854

Sources: Directorate of Sericulture, Government of Assam, Guwahati, Assam.

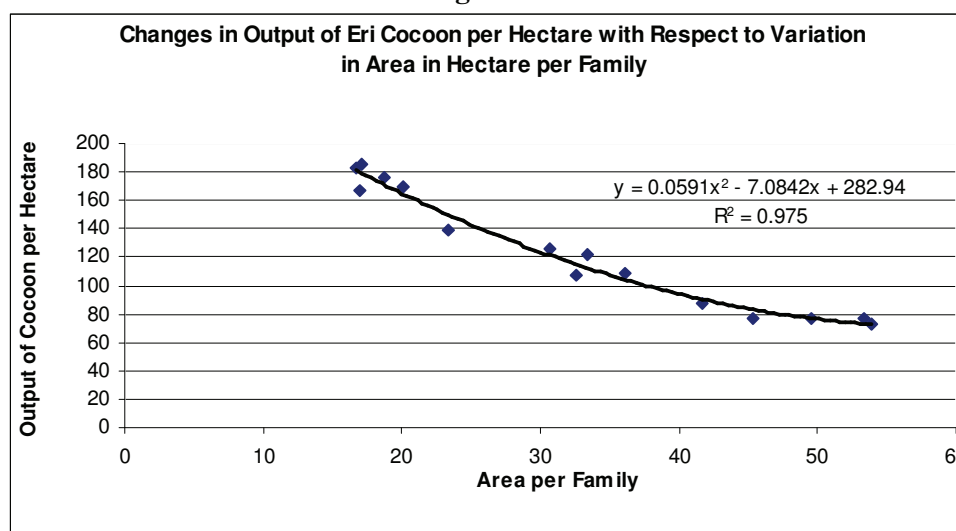
Note: *Interpolated data is considered, as it was not available from the secondary sources.

Diagram-4.4
Employment of Families per Hectare of Eri Plantation as well as per Kilogram of Eri cut Cocoons in Assam during 1990-91 to 2004-05.



Note: * indicates the figure is provisional

Diagram-4.5



$$Y_t = 226.53 - 3154 A_t^* \dots\dots\dots R^2 = 0.94; Rbar^2 = 0.935\dots(4.10)$$

(7.6681) (229.78)

$$Y_t = -16.33 + 5321.3 X_t^* - 33915.2 X_t^{2*}, R^2 = 0.974, Rbar^2 = 0.969 \dots\dots\dots(4.11)$$

(17.69) (1026.05) (12911.5)

$$Y_t = 284.94^* - 7.084 M_t^* + 0.059 M_t^{2*}, R^2 = 0.975, Rbar^2 = 0.971 \dots\dots\dots(4.12)$$

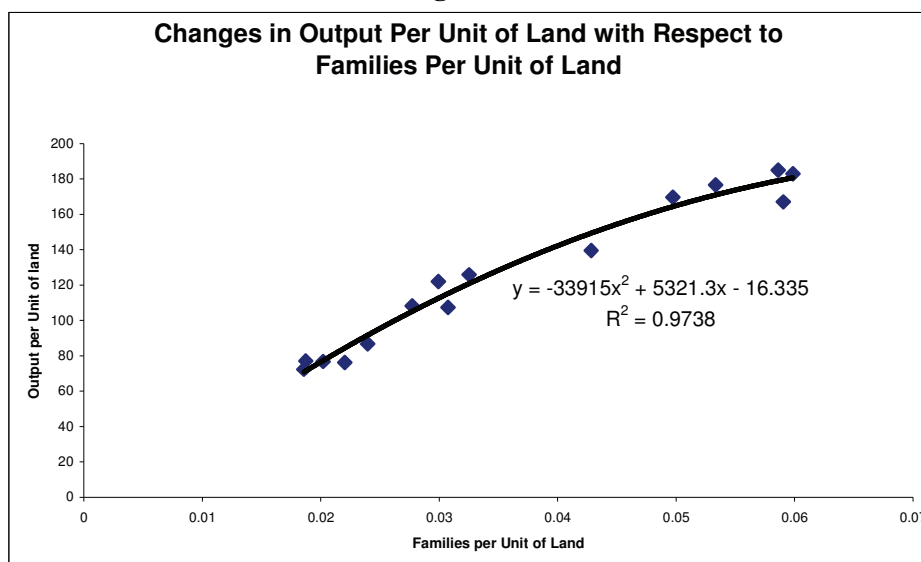
(14.88) (0.97) (0.014)

Notes: Y_t , A_t , X_t and M_t represent output of cocoon per hectare of land under eri feed plantation, average area of land under a family, number of families per hectare of land and area per unit of family respectively.

Here, * indicates that the coefficient is significant at both 1 and 5 per cent level of significance by two tailed test.

The terms in the brackets represent standard error of corresponding coefficient.

Diagram-4.6



4.3.5 Changes in Employment of Families in Sericulture in Barpeta District

The position of unemployment in Barpeta district is not different from that of the entire state of Assam. The district of Barpeta is one where unemployment rate is very high. The number of unemployed persons as per registration in the district Employment Exchange was 80327 in 2004¹⁶. Out of 1.64 lakh population of the district (2001 Census Report), 31.40 per cent was in the working class, which was less than that of the state average (35.78)¹⁷. It was due to the slow pace of agricultural development and almost zero industrialisation on the one hand and on the other hand high growth rate of population that was 18.53 per cent during 1991 to 2001(2001 Census Report). Moreover, there is almost no employment in the state government sector in recent years. Therefore, people have to find out the scope of self-employment on the basis of their knowledge, skill and experience. Sericulture has provided employment to a large number of families belonging to all General Category, Scheduled Caste and Scheduled Tribes in Barpeta district. Here, especially the poor villagers have been practicing such activities from the traditional

¹⁶Directorate of Economics and Statistics, Government of Assam (2005), *Statistical Handbook*, Table-19.05, P-168

¹⁷Directorate of Economics and Statistics, Government of Assam (2005), *Statistical Handbook*, Table-1.10, P-28.

period, as it requires very simple tools and limited investment. Knowledge on such activities is inherited through generations. Changes in engagement of families in sericulture in the district during 1995-96 to 2005-06 are shown in table-4.5.

Table-4.5
Employment of Number of Families in Sericulture in Barpeta District

Silk variety	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Eri	886	1798	1735	1400	2376	2433	3421	3421	3421	3421	3421
Muga	52	09	00	200	05	85	74	115	115	115	116
Mulberry	134	253	162	378	257	279	294	323	323	323	324
Total	1072	2060	1897	1978	2638	2797	3789	3859	3859	3859	3861

Source: Directorate of Sericulture, Government of Assam, Guwahati, Assam.

Note: Tasar is not considered here, as it is not practised in Barpeta district. However, it is grown on a minor scale in some districts of Assam.

From table-4.5, it is noticed that the number of families engaged in sericulture in Barpeta district has increased by more than three times from 1072 in 1995-96 to 3861 in 2005-06. As alternative employment opportunities were not sufficient to cope up with increasing population in the district of Barpeta, increasing number of people has been engaged in sericulture for their livelihood. Among all the sericulture activities, ericulture occupies the prominent place in terms of generation of employment in the district¹⁸. During 1995-96 to 2005-06, number of families practising ericulture increased by more than four times (i.e. from 886 in 1995-96 to 3421 in 2005-06) which was more than that of sericulture total. During this period, although number of families engaged in mugaculture increased by more than three times, still now only 116 families are engaged in mugaculture in the district. The main reason for its deplorable condition was the scarcity of muga host plants. The number of families practicing mulberry culture also increased from 134 in 1995-96 to 324 in 2005-06, which is also very less compared to that of ericulture. Though Directorate of Sericulture, Government of Assam set up a Sericulture Farm at Howly (within the district) to supply muga and mulberry seeds and to motivate

¹⁸Though ericulture is one of the important activities of the rural people of Barpeta district, Karbi Anglong occupies the 1st position in terms of generation of employment and output of ericulture in the state. But Barpeta is comparatively a smaller district in size and concentration of ericulture is much higher.

people towards these cultures, it failed to fulfil its prime objective. With the rising pressure of increasing population more and more land was used for cultivation of food crops and for construction of dwelling houses, and hence the availability of muga host plants has not increased significantly. Also it is a costly and risky affair. Apart from that, as the rearers have to stay round the clock in *Somanies*, it is highly tedious for them. Most of them cannot hire labour also for their unhealthy economic condition. Therefore, they prefer to culture eri to muga, which is quite easy to carry on. Though the position of mulberry in the generation of employment opportunities has been relatively better than muga it has not been satisfactory in the district.

Diagram -4.7

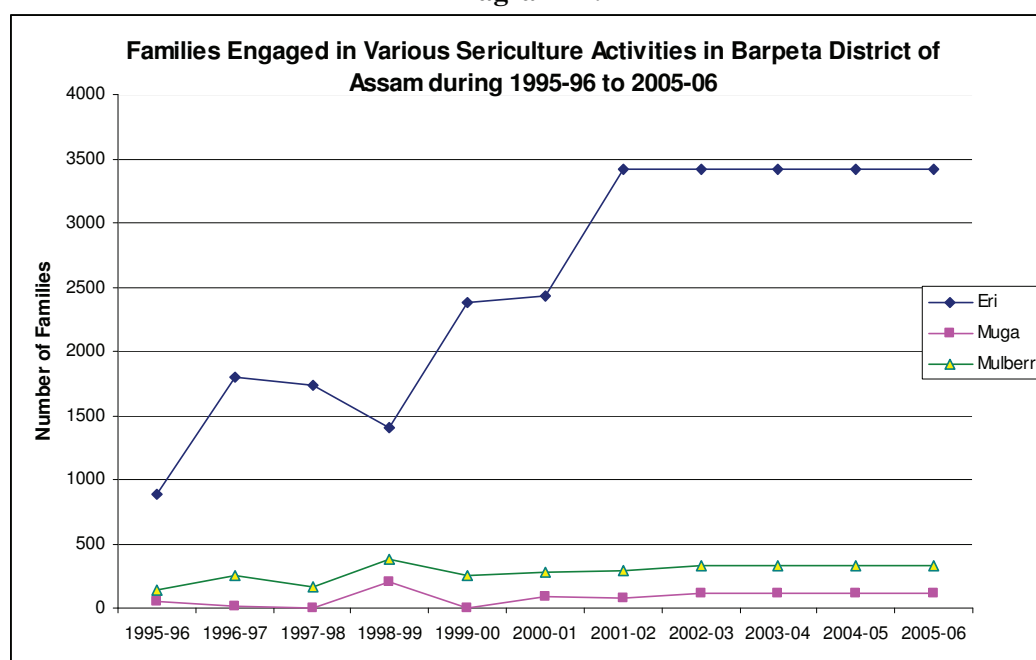


Diagram-4.7 also depicts the relative growth in number of families engaged in eri, muga and mulberry over time in the district of Barpeta. Number of families engaged in ericulture has recorded a significant rise from 1995-96 to 2001-02 and remain stagnant thereafter. Also a short-term decline is observed from 1997-98 to the following year. However, a positive growth in number of families is observed in case of muga and mulberry during that particular year though there is no significant growth of families

engaged in muga and mulberry activities throughout the whole period. The rise in number of families in muga and mulberry during 1997-98 to 1998-99 was because of the government incentives in the form of aid under Catalytic Development Project (CDP) in terms of cash and kind as well as training given to the growers for the promotion of muga and mulberry and that caused a drastic shift of eri rearers to muga and mulberry culture. In the following years when grants and aids were withdrawn, most of the rearers returned to ericulture again.

4.3.6 Labourer Engaged for the Production of Eri Cocoons in the Sample Households

The secondary data collected from different sources is not sufficient to have an idea of the employment and income generated in ericulture in the district of Barpeta. Secondary data only informs us about the number of families engaged in ericulture. But the size of families of rearers, number of family members engaged in such activities and the extent of activities by a family varies across the families. Therefore exact number of people engaged in ericulture cannot be approximated correctly. Moreover, as it is a part-time occupation it is very difficult to estimate the generation of man-hours or man-days per unit of output exactly from the secondary data. Therefore, primary data has been collected from 180 families on the basis of multistage random sampling method from nine villages within three CD blocks of Barpeta district as mentioned earlier, where ericulture is widely practised.

From the primary data, correlation between the annual number of broods reared and the annual family income of the 180 sample households during 2005-06 is observed to be -0.492 . Similarly, the correlation between the revenue generated annually from ericulture proper and the annual family income is calculated at -0.283 and both are significant at 5 per cent level of significance. It indicates that relatively poorer are more interested in practising ericulture than the relatively well off families in the study area. The

aggregate figures of broods reared annually by the sample families and average annual family income across the villages are also presented in table-4.6, which also shows that the richer village practice the same relatively less than the poorer villages.

Table-4.6
Number of Broods per Family in the Sample Households during 2005-06

Block	Village	Household (Number)	Total Number of Broods	Broods per Family	Total Income per family (Rs)
Sarukhetri	Gohia	23	51	2.22	51869.56
	Agdia	10	32	3.2	47700.00
	Garartari	17	37	2.17	51294.11
	Sub-total	50	120	2.4	50840.00
Gobardhana	Bashbari	18	36	2.00	50555.55
	Nimua	32	86	2.68	48500.00
	Khusrabari	10	25	2.5	50800.00
	Sub-total	60	147	2.45	49500.00
Jalah	Salbari	14	34	2.43	160500.00
	Hahchara	21	53	2.53	53000.00
	Bhuyapara	35	83	2.37	56200.00
	Sub-total	70	170	2.43	76100.00
Grand Total		180	437	2.43	60216.66

Source: Compiled from field survey

As eri silkworm rearing is a part time occupation of the family members in most cases and the members are not fully engaged throughout the day, the number of people engaged cannot be equated with the number of man-days generated in this occupation. It is observed from the sample families that the main host plant castor (Era in Assamese) used by the eri silkworm rearers are grown naturally in most cases in their kitchen garden or in the boundaries of homestead areas or in the wasteland. Thus, hardly any labour is required for growing and nourishment of eri host plant. Here generation of employment is estimated through the number of man-hours (working hours utilised every day) required from the collection of leaves to the production of eri cocoons.

Normally everyday three hours are required for the maintenance i.e., collection of leaves, supply of food leaves to the worms and clearing of the rearing trays (removing the odour and unconsumed leaves) for a brood of 2000 seeds (laying). Usually 20 days of gestation period are there for the harvesting of one brood of cocoon during the summer.

However, the gestation period extended to maximum 28 days (four weeks) during winter season. Therefore, the total man-hours required to harvest one brood of cocoon is 60 man-hours (= 3 x 20), i.e., equivalent to 8.5 working days during summer¹⁹. Whereas during winter season, number of man-days required for harvesting a brood of cocoon is about 10.5 man-days. The number of broods of the sample families practicing ericulture varies from one to four in a year. However, maximum six broods can be harvested in a year if there is no constraint on the supply of food leaves. An average sample family harvest 2.44 broods of cocoon in a year and hence 23.18 equivalent man-days are generated in a year²⁰. Number of broods is less in the sample villages than the optimum possible production because of the shortage of food leaves, as the rearers do not scientifically cultivate eri host plants. The aggregate production of cocoon, number of people engaged, man-days generated in the production of cocoon in the sample households is presented in table-4.7.

Table-4.7
Village wise Employment Generated in the Sample Households during 2005-06

Block	Village	Number of Household	Production of Cocoon (Kg)	Number of People Engaged	Number of people Engaged per Kg of cocoon	Total Man-days Generated	Equivalent Man-days per Kg
Sarukhetri	Gohia	23	148	75	0.50	504.5	3.40
	Agdia	10	79	43	0.54	328	4.15
	Garartari	17	120.6	51	0.42	377	3.12
	Sub-total	50	347.6	169	0.48	1209.5	3.47
Gobardhana	Bashbari	18	106.73	57	0.54	362	3.39
	Nimua	32	249.55	129	0.52	867	3.47
	Khusrabari	10	76.45	40	0.53	249.5	3.26
	Sub-total	60	432.73	226	0.53	1478.5	3.41
Jalah	Salbari	14	93.5	64	0.68	399	4.26
	Hahchara	21	150.5	97	0.64	533.5	3.54
	Bhuyapara	35	243.3	141	0.57	830.5	3.41
	Sub-total	70	487.3	302	0.62	1763	3.61
Grand Total		180	1267.63	697	0.55	4451	3.51

Source: Compiled from Field Survey

Note: One man-day is equivalent to eight hours.

¹⁹Here eight hours is considered to be equal to one man-day.

²⁰Here one point to be noted is that the size of the brood and thus its production capacity also varies across the sample families but hardly it affects the engagement of family labourer for the cleaning and supplying of leaves to the worms and maintenance of the brood.

From table-4.7, it is observed that 697 people of all 180 families were engaged for 4451 equivalent man-days and produced 1267.63 kilogram of eri cut cocoons during the previous year of survey. To produce one kilogram of eri cut cocoons, 0.55 number of labourer was engaged. Number of labourer engaged per kilogram of eri cut cocoon was the highest in Jalah CD block and within this block, engagement of number of labourer was the highest in Salbari village. It does not necessarily mean that each individual of this village is engaged for fewer hours in the ericulture activities. Actually, many of them are engaged in rearing muga cocoon along with ericulture (joint product farms). Culturing muga along with eri they can easily catch the buyer and sell eri cocoons together with muga cocoons to enhance their family earnings. Number of people engaged in the production of eri cocoon is the lowest in Garartari village within Sarukhetry block. Most of the people of that village are primarily engaged in agriculture and pisciculture, which is more remunerative in comparison to ericulture. Therefore, fewer labourers are engaged in ericulture. In terms of man-days, it is noticed that 3.51 equivalent man-days were generated from the production of one kilogram of eri cut cocoons. Man-days equivalent generated per unit of cocoon output varies from 3.12 in Garartari of Sarukhetry block to 4.26 in Salbari village within Jalah block. Actually in Salbari village alternative occupation are relatively less and people also engage in ericulture extensively during winter and hence labour engagement per unit of output is more due to long gestation period. Yet the rearers prefer to practice ericulture in winter to summer seasons because of the availability of castor leaves (eri food plant), which is much more during winter than summer and hence collection of it is easier in winter season.

4.3.7 Contribution of Ericulture to the Family Income of Sample Households²¹

The rural people especially the poorer mostly practise ericulture by traditional method. It requires very small amount of investment. But it can contribute a good amount to the family income and help in improving their standard of living. Contribution of ericulture to the family income of the sample households is depicted in table-4.8.

Table-4.8
Contribution of Ericulture to the Income of Sample Households during 2005-06

Block	Village	House-hold (Number)	Total Income of the Sample Families (Rs)	Income from Ericulture Proper (Rs)	Percentage Contribution of Ericulture Proper to Total Family Income	Total Income per family (Rs)
Sarukhetri	Gohia	23	1193000	49090	4.11	51869.56
	Agdia	10	477000	19690	4.12	47700.00
	Garartari	17	872000	36446.75	4.17	51294.11
	Sub-total	50	2542000	105226.75	4.13	50840.00
Gobardhana	Bashbari	18	910000	29812.45	3.27	50555.55
	Nimua	32	1552000	77245.5	4.97	48500.00
	Khusrabari	10	508000	20537.5	4.04	50800.00
	Sub-total	60	2970000	127594.95	4.29	49500.00
Jalah	Salbari	14	2247000	25695	1.15	160500.00
	Hahchara	21	1113000	41282.5	3.70	53000.00
	Bhuyapara	35	1967000	68266	3.47	56200.00
	Sub-total	70	5327000	135243.5	2.53	76100.00
Grand Total		180	10839000	368064.45	3.39	60216.66

Source: Compiled from Field Survey

From table-4.8, it is noticed that the average contribution of ericulture to the family income of the 180 sample households was only 3.39 per cent. Its share to family income was slightly higher (4.29 per cent) in Gobardhana CD block. It is because of the fact that Eri Concentration Centres of Bajegaon Pathar and Nimua grow and supply eri feed leaves to the rearers at free of cost that raises the scope of earning of those villagers of the block from ericulture activities. The villagers of Nimua also recorded the highest percentage of average family income generated from ericulture, which is about 5 per cent. Also, there is a weekly market (organised market) where the rearers can sell their bye product, pupae

²¹ Imputed cost of labour is included in the income from ericulture proper as the activities are carried out by the family members of the rearing families.

and raise their income. Share of ericulture to the family income is observed to be the lowest (2.53 per cent) in Jalah CD block. Within this block, it is the lowest (i.e. 1.15 per cent) in Salbari village, which is also the lowest among all the nine villages. Many of the sericulture families in this village practice mugaculture and as major portion of income of these sericulturists originated from mugaculture, share of eri to the family income was negligible here. Though in terms of percentage, ericulture proper (cocoon output) constitute very less in absolute amount it is not altogether negligible as it provides employment to the people especially the rural tribal and non-tribal women who have no scope of alternative more remunerative activity. Moreover, the weaving part of ericulture (not described yet) also contributes to employment and income of the weaving families (some of the ericulture families are also the weaver). Also it is noticed that Salbari village within Jalah block generated the highest amount of family income (Rs.1.60 lakh) and on the other hand Agdia village within Sarukhetry block generated the lowest income (Rs.47700). It indicates that the share of ericulture to family income is less in the richer areas than the poorer areas i.e., the riches put relatively less stress on ericulture as they have alternative opportunities, which is also clear from the regression equation-4.13.

$$\text{LnY}_i = 13.154 - 1.086 \text{ LnX}_i^* ; \dots\dots\dots R^2 = 0.946 \dots\dots\dots (4.13)$$

(0.098)

(Figure in the bracket is standard error of the coefficient of elasticity and t-value= -11.08), Here, Y_i represents average percentage contribution of ericulture to family income of i^{th} village and X_i represents average family income of i^{th} village. Altogether these nine villages generated about Rs.368 thousands from ericulture during that particular year and hence one can imagine what would be the total annual income generated by all the 140 ericulture villages of the district from such activities.

4.3.8 Components of Income Generated from Ericulture by the Sample Households

Income earned by the rearers in ericulture proper consists of two important parts, viz, income from eri cut cocoons and income from pupae. Eri cut cocoons are the prime products while eri pupae are the subsidiary product of ericulture proper. Contribution of these two components of the total income from ericulture of sample households is presented in table-4.9.

Table-4.9
Income Generation through Ericulture in the Sample Households during 2005-06

1	2	3	4	5	6	7	8
Block	Village	Household (Number)	Sales Proceed of Eri Cocoons (Rs)*	Sales Proceed of Pupae (Rs)*	Total Revenue (Rs) (4+5)	Percentage of (4) to (6)	Percentage of (5) to (6)
Sarukhetri	Gohia	23	37730	11360	49090	76.85	23.15
	Agdia	10	13845	5845	19690	70.32	29.68
	Garartari	17	27286.75	9160	36446.75	74.87	25.13
	Sub-total	50	78861.75	26365	105226.75	74.95	25.05
Gobardhana	Bashbari	18	22002.45	7810	29812.45	73.81	26.19
	Nimua	32	50025.5	27220	77245.5	64.77	35.23
	Khusrabari	10	14722.5	5815	20537.5	71.69	28.31
	Sub-total	60	86750.45	40845	127594.95	67.98	32.02
Jalah	Salbari	14	18795	6900	25695	73.15	26.85
	Hahchara	21	30102.5	11180	41282.5	72.92	27.08
	Bhuyapara	35	50756	17510	68266	74.35	25.65
	Sub-total	70	99653.5	35590	135243.5	73.69	26.31
Grand Total		180	265265.7	102800	368064.45	72.08	27.92

Source: Compiled from Field Survey

Note: * sales proceeds are calculated at current price.

Table-4.9 shows that major portion of income originated from ericulture of the sample families (around 72 per cent) was earned from cut cocoons. Of course, the rearers earned a handsome income (around 28 per cent of their ericultural income) from subsidiary product, pupae. Income from pupae was the highest (32.02 per cent) in Gobardhana CD block. Within the CD block, it was the highest in Nimua (35.23 per cent). It was because of organised market for pupae in that locality that helps the rearers to get proper price of it. On the other hand, percentage contribution of pupae to family income was the lowest in Gohia village, which was 23.15 per cent. It also indicates that maximum income from eri cut cocoons (76.85 per cent) was earned by the rearers of Gahia. The

rearers of this village practiced ericulture mainly for cocoon and weaving of endi shawl, as the demand for pupae in that village is very less²².

4.3.9 Generation of Employment and income in Eri Silk Industry

Endi textile industry is well organised in comparison to the ericulture proper. Though there are organised industries in other parts of India (Bhagalpur Spun Mill in Bihar) it is still in the form of a cottage industry in Assam. Very few medium scale industries are there at Kokrajhar, Salakhati, Rangia, Mukalmua, Boko and other parts of Assam and most of those are run by co-operatives and Non-Government Organisations (NGOs). But there is no such industry in the entire Barpeta district. The major part of the cocoon produced in the district is exported to the other region of the country through the middleman traders. About half of the rearer families in the district are engaged in weaving at very small scale like cottage industry. However, the endi products form an integral part of the socio-economic and cultural life of the rural Assamese people. Hand-spun eri yarn was only valued for man's wraps and women's scarves either for home consumption or for gift (Gogai and Goswami, 1998). But now the trend has changed. Some of them are trying to meet the needs of modern generation youths producing variety of products. The product ranges from ladies garments Mekhela Chaddar²³, Dokhanas²⁴, skirts, midis, maxis; children and gents garments jackets, kurtas; fashion accessories like ties, scarves, stoles, kerchiefs etc and bags, wallets, file folders, portfolios etc. Though a large number of people are engaged in the spinning, reeling and weaving of eri, muga and mulberry fabrics, the information on employment and income generated in such activities especially of endi-textile is not available from secondary sources. Therefore, an attempt is made to

²² Gahia village is surrounded by Muslims; who do not consume pupae.

²³ Mekhela Chadder is an Assamese traditional dress, which is divided in to two parts, Mekhela (like petticoat used to cover the lower portion of the body) and Chadder (like sari but shorter which is used to cover the upper portion of the body).

²⁴ A wrapper used to cover the lower portion of the body especially by Bodo women.

assess the employment and income generated in the spinning and weaving of eri cocoon in Barpeta district on the basis of primary data. The entire eri textile industry can be divided into two parts: eri spinning and eri silk weaving.

4.3.9.1 Generation of Employment and Income in Eri Silk spinning in the Sample Households

Eri cocoons are open mouthed. The cocoons cannot be reeled like mulberry and muga, which are compact with continuous filaments. Therefore, eri cocoons are spun like cotton. In eri silk spinning, various types of spinning devices are employed in Assam; some are traditional while some are modern. The traditional spinning devices are Drop Spindle (locally known as *Takli* or *Takura* or *Takuri*) and Spinning Wheel (locally known as *Charkha* or *Zatar*). *Takli* is a simple device and twisting of the thread is done by hand. But, spinning by *Takli* is very slow and tedious. In the *charkha*, the twisting is done by a wheel. Modern spinning devices available in the market are NR Das type²⁵, Choudhury type²⁶, Central Silk Technological Research Institute (CSTRI) pedal operated (old model) spinning machines as well as CSTRI motor cum pedal operated etc. The CSTRI motor cum pedal operated spinning machine is the most efficient one. On an average, one can get 50 grams of yarn in 8 hours by using *Takli* whereas one can obtain 200-250 grams of yarn by using CSTRI motor cum pedal operated machine during the same period of time (Kariyappa, et al, 2003).

²⁵N. R. Das type eri spinning charkha is built on a wooden frame and is operated by pedal. It is fitted with automatic traverse motion. Feeding of fibres can be controlled with ease.

²⁶Choudhury type spinning charkha is pedal driven, durable and can be operated easily. The machine moves on ball bearings or still bushing and can be mended easily.

Table-4.10
Generation of Employment and Income in Eri Silk Spinning in the Sample Households during 2005-06

Block	Village	Eri culture Family (Number)	Spinning Family (Number)	Percentage of Families in spinning	Production of Eri Cocoon (Kg)	Cocoon used in Spinning (Kg)	Percentage of cocoon used in spinning at Home
Sarukhet	Gohia	23	06	26.08	148	27	18.24
	Agdia	10	05	50.00	79	35	44.30
	Garartari	17	06	35.30	120.6	35	29.02
	Sub-Total	50	17	34.00	347.6	97	27.91
Gobardha	Bashbari	18	08	44.44	106.73	37	34.66
	Nimua	32	14	43.75	249.55	92	36.86
	Khusrabari	10	04	40.00	76.45	28	36.62
	Sub-Total	60	26	43.33	432.73	157	36.34
Jalah	Salbari	14	09	64.29	93.5	35	37.43
	Hahchara	21	10	47.62	150.5	57	37.87
	Bhuyapara	35	16	45.72	243.3	74	30.42
	Sub-Total	70	35	50.00	487.3	166	34.06
Grand Total		180	78	43.33	1267.63	420	33.13

Source: Compiled from field survey.

Notes: (i) Here the spinners do not work for the whole day for the spinning of eri cocoon. The excess hours of the day they use for this purpose. The time required per day to produce yarn is considered and by considering 8 hours equivalent as one man-day, generation of man-days per kg output of yarn is estimated.
(ii) Imputed labour cost is included in net revenue from spinning.

Table-4.10 (Continued)

Block	Village	Yarn Production (Kg)	Percentage of Yarn from Cocoon	Total Revenue from Yarn (Rs)	Total Man-days Generated in Spinning	Man-days Generated to Spin One kg of Cocoons	Gross Revenue from Spinning per kg of Cocoon (Rs)	Price of Cocoon (Rs)	Net Revenue from Spinning per kg of Cocoon (Rs)
Sarukhet	Gohia	21.44	79.44	21448	477	17.67	794.44	254.94	539.5
	Agdia	28.35	81.00	28350	645	18.43	810	175.26	634.74
	Garartari	28.00	80.01	28003	554	15.83	800	226.25	573.75
	Sub-Total	77.80	80.21	77803	1675	17.28	802.6	226.95	575.65
Gobardh	Bashbari	29.91	80.86	29918	680	18.38	793.25	206.16	587.09
	Nimua	73.6	80.00	73600	1700	18.48	808.70	200.46	608.24
	Khusrabari	22.4	80.00	22400	510	18.21	800	192.57	607.43
	Sub-Total	126.14	80.35	126149	2890	18.41	803	200.47	602.53
Jalah	Salbari	27.84	79.57	27849	620	17.71	797.57	201.02	596.55
	Hahchara	46.05	80.79	46050	1037	18.19	807.90	200.02	607.88
	Bhuyapara	59.80	80.82	59806	1320	17.84	808.10	208.62	599.48
	Sub-Total	133.81	80.61	133812	2977	17.93	806.02	204.50	601.52
Grand Total		337.72	80.41	337722	7543	17.95	804.16	209.26	594.90

Source: Compiled from field survey.

Notes: (i) Here the spinners do not work for the whole day for the spinning of eri cocoon. The excess hours of the day they use for this purpose. The time required per day to produce yarn is considered and by considering 8 hours equivalent as one man-day, generation of man-days per kg output of yarn is estimated.
(ii) Imputed labour cost is included in net revenue from spinning

From the field survey, out of 180 eri rearing families of nine villages under three C.D. blocks, 78 families (43 per cent) were found who spun eri yarn using traditional *Takli*. They prefer *Takli* because of its cheapness and as it could be prepared easily at home from locally available bamboo. Also it is available in the market at a nominal price of Rs.10 per piece. A wooden *Zatar* or *Charkha* cost around Rs.250 and modern spinning devices cost up to more than thousand rupees. Though these devices are more efficient than *Takli*, the poor spinners cannot afford to buy these. Moreover, they are lack in technical knowledge for using such modern machines. Most of the families do not possess electricity, which is essential to run the motors of the machines. The petty individual spinners and weavers also cannot afford to buy the generators. Furthermore, their scale of operation is so low that the machines will be seriously under-utilised and hence also uneconomic for them. Only, formation of co-operative by a number of spinners and weavers can make it feasible which was not found during the field survey. Most of the spinners even never heard about these machines before. Hence, there is mass use of traditional technology, *Takli*. A *Takli* can be used for more than four years. Therefore, annual depreciation charges are also negligible. Generation of employment and income in spinning of eri cocoon in the sample households are presented in table-4.10.

Table-4.10 shows that the percentage of families engaged in spinning was the highest in Jalah block among all the three blocks, which was 50 per cent. Within the block, Salbari village recorded the highest 64.29 per cent of families engaged in spinning among all the nine villages. Maximum eri rearers of that village are engaged in spinning eri cocoon because of the fact that they can sell their endi product (Shawl) to the buyers of muga cocoon easily and thus can make an addition to their family income. On the other hand, only 34 per cent of the eri rearing families of Sarukhetry

block were engaged in spinning. Within this block, 26.08 per cent of eri rearing families of Gahia village were involved in spinning. It is because most of the rearer families here are very poor and they cannot wait for value addition and go for spinning and weaving fabrics. Therefore, most of the rearers sell eri cocoon to the middlemen traders. It is also clear from estimated equation-4.14 that though many families grow eri-cocoon, percentage of rearing families practice spinning and weaving rises with relatively higher average family income areas.

$$Y_i = 31.13 + 0.0002 X_i^* ; \dots R^2 = 0.512; \dots (4.14) \\ (7.58E^{-05})$$

Here Y_i is the percentage of rearing families of i^{th} village engaged in spinning and weaving and X_i represents average family income of i^{th} village.

It is found that out of 1267.63 kilogram of eri cut cocoons, only 420 kilogram (33.13 per cent) were used for spinning by the sample families. Among the nine villages, Hahchara village within Jalah block recorded the first position in the use of cocoon for spinning purpose. In this village, 37.87 per cent of total production of cocoon is used for spinning and weaving of fabrics. It is because the spinners cum weavers can sell their fabrics in the market or fairs and exhibitions held at different places of Assam through their Self-Help Group and earn handsome revenue from their products. Conversely, in Agdia village within Sarukhetry block, only 18.24 per cent of total production of cocoon is used for spinning. It is because of their deplorable financial conditions as mentioned earlier. In total 337.72 kilogram of eri yarn was spun (produced) from 420 kilogram of eri cut cocoon. On an average, approximately 800 grams of yarn was obtained from one kilogram of eri cut cocoons. In other words, on an average from one kilogram of cocoon 80.41 per cent is obtained as yarn. The percentage of production of yarn from eri cut cocoon was almost same across the

villages. It indicates that wastage is uniform and very less in the spinning of cocoon²⁷. It is noticed that 7543 equivalent man-days were generated in spinning of 420 kilogram of eri cocoon. It appears that from spinning one-kilogram of eri cut cocoon, 17.95 equivalent man-days were generated. Though there would be no much difference in the generation of man-days from the spinning of one kilogram of eri cut cocoon across the villages due to the use of identical traditional technique of spinning by the rearers it was exceptionally low in the village Garartari within Sarukhetry block where it was 15.83 equivalent man-days. It indicates that the spinners of that village were more efficient for which they took less time in spinning. Eri culture is an old practice for the people of Garartari. In Assam, eri yarn is not sold in the market. The spinners use their spun yarn in weaving endi cloths. On an average, one spinner earns gross revenue of Rs.804.16 by spinning one kilogram of eri cut cocoons. Like man-days generation from spinning of one-kilogram cocoon, gross revenue from spinning per kilogram does not vary too much. Among the nine villages, the spinners of Agdia village within Gobardhan block realised maximum gross revenue of Rs.810 per kilogram of cocoon. Conversely, the spinners of Bashbari within the same block earned the lowest income of Rs.793.25 from the spinning of one-kilogram eri cocoon. However, in case of net revenue earned from spinning per kilogram cocoon varies significantly among the villages. The spinners of Agdia received the highest net revenue of Rs.634.74 from spinning per kilogram of cocoon. At the same time, in Gahia village net revenue earned from spinning per kilogram cocoon was the lowest, which was only Rs.539.50. The variation in net revenue amongst the villages was due to differences in price of cocoon

²⁷It is generally noticed from the experience of those who use modern spinning machine that the wastage is more or less same as observed in case of these traditional spinners.

enjoyed by the rearers. On an average, a spinner earned net revenue of Rs.594.90 through spinning of one kilogram of cocoon.²⁸

4.3.9.2 Generation of Employment and Income in Eri Silk Weaving in the Sample Households

Mahatma Gandhi once said, “Every woman of Assam is a born weaver. No Assamese girl who does not weave can expect to become a wife. And she weaves fairy tales in cloths²⁹.” It is mentioned earlier that some of eri rearers directly sell their cocoon to the traders or middleman and some use their own produced cocoon in spinning and weaving. A part of produced cocoon reaches the spinning and weaving mills especially in the other parts of the country. There, the production is carried out with the help of hired labour and in some cases (as observed from other parts of Assam, e.g. Kokrajhar, Mukalmua, Rangia, Boko etc) those are run by the co-operatives and NGOs. Employment and income generation due to ericulture in those areas could not be estimated due to the paucity of information. But the part of cocoon used by the rearers themselves (as happened in most parts of Assam) is spun and weaved by the family members themselves. Hired labourer is also absent and hence information on wage rate is not available. Therefore, the net income generated by those families in spinning and weaving includes their imputed wages and profits together.

In Assam, usually throw shuttle loom is used for weaving of eri fabric by the weavers. Eri weavers of Assam prepare two special types of shawl suitable for male and female in winter respectively. The average size of an endi shawl prepared for male (Gent’s shawl) in Assam is 2.75 metres of length and 1.35 metres of width. The usual size of an endi shawl prepared for female (lady’s shawl) in Assam is 2 metres of

²⁸ Here opportunity cost of labour is included in the estimated net revenue as the producers themselves carryout the spinning activity.

²⁹ Gandhi, M. K. (1921), “*Monohar Assam*”, Young India.

Table-4.11
Generation of Employment and Income in Eri Silk Weaving in the Sample Households during 2005-06

Block	Village	Weaving Family (Number)	Male Shawl Sold (Number)	Female Shawl Sold (Number)	Total Sale Proceeds from Male Shawl (Rs)	Total Sale Proceeds from Female Shawl (Rs)	Total Revenue (Rs)	Total Man-days Generated	Man-days per Shawl	AR per Male Shawl (Rs)	AR per Female Shawl (Rs)
Sarukhetri	Gohia	06	27	14	40412	7500	47912	34	0.829	1496.75	535.72
	Agdia	05	26	31	42800	17600	60400	41.5	0.728	1646.15	567.74
	Garartari	06	14	15	17800	8800	26600	21.5	0.741	1271.43	586.66
	Sub-Total	17	67	60	101012	33900	134912	97	0.764	1507.65	565.00
Gobardhana	Bashbari	08	31	25	41600	14100	55700	43.5	0.777	1341.94	564.00
	Nimua	14	85	52	99000	28550	127550	111	0.810	1164.70	549.04
	Khusrabari	04	26	17	35100	9000	44100	33.5	0.779	1350.00	529.42
	Sub-Total	26	142	94	175700	51650	227350	188	0.797	1237.32	549.47
Jalah	Salbari	09	24	28	24500	17700	42200	38	0.731	1020.83	632.15
	Hahchara	10	58	27	91700	21200	112900	71.5	0.841	1581.04	785.18
	Bhuyapara	16	64	56	83100	34350	117450	92	0.767	1298.44	613.40
	Sub-Total	35	146	111	199300	73250	272550	201.5	0.784	1365.07	659.90
Grand Total		78	355	265	476012	158800	634812	486.5	0.785	1340.88	599.25

Source: Compiled from field survey.

Notes: (1) Sale Proceeds is calculated at market price.

(2) AR stands for average revenue.

length and 1 metre of width. Normally, an expert weaver takes one man-day to prepare one male shawl where as she can weave two ladies shawls during the same period of time³⁰. Generation of employment and income in weaving among the sample households is estimated by using the information on production and man-days required per unit of production and displayed in table-4.11.

From table-4.11, it is noticed that approximately 486.5 man-days were generated from the production of 620 shawls (male and female shawl) by all the 78 weaving families. On an average, 0.785 man-days were generated in the weaving of a shawl. Man-days generated per shawl varied from 0.728 in Agdia village of Sarukhetry block to 0.841 in Hahchara village of Jalah Block. This is primarily because of the differences in composition of male and female shawl produced by an average family of those villages. The weavers prepare relatively more male shawl in comparison to female shawl because of high demand. However, there is no much difference in labour time required to produce each item as all of them use the same technology (traditional throw shuttle loom) in weaving activity and it indicates very insignificant differences in individual efficiency. But, income from per shawl varies across the weavers and villages because of differences in quality of output and opportunities of marketing³¹. Average revenue obtained from one male and female shawl was Rs.1340.88 and Rs.599.25 respectively. The weavers of Agdia received the highest price per male shawl (Rs.1646.15). It was because of better marketing facilities enjoyed by the weavers of that village. They frequently participate in fairs and exhibitions held at different places of Assam at different time. However, at the same time, the weavers of

³⁰ However, in the weaving families multiple persons extend their hands (spare time) in weaving. But all of them do not have equal expertise in weaving. The best persons are engaged in weaving in order to maintain the quality.

³¹ In spite of use of similar technology and efficiency of the weaver, quality of output (finishing or percentage of defection) varies depending upon the quality of yarn, finishing of work and due to some reasons beyond the control of the weavers.

Salbari village sold their male shawls on an average at the lowest price (Rs.1020.85) among all the villagers as they lacked in marketing information and sold their products in their locality only and to the traders who come door to door to purchase muga cocoon from them along with endi shawl.³² Also, this village is located in the far interior and has very poor communications facilities. In case of female shawl, the maximum price per shawl (Rs.785.18) was received by the weavers of Hahchara as they also sell their products in fairs and exhibitions held at different places and at different time through their Self- Help Group. All the ten weaving families of that village together formed Self-help Group. Therefore, those weavers have better financial condition and do not go for distressed sell. The average price per unit of male shawl of that village was also the second highest among all the nine villages. On the other hand, sale proceeds received from one female shawl is the lowest in Khusrabari village of Gobardhana block.

Though total man-days generated is substantial, per family very few man-days are generated in the weaving of eri yarn. So, most of the time of the year, the looms remain unutilised. This is because of the very low scale of operation that prohibits modernisation of the activity. Actually, still now the users of the endi textile are mainly confined to the aged population because of lack of variation and style of output; it has not been able to generate sufficient demand for the young people. In stead of producing at home by individual weavers, if co-operatives can be formed like that of “Roje Eshanshali” of Kokrajhar, modernisation of the activity will be possible and production can be done on larger scale and these individual ericulturists cum weavers families can be members of that co-operative. This will lead to an increase in scope for expansion of output and employment and hence income of the participating families.

³² The food plant for mugaculture is available in that village, which are not plenty in other villages and hence the other villagers are deprived of mugaculture.

4.3.10 Total Employment and Income Generated in the Whole Ericulture Activities

Since ericulture consists of ericulture proper and endi textile industry as mentioned earlier in chapter-1, therefore, generation of employment and income is to be considered in ericulture total. Eri cut cocoons are produced by rearers. Along with income from eri cut cocoons, the rearers earn income from bye- product, pupae. In the second stage of activity cocoons are converted into yarn by spinners and lastly, yarn is used in producing fabrics by weavers. Therefore, employment and income generation at each stage of production are summed up to get total income and employment generated in ericulture total. Employment and income generation in the production of eri cut cocoons and endi textile industry in the sample villages are estimated and presented in the appendix-4.1.

From appendix-4.1, it is observed that from the production of 1267.63 kilogram of eri cocoon, 12480.5 equivalent man-days are generated in ericulture total. This production has generated revenue of Rs.1134053. Gross value addition in ericulture total is of Rs.966930.7. However, net value addition is of Rs.453884.2, which is less than half of gross value addition in ericulture total. In total ericulture, gross value addition and net value addition are found to be the highest in the village Nimua within Gobardhana block. Gross value addition is the lowest in Garartari while net value addition is the lowest in Salbari village.

Generation of equivalent man-days in ericulture proper is 4451. The revenue generated in ericulture proper is Rs.499240.7. Gross value addition and net value addition in ericulture proper is of Rs.479293.7 and Rs.293701.2. Gross and net value addition are found to be the highest in the village Nimua. On the other hand, gross value addition is the lowest in Khusrabari, while net value addition is the lowest in Agdia.

Out of total production of cocoon (1267.63 Kg), only 420 kilograms are used in spinning and weaving by the sample rearers. In spinning and weaving activity, altogether 8029.5 equivalent man-days are generated. Revenue generated in spinning and weaving activity is Rs.634812. Gross value addition in spinning and weaving of endi textile is of Rs.487637. But net value addition is very low of Rs. 160183. Net value addition in spinning and weaving is much lower than ericulture proper. It is because of high proportion of imputed labour cost. Gross value addition in spinning and weaving is the highest in Nimua village and lowest in Garartari. In case of net value addition it is the highest in Hahchara village and lowest in Garartari village. In the village Garartari, net value addition is found to be negative. It is because of higher wage rate.

If the entire cocoons are used in spinning and weaving, a sum of Rs. 1471770 could have been generated by the sample households. Net gain in gross revenue in weaving is of Rs. 984132.7. In terms of percentage, around 101 per cent of actual income could have been generated if the entire cocoons are processed in weaving.

Similarly, more man-days could have been generated with the processing of entire cocoon in weaving. Potentiality of generation of man-days equivalent in weaving is 23561.32. But potentiality of ericulture total in generation of man-days is 28012.32. It indicates that 128.53 per cent of man-days can be generated. Thus, if the cocoon rearers provided basic facilities of weaving, then more employment and income could be generated.

4.4. Role of Ericulture in Eradicating Rural Poverty

One of the important problems that the state of Assam has been facing is the problem of mass poverty. In the year 2004-05, Assam ranks 17th in terms of incidence

of poverty among all the 35 states and union territories of India. Though the Planning Commission Report (2007) shows a drastic fall in incidence of poverty (55.77 lakh i.e., 19.7 per cent) still now a large section of rural population of Assam is living under poverty (22.3 per cent) and there is no doubt that the incidence is more among the females. Ericulture plays an important role in reducing the hardship, improving economic condition and standard of living of those people. The activities require small amount of investment and hence is adopted even by poor rural folk. Planning commission of India stipulated per capita income of Rs.387.64 per month as the benchmark (poverty line) for the rural areas of Assam to estimate incidence of poverty for the year 2004-05. Here, in this analysis after adjusting with the rising price index approximated Rs.433 monthly per capita income is considered to calculate the proportion of families living below and above poverty line in 2006 in the study area.

Table-4.12
Number of Families in Different Monthly per Capita Income Groups with Income from Ericulture

Block	Village	Household (Number)	Less than Rs.250	Rs.251 to Rs.433	Rs.434 to Rs.600	Above Rs.600
Sarukhetri	Gohia	23	1	5	9	8
	Agdia	10	0	6	1	3
	Garartari	17	0	6	5	6
	Sub-total	50	1 (2.00)	17 (34)	15 (30)	17 (34)
Gobardhana	Bashbari	18	0	5	3	10
	Nimua	32	0	12	9	11
	Khusrabari	10	1	5	2	2
	Sub-total	60	1 (1.67)	22 (36.67)	14 (23.33)	23 (38.33)
Jalah	Salbari	14	3	2	3	6
	Hahchara	21	4	8	2	7
	Bhuyapara	35	2	9	12	12
	Sub-total	70	9 (12.86)	19 (27.14)	17 (24.29)	25 (35.71)
Grand Total		180	11 (6.11)	58 (32.2)	46 (25.55)	65 (36.11)

Source: Compiled from field Survey

Note: Figures in the parentheses represent percentage of corresponding figure to total

First of all, distribution of families among different income groups of the sample villages with per capita income including income from ericulture activities is enumerated and presented in table-4.12. Thereafter, the similar distribution is computed

without incorporating the income from ericulture activities by the sample families, which is presented in table-4.13. Comparing these two tables we can observe the changes in number and percentage of families in different income groups with and without having ericultural income. It provides us an idea of how far ericulture in these villages have been successful in eradicating poverty or lifting people out of the clutches of poverty.

From table-4.12, it is observed that out of 180 eri rearing families; altogether 69 families (38.13) are living below poverty line. Out of these 69 families 11(6.11 per cent) are very poor having income even less than Rs.250. Among the three blocks, percentage of families living below poverty line is the maximum in Jalah block (40 per cent of families in this block have monthly per capita income less than Rs.433). However, incidence of poverty is observed to be the maximum in the villages Agdia and Khusrabari with figure recorded at 60 per cent. But the percentage of families belong to the very poor category is higher in Salbari (21.43 per cent). Where as 55.56 per cent of total families in that village belong to the higher income group with monthly per capita income above Rs.600. Earlier, also we have observed that the average family income of this village is much higher than that of the other villages and those relatively better off families practice more mugaculture and weaving along with ericulture proper. It indicates that the distribution of income in this village is skewed towards the relatively richer families.

Table-4.13 shows if the income from ericulture is not taken into account, 78 families (i.e., 43.33 per cent) would belong to the poor category. It indicates that the ericulture activities have helped 09 families i.e., 5.2 per cent of the sample families to overcome poverty. Among the poorer 36 families (20 per cent) would be very poor with monthly per capita income less than Rs.250. But the figure was only 11 i.e., 6.11

per cent in earlier case (when ericultural income was incorporated). Moreover, 23.33 per cent of the families belong to the group of Rs.251 to Rs.433 monthly per capita income, which means about 14 per cent of the families have been able to improve their condition from very poor to moderate poor due to the ericulture activities.

Table-4.13
Number of Families in Different Monthly per Capita Income Groups without Income from Ericulture

Block	Village	Household (Number)	Less than Rs.250	Rs.251 to Rs.433	Rs.434 to Rs.600	Above Rs.600
Sarukhetri	Gohia	23	3	4	8	8
	Agdia	10	4	2	1	3
	Garartari	17	2	4	6	5
	Sub-total	50	9 (18.00)	10 (20.00)	15 (30.00)	16 (32)
Gobardhan	Bashbari	18	3	3	2	10
	Nimua	32	6	9	7	10
	Khusrabari	10	3	4	0	3
	Sub-total	60	12 (20.00)	16 (26.67)	9 (15.00)	23 (38.33)
Jalah	Salbari	14	3	2	3	6
	Hahchara	21	7	5	2	7
	Bhuyapara	35	5	9	9	12
	Sub-total	70	15 (21.43)	16 (22.86)	14 (20.00)	25(35.71)
Grand Total		180	36 (20)	42 (23.33)	38 (21.11)	64 (35.56)

Source: Compiled from field Survey

Note: Figures in the parentheses represent percentage of corresponding figure to total

Table-4.14
Percentage Change in Poverty due to Ericulture

Block	Village	Household (Number)	Number and Percentage of Households below Poverty		Percentage Decline in Poverty due to Ericulture Activity	Percentage of Families Practice Spinning and Weaving
			Without Income from Ericulture	With Income from Ericulture		
Sarukhetri	Gohia	23	7 (30.43)	6 (26.08)	14.29	26.09
	Agdia	10	6 (60.00)	6 (60.00)	0.00	50.00
	Garartari	17	6 (35.29)	6 (35.29)	0.00	35.29
	Sub-total	50	19 (38.00)	18 (36.00)	5.26	34.00
Gobardhan	Bashbari	18	6 (33.33)	5 (27.77)	16.68	44.44
	Nimua	32	15 (46.87)	12 (37.5)	19.99	43.75
	Khusrabari	10	7 (70.00)	6 (60.00)	14.28	40.00
	Sub-total	60	28 (46.66)	23 (38.33)	17.85	43.33
Jalah	Salbari	14	5 (35.71)	5 (35.71)	00	64.29
	Hahchara	21	12 (57.14)	12 (57.14)	00	47.62
	Bhuyapara	35	14 (40.00)	11 (31.42)	21.45	45.71
	Sub-total	70	31 (44.28)	28 (40.00)	9.66	50.00
Grand Total		180	69 (38.33)	78 (43.33)	11.54	43.33

Source: Compiled from tables-4.12 and 4.13

Note: Figures in the parentheses represent percentage of families below poverty line

Table-4.14 depicts that there is an over all 11.54 per cent decline in poverty because of the adoption of ericulture activities by the sample villagers. However the impact is more in the village where relatively less families practice spinning and weaving along with the production of cocoon. The correlation between percentage reduction in poverty and percentage of ericulturist families engaged in weaving across the sample villages is negative which is -0.362 . Though the correlation coefficient is not very high it indicates that the relatively well off families (who were already above poverty line) practice weaving along with ericulture proper and hence the impact in terms of poverty alleviation is appeared to be insignificant. But the areas or villages where less percentage of ericulture families practice weaving, the incidence of poverty is more and thus they cannot adopt weaving without any external financial support. Most of them earn a few amounts from ericulture proper (from the sale of cocoon and pupae), which are not very high in absolute amount, but has very high significance for those families and they can just meet their daily subsistence requirements, i.e. it helps them to come out of acute poverty. It is also clear from the correlation between the average total family earning from all ericulture activities across the villages with the percentage of ericulturist families practicing spinning and weaving (along with ericulture proper) which is positive and the value is 0.35 .

4.5. Conclusion

An attempt has been made in this chapter to deal exclusively with the topic of ericulture as a source of employment as well as income in Assam in general and in the district of Barpeta in particular. So far as employment is concerned, it appears that a small portion of total workforce (only 3.94 Per cent) is engaged in ericulture. But this figure does not include the employment generated in the spinning and weaving and

marketing of fabrics. Therefore, the total figure of employment generated due to the whole ericulture (including endi-textile activities) is much more than the figure supplied by the Directorate of Sericulture, Government of Assam (also indicated by the government employees of that department). This is clear from the estimated figure of employment generation per kilogram of cocoon in the sample areas of Barpeta district, which shows that the total employment generated in all such activities was more than six times to that of man-days generated in ericulture proper. Thus even if one third of the produced cocoon is used for spinning and weaving approximately 22 man-days are generated from one kilogram of cocoon production. It is practiced as the majority of rural tribal women as a spare time occupation in the rural areas. However, the number of family engaged in ericulture as percentage of families engaged in sericulture, as a whole is as high as around 70 per cent. This speaks the position of the ericulture among all the sericulture activities.

So far income generation is concerned; the contribution of ericulture to NSDP at market price is not very significant. Its contribution was only 0.0436 per cent in 2004-05. But whatsoever the income from the occupation might be, it fairly supplements income of the rural poor rearers especially the tribal women a significant way. Moreover, from the sample households, it is observed that about Rs.1411.25 is generated from each kilogram of cocoon. Therefore, if (as observed from the sample) one third of the produced cocoon is processed total revenue generated by the rearers and weavers' families of Assam would be about Rs.24.79 crores, which is not very insignificant at all.

Since the technology used by the spinners is still primitive (they use *Takli*), output per spinner, per day is extremely low (around 50 grams per day) as compared to the 250 grams per day from CSTRI pedal cum motor operated spinning machine.

Hence, it is relatively less remunerative (i.e. Rs.34.35 per man-day). Net value added of eri yarn per 840 grams is around Rs.585.48, which costs 17.42 man-days.

Weaving is the end process of the ericulture activities. From analysis, it is found that employment generation per shawl was only 0.785 man-days. Moreover, the net revenue added per cloth production from one-kilogram of cocoon is only Rs.697.

Ericulture total is completely managed by rural women folk. The rural tribal women can help the family by contributing income as well as by supplying protein full pupae to their children and other family members. Contribution to family income makes the women to be more empowered and independent in the family as well as in the society.

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Appendix-4.11

Man-days Generated and Gross and Net Value Addition in Total Ericulture Activity

Block	Village	Households (Number)	Production of Cocoon (Kg)	Ericulture Proper					
				Man-days Equivalent Generated	Revenue Generated (Rs)	Cost of Capital (Rs)	Gross Value Added (Rs)	Labour Cost (Rs)	Net Value Addition (Rs)
SobardhanSarukhetry	Gahia	23	148	504.5	57720	2637	55083	22702.5	32380.5
	Agdia	10	79	328	30760	1630	29130	14760	14370
	Garartari	17	120.6	377	46821.75	1985	44836.75	16965	27871.75
	Sub-total	50	347.6	1209.5	135301.8	6252	129049.75	54427.5	74622.3
SobardhanSarukhetry	Bashbari	18	106.73	362	41702.45	1495	40207.45	14480	25727.45
	Nimua	32	249.55	867	106155.5	4220	101935.5	34680	67255.5
	Khusrabari	10	76.45	249.5	28812.5	1010	27802.5	10479	17323.5
	Sub-total	60	432.73	1478.5	176670.5	6725	169945.45	59639	110306.5
Jalah	Salbari	14	93.5	399	37000	1635	35365	14238	21397
	Hahchara	21	150.5	533.5	59602.5	2100	57502.5	22407	35095.5
	Bhuyapara	35	243.3	830.5	90666	3505	87161	34881	52280
	Sub-total	70	487.3	1763	187268.5	6970	180298.5	71526	108772.5
Grand Total		180	1267.63	4451	499240.7	19947	479293.7	185592.5	293701.2

Source: Compiled from Field Survey.

Appendix -4.11 (Continued)

Block	Village	Spinning and Weaving of Endi Textile							Erculture Total			
		Spun Cocoon (Kg)	Man-days Equivalent Generated	Revenue Generated (Rs)	Cost of Capital (Rs)	Gross Value Addition (Rs)	Labour Cost (Rs)	Net Value Addition (Rs)	Man-days Equivalent Generated	Revenue Generated (Rs)	Gross Value Addition (Rs)	Net Value Addition (Rs)
Sarukhetry	Gahia	27	511	47912	10030	37882	22995	14887	1015.5	105632	92965	47267.5
	Agdia	35	686.5	60400	12070	48330	30892.5	17437.5	1014.5	91160	77460	31807.5
	Garartari	35	575.5	26600	11575	15025	15862.5	-837.5	952.5	73421.75	59861.75	27034.25
	Sub-total	97	1773	134912	33675	101237	69750	31487	2982.5	270213.8	230286.8	106109.3
Gobardhana	Bashbari	37	723.5	55700	13490	42210	28940	13270	1085.5	97402.45	82417.45	38997.45
	Nimua	92	1811	127550	31710	95840	72440	23400	2678	233705.5	197775.5	90655.5
	Khusrabari	28	543.5	44100	9075	35025	22827	12198	793	72912.5	62827.5	29521.5
	Sub-total	157	3078	227350	54275	173075	124207	48868	4556.5	404020.5	343020.5	159174.5
Jalah	Salbari	35	658	42200	13305	28895	27636	1259	1057	79200	64260	22656
	Hahchara	57	1108.5	112900	20320	92580	46557	46023	1642	172502.5	150082.5	81118.5
	Bhuyapara	74	1412	117450	25600	91850	59304	32546	2242.5	208116	179011	84826
	Sub-total	166	3178.5	272550	59225	213325	133497	79828	4941.5	459818.5	393623.5	188600.5
Grand Total		420	8029.5	634812	147175	487637	327454	160183	12480.5	1134053	966930.7	453884.2

Source: Compiled from Field Survey.

Appendix -4.11 (Continued)

If All Produced Cocoons are Used in Weaving by the Rearers Themselves							
Potential Gross Value Added in Weaving (Rs)	Net Gain in Gross Revenue in Weaving (Rs)	Potential Gross Value Added in Ericulture Total (Rs)	Percentage Gain in Gross Value Added in Ericulture Total	Potential Employment in Weaving (Number)	Net Gain in Employment in Weaving (Number)	Potential Total Employment in Ericulture Total (Number)	Percentage Gain in Total Employment in Ericulture Total
207649.5	169767.5	262732.5	182.61	2801.04	2290.04	3305.54	225.51
109087.7	60757.71	138217.7	78.44	1549.53	863.03	1877.53	85.07
51771.86	36746.86	96608.61	61.39	1214.61	862.11	1591.61	118.18
362783.3	261546.3	491833.1	113.57	5554.43	4004.43	6763.93	145.11
121758.7	79548.74	161966.2	96.52	2087.00	1363.50	2449.00	125.61
259966	164126	361901.5	82.99	4912.34	3101.34	5779.34	115.81
95630.76	60605.76	123433.3	96.46	1483.95	940.45	1733.45	118.59
477036.6	303961.6	646982	88.61	8483.71	5405.71	9962.21	118.64
77190.93	48295.93	112555.9	75.16	1757.80	1099.80	2156.80	104.05
244443.7	151863.7	301946.2	101.19	2926.83	1818.33	3460.33	110.74
301987.9	210137.9	389148.9	117.39	4642.43	3230.43	5472.93	144.05
626224.5	412899.5	806523	104.90	9330.62	6152.12	11093.62	124.50
1471770	984132.7	1951063	101.78	23561.32	15754.82	28012.32	128.53

Source: Compiled from Field Survey.

Chapter– 5

Spatio-Temporal Variation in Ericulture in Assam

5.1. *Introduction*

At present, there are 26 districts in Assam¹. Although ericulture is practiced all over Assam, it is not evenly distributed in all the districts of Assam. In some districts it is cultured extensively by thousands of families, while in some others it is practiced by a limited number of families within a small area. Though, it is cultured by the rural poor households belonging to all communities, it is apparent that the concentration is more in the tribal dominated areas. For example, 68.28, 55.69 and 47.29 per cent of total population of N. C. Hills, Karbi Anglong and Dhemaji districts respectively are tribal (2001 Census Report). These are also the frontrunners in terms of production of eri cocoon, number of families engaged in ericulture and area under host plant among all the districts of the state. Similarly, the northern part of Barpeta is tribal dominated, where ericulture activities are prominent and hardly any such activity is observed in the southern part of the district.

In this chapter first of all, district-wise variation in contribution of eri-cut cocoon to total state production during 1990-91 to 2005-06 has been discussed. Thereafter, number of families engaged in ericulture across the districts of Assam is analysed. It is followed by a discussion on district-wise variation in area under eri host plants. At last, district wise variation in area, production of eri cocoon and number of families engaged in ericulture has been analysed.

¹ In the year 2005, three extra districts were created in Assam, viz. Baska, Udalguri, and Sirang. But the figures of these districts are not still available. Therefore, the former 23 districts are considered here.

For the purpose of analysis, first of all, percentage contribution of eri cocoon of each district to total state production of cocoon and rate of growth of production over time has been estimated by using the data collected from Directorate of Sericulture, Government of Assam. Inter-district disparity in contribution of eri cocoon output to state total is measured by co-efficient of variation. Thereafter, exponential rate of growth of number of families engaged in ericulture in different districts has been estimated by using regression equation $\ln Y_t^d = \alpha^d + \beta^d t$. Where, Y_t^d is the number of families engaged in district d at time t, t is time in years and U_t represents the random disturbance term. Here α^d , β^d are the two parameters and β^d represents the annual exponential rate of growth. Estimation has been done for the whole period as well as different sub-periods. District-wise variation in area under eri host plant to total ericultural land during 1993-94 to 2005-06 is also measured by the same coefficient of variation.

5.2. District-wise Variation in Contribution of Eri-Cut Cocoon to Total State Production during 1990-91 to 2005-06

Production of eri cocoon is observed to be unequal across the districts of Assam. In some districts, production is very high while; in some others it is very low. District-wise variation in contribution of eri cut cocoon to total state production during 1990-91 to 2005-06 is presented in table-5.1.

From table-5.1, it is observed that in the year 1991-92 Karbi Anglong alone contributed 21.64 per cent to total production of cocoon in Assam. It is followed by Kokrajhar and N. C. Hills with 5.66 per cent and 4.85 per cent in the same year. These are the districts where percentage of S.T. population is also very high as mentioned earlier. The tribal people practice this ericulture for endi cloths as well as pupae, which is their one of the favourite consumption items. Also the byproduct pupae raise their

income from ericulture substantially². In 1995-96, although the share of Karbi Anglong in the state total production declined to 20.25 per cent, still it was at the top position. It was followed by N. C. Hills and Sibsagar with 8.42 per cent and 7.17 per cent. In the year 2000-01 and 2005-06 also, Karbi Anglong stood at the top most position. The district was at the last position in terms of contribution to total state production was Hailakandi in the year 1991-92 and 2005-06. However, in 1995-96 and 2000-01, Karimganj was at the bottom position. These two districts together always contributed about 3 per cent of total state production that even came down to below one per cent in 2000-01 before being increased again to about 3 per cent in 2005-06. In spite of changing their positions they have always been at the bottom two positions. These are the two districts where percentage of S.T. population is also the lowest (0.19 and 0.29 per cent in 2001).

The districts, which were contributing more to the total state production, continued to produce and contribute more. They have been producing more as they enjoy better marketing facilities. Due to more availability, the traders of cocoon also visit the rearers of those areas frequently for collecting cocoon and even advance loan to those rearers that encourage them to produce more. On the other hand, those who were lagging behind are still contributing less as they are deprived of these facilities. As the rearers in those areas are scattered and produce very limited in quantity; very few traders visit them and not frequently and thus they face the problem of marketing. District-wise variation in output of cocoon is also presented in diagram-5.1.

During 1991-92 to 2005-06, growth in percentage contribution to total state production of cocoon was the highest in Cachar (294.44 per cent), which is followed by Barpeta (213.64 per cent) and Marigoan (150 per cent). On the other hand, growth rate of

² Revenue from pupae constitutes 27.92 per cent of the revenue from ericulture in the sample families as discussed in table-4.8 in chapter-4.

percentage contribution to total state production during the same period was the lowest in Dhubri (-68.89 per cent) and followed by Golaghat (-40.0 per cent) and Jorhat (-34.78 per cent) respectively. That is the percentage contribution declined in those districts.

Table-5.1
District-wise Variation in Contribution of Eri Cut Cocoon to Total State Production

1	2	3	4	5	6	7	8	9
	Percentage to State Total				Growth Rate of Production (Percentage)			
District/ Year	1991-92	1995-96	2000-01	2005-06	1991-2 to 1995-6	1995-6 to 2000-1	2000-1 to 2005-6	1991-2 to 2005-6
Dhubri	4.55	3.12	2.55	1.00	-22.67	-12.64	-53.95	-68.89
Kokrajhar	5.66	5.38	5.60	5.14	7.14	11.00	8.11	28.57
Goalpara	3.64	2.33	1.41	3.14	-27.78	-35.38	161.90	22.22
Bongaigaon	NA	1.97	3.03	2.57	19.57*	63.64	0.00	95.65*
Barpeta	4.45	3.41	3.53	9.86	-13.64	10.53	228.57	213.64
Nalbari	3.64	1.68	2.18	3.71	-47.78	38.30	100.00	44.44
Kamrup	4.25	5.20	5.21	6.43	38.10	6.90	45.16	114.29
Darrang	4.04	3.94	4.37	3.86	10.00	18.18	3.85	35.00
Sonitpur	4.25	4.01	4.91	4.57	6.67	30.36	9.59	52.38
Nagaon	3.84	4.12	4.87	4.57	21.05	26.09	10.34	68.42
Marigaon	2.83	1.43	2.74	5.00	-42.86	103.75	114.72	150.00
Sibsagar	4.33	7.17	4.71	5.14	86.92	-30.00	28.57	68.22
Jorhat	4.65	5.02	3.70	2.14	21.74	-21.43	-31.82	-34.78
Golaghat	4.04	4.30	5.04	1.71	20.00	25.00	-60.00	-40.00
N.Lakhimpur	3.84	4.12	4.37	3.00	21.05	13.04	-19.23	10.53
Dhemaji	3.03	2.76	3.87	3.86	2.67	49.35	17.39	80.00
Dibrugarh	3.32	2.87	2.40	3.43	-2.44	-10.63	67.83	46.34
Tinisukia	3.84	4.12	3.19	2.71	21.05	-17.39	0.00	0.00
Cachar	3.64	2.69	1.85	10.14	-16.67	-26.67	545.45	294.44
Hailakandi	1.09	1.25	0.40	0.71	29.63	-65.71	108.33	-7.41
Karimgang	1.82	0.54	0.34	2.57	-66.67	-33.33	800.00	100.00
KarbiAnglong	21.64	20.25	22.18	11.86	5.61	16.81	-37.12	-22.43
N.C. Hills	4.85	8.42	8.74	2.86	95.83	10.64	-61.54	-16.67
Total	100.0	100.0	100	100	12.84	6.63	17.65	41.56
Coeff. of Var.	89.88	90.24	97.65	65.58	518.44	499.98	234.28	156.19
Correlation	R ₂₃ =0.94(12.54); R ₃₄ =0.975 (19.96); R ₄₅ =0.5524 (3.04); R ₂₅ =0.618 (3.60)				R ₆₇ =-0.148 (-.69), R ₇₈ = -0.315 (-1.52), R ₈₉ = 0.615, (3.58), R ₆₉ = -0.285 (-1.36)			

Source: Directorate of Sericulture, Government of Assam, Guwahati.

Notes: (i) * indicates that the growth from 1993-94 instead of 1991-92.

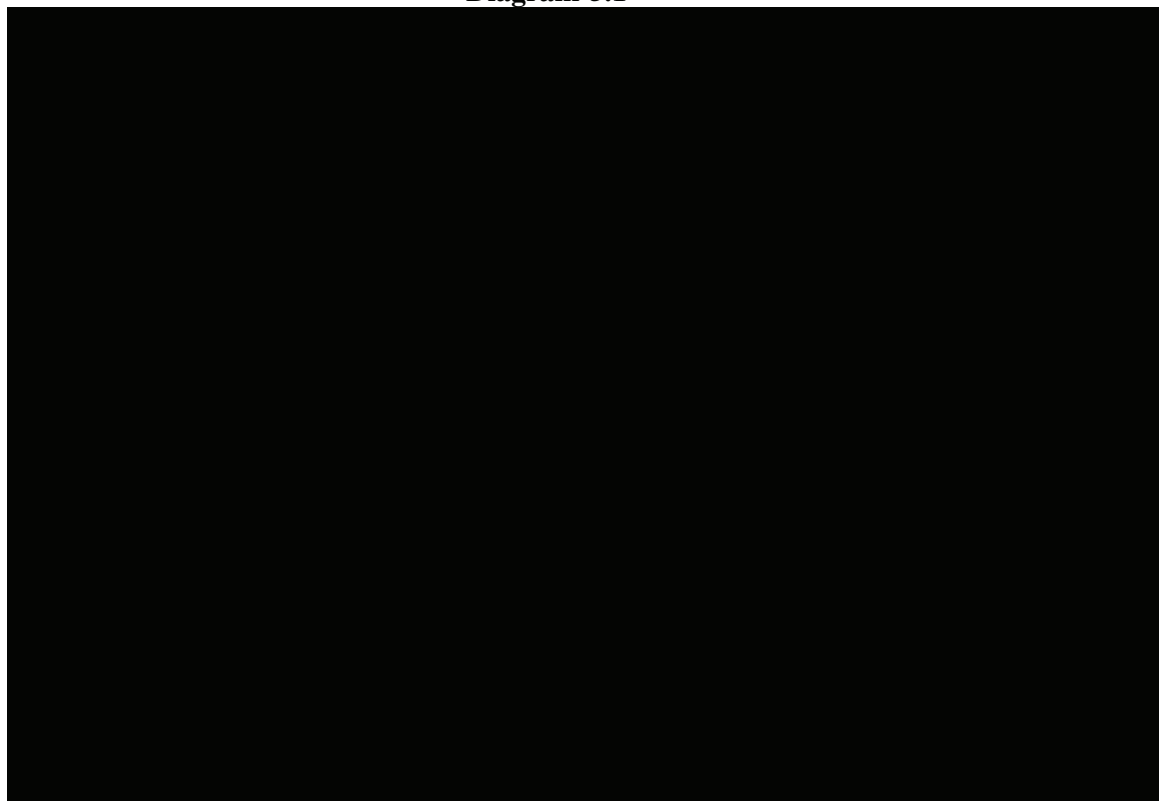
(ii) Figures in the parentheses represent t-values.

(iii) NA means not available.

It is also observed that correlations between district-wise percentage contributions to total state production of cocoon of various years are significantly positive. It indicates that the advanced districts, which were contributing more to total

state production earlier, are still contributing more. On the other hand, those who were contributing less are still contributing less to total state production. However, the inter-district variation in contribution to total state production and its growth rate in different sub-periods have declined (that is clear from the declining coefficient of variation), which indicates that the laggard districts have been advancing faster in terms of expansion of eri activities and output than the relatively advanced districts.

Diagram-5.1



5.3. District-wise Variation in Contribution of Ericulture Proper to Employment Generation in Assam during 1995-96 to 2005-06

Number of families engaged in ericulture in different districts of Assam is not uniform. The number of population engaged varies in accordance with the variation in size and structure of population of various districts as well as their economic conditions. In Assam, ericulture is mainly practiced by the Bodos, Kacharis, Misings, Garos, Ahoms and Karbis. It is associated with their socio-economic and cultural life. Therefore, number of families engaged in ericulture is high in those districts where number of tribal

people is high. In Karbi Anglong, which is the largest district of Assam and where 55.69 per cent of the inhabitants are tribal areas (as per 2001 Census Report) and majority of them live in the rural; number of families engaged in ericulture is the highest. But now people of general caste also started practicing ericulture. Changes in the districts belonging to top five and bottom five positions in terms of engagement of families in ericulture as well as their lower and upper limits of percentage of families engaged since 1995-96 is presented in table-5.2.

Table-5.2
Changes in Percentage of Top Five and Bottom Five districts in the Ranking of number of Families Engaged in Ericulture during 1995-96 to 2005-06

	1995-96	2000-01	2005-06
Top 5 Districts	Karbi Anglong, Jorhat, Sibsagar, N. Lakhimpur and Dibrugarh (≥ 6)	Karbi Anglong, N. Lakhimpur, Nagoan, Dhemaji and Golaghat (≥ 6.96)	Karbi Anglong, N. Lakhimpur, Jorhat Dhemaji and Golaghat (≥ 6.37)
Bottom 5 Districts	Hailakandi, Karimganj, Barpeta, Goalpara and Bongaigoan (≤ 2.10)	Hailakandi, Karimganj, Tinisukia, Goalpara and Bongaigoan (≤ 1.37)	Hailakandi, Karimganj, Tinisukia, Goalpara and Bongaigoan (≤ 1.18)

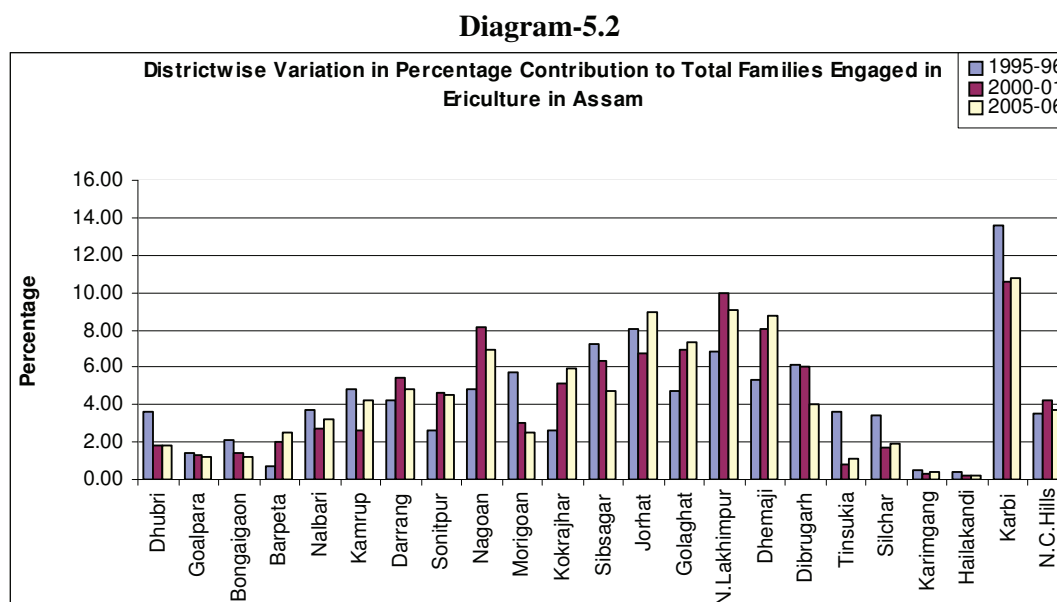
Source: Directorate of Sericulture, Government of Assam, Guwahati (see Appendix-5.1).

Note: Figures in the parentheses represent minimum or maximum percentage to total number of families engaged in ericulture.

From table-5.2, it is observed that in the year 1995, among all the 23 districts of Assam, top five districts where number of families engaged in ericulture was the highest, were Karbi Anglong, Jorhat, Sibsagar, North Lakhimpur and Dibrugarh. Contribution of each district to total number of families engaged in ericulture in the state was at least six per cent. On the other hand, in the same year, the five districts that hold bottom positions were Hailakandi, Karimganj, Barpeta, Goalpara and Bongaigoan. Their contribution at individual level to state total was maximum 2.10 per cent. The number of families engaged in ericulture is less in these districts as tribal population in these districts is also very less (e.g. in Hailakandi and Karimganj districts tribal population constitutes of less than one per cent of total population). In the year 2000-01, the position of Karbi Anglong has not changed. However, Nowgoan, Dhemaji and Golaghat entered in the top five superseding Jorhat, Sibsagar and Dibrugarh in terms of percentage contribution to total

number of families engaged in ericulture. Unlike the top five districts, there was a little change in the bottom five districts. The district of Barpeta who was among the bottom five districts improves to 17th position and Tinsukia is pushed back to 21st position. In the year 2005-06, a little change is observed in the top five districts. Jorhat regained its position in top five overtaking Nowgoan. In case of the bottom five districts, no change is observed in 2005-06. It indicates that, the district where number of families engaged in ericulture was high is still high with little variation within the group. On the other hand, those districts with less families engaged in ericulture is still less. In other words, the gap between contribution of top five and bottom five districts to total employment of families in ericulture has increased during the period. The district of Barpeta has been improving its position from 21st in 1995-96 to 17th in 2000-01 and then to 15th in 2005-06 as general caste families in the district also started practicing it.

District wise variation in contribution to total families engaged in ericulture during 1995-96, 2000-01 and 2005-06 has also been presented in diagram-5.2.



From table-5.3, it is observed that annual exponential rate of growth of families engaged in ericulture was the highest in Kokrajhar with 13.09 per cent during 1995-96 to

2005-06. With the formation of large number of Self-Help Groups, Co-operatives among the rearers and weavers, number of families engaged in ericulture has increased. It was followed by Barpeta and Dhemaji with 12.3 per cent and 11.85 per cent respectively. On the other hand, Goalpara occupies the bottom position where annual exponential rate of decline in number of families engaged in ericulture was 11.8 per cent during the same period. It was followed by Tinsukia and Marigoan with -11.64 and -10.48 per cent respectively.

Table-5.3
District wise Annual Exponential Rate of Growth of Families Engaged in Ericulture during 1995-96 to 2005-06

District/Year	Exponential Growth Rate (Percentage)	Standard Error	Significance/ Insignificance (5 per cent by Two-tailed Test)
Dhubri	-6.3 (19)	0.021	Significant
Goalpara	-11.8 (23)	0.056	Significant
Bongaigaon	-7.0 (20)	0.015	Significant
Barpeta	12.3 (2)	0.021	Significant
Nalbari	9.8 (4)	0.058	Insignificant
Kamrup	3.81 (10)	0.023	Insignificant
Darrang	5.1 (8)	0.01	Significant
Sonitpur	6.22 (7)	0.011	Significant
Nagoan	8.5 (5)	0.025	Significant
Morigoan	-10.48 (21)	0.0341	Significant
Kokrajhar	13.09 (1)	0.0244	Significant
Sibsagar	-2.8 (16)	0.0046	Significant
Jorhat	3.76 (11)	0.0196	Insignificant
Golaghat	4.5 (9)	0.016	Significant
N.Lakhimpur	7.0 (6)	0.024	Significant
Dhemaji	11.85 (3)	0.023	Significant
Dibrugarh	-1.13 (14)	0.011	Insignificant
Tinsukia	-11.64 (22)	0.0389	Significant
Silchar	-2.83 (17)	0.0171	Insignificant
Karimgang	1.35 (12)	0.038	Insignificant
Hailakandi	-6.08 (18)	0.0291	Significant
Karbi Anglong	-0.042 (13)	0.013	Insignificant
N.C.Hills	-2.66 (15)	0.019	Insignificant
Assam	1.98	0.0034	Significant

Source: Directorate of Sericulture, Government of Assam, Guwahati.

Note: Figures in the parentheses represent rank of districts in terms of exponential growth rate.

5.4. District wise Variation in Area under Eri Host Plant during 1993-94 to 2005-06

Area under eri host plant has been increasing in Assam since 1993-94. Area under host plant has increased from 2325.06 hectares in 1993-94 to 7294 hectares in

2005-06 that is it increased by about 214 per cent during last twelve years. A major portion of this land under host plant was under sericulture department of the government of Assam in the form of Eri Concentration Centres (ECCs) and Eri Seed Grainages (ESGs) in 1993-94. In that year, 487.58 hectares and 141.61 hectares of land were under ECCs and ESGs³ (a total of 26.71 per cent of gross area under eri host plant). During 2005-06, percentage of area under host plant in the government sector to total area under eri host plant declined to 6.79 per cent. It is because of decline in area under ECCs and ESGs to 370.66 and 124.69 hectares respectively and rapid increase in area under the private sector.

Table-5.4 describes the changes in district-wise contribution to total area under eri host plant in the state during 1993-94 to 2005-06. From the table, it is noticed that the district of Kamrup ranked first with 9.65 per cent of area under eri host plant of the state total ericultural land during 1993-94, which was followed by Karbi Anglong with 8.97 per cent and Sibsagar with 8.24 per cent. On the other hand, the district of Bongaigaon was at the bottom position with 0.28 per cent of total ericultural land of the state and followed by Karimganj (1.87 per cent) and Dibrugarh (2.13 per cent) respectively. In the subsequent years 1998-99, 2002-03 and 2005-06, the share of ericultural land of Karbi Anglong to total ericultural land of the state was the highest. It was because; Karbi Anglong is the largest district in terms of proportion of area of the state and the concentration of tribal population is the highest in this district who are more interested in ericulture and thus there was much scope of increase in area under it. There was no much change in the districts belonging to the bottom five positions in the following years. The significant positive correlation among the district-wise contribution to total state ericultural area in different years indicates that the districts were the frontrunners in

³ Directorate of Economics and Statistics, Government of Assam, *Statistical Handbook*, 1994, Table-8.02, P.-91.

terms of contribution in the earlier years is still in the front in spite of a minor change in the relative ranking of the respective districts. Whereas, those who were lagging behind in terms of contribution to state total is still lagging despite some remarkable improvement in some of the backward districts like Dhemaji, Golaghat etc.

However, Bongaigoan stood first in terms of the rate of growth of percentage contribution to total area under eri host plant in the state during 1993-94 to 2005-06, where growth was at the rate of 664.83 per cent. It is because, earlier very few area in the district was under the growth of host plant and thus sufficient land was remaining unused and that made it possible to bring more and more land under eri host plant over the years. It is followed by North Lakhimpur and Cachar where the rate of growth of percentage contribution was 139.64 and 124.01 per cent respectively during the whole period. It was primarily due to the setting up of several ECCs by the Sericulture Department of the Government of Assam for the plantation of castor. Though large tract of land was allocated to these ECCs in the district of Bongaigoan and Lakhimpur (which were on record under eri host plant) only 4.06 hectares in Bongaigoan and 4.50 hectares in N. Lakhimpur was used for plantation and expansion of area from 11.75 to 13.68 hectares only took place in the district of Cachar during 1993-94 to 2005-06⁴. On the other hand, Tinsukia stood at the bottom position in terms of growth of percentage contribution to area under eri host plant in the state, which was -45.47 per cent during 1993-94 to 2005-06. It was followed by Kamrup with -39.74 per cent and Sibsagar with -37.75 per cent. Positive correlation between growths of district-wise contribution in different sub-periods also indicates that in majority of districts where growth was faster in the early sub-period also recorded faster growth in the later sub-periods and vice-versa.

⁴ Directorate of Economics and Statistics, Government of Assam (2006), *Statistical Handbook*, Table-8.02, Pp. 94-95.

Table-5.4
District-wise Variation in Area Under Eri Host Plant to Total Ericultural Land of Assam during 1993-94 to 2005-06

1	2	3	4	5	6	7	8	9
	Percentage Contribution to Total Area under Eri Host Plant in Assam				Growth Rate of Proportion of Area (Percentage)			
District/Year	1993-94	1998-99	2002-03	2005-06	1993-4 to 1998-9	1998-9 to 2002-3	2002-3 to 2005-6	1993-4 to 2005-6
Dhubri	5.14	4.57	3.66	3.26	-11.24 (16)	-19.88 (20)	-10.81 (22)	-36.57 (20)
Kokrajhar	5.91	6.36	4.87	4.66	7.51(8)	-23.37 (21)	-4.31 (16)	-21.17 (15)
Bongaigaon	0.28	0.69	2.23	2.13	147.00 (1)	224.90 (1)	-4.69 (18)	664.83 (1)
Goalpara	6.91	6.97	6.70	6.47	0.89 (11)	-3.78 (10)	-3.48 (13)	-6.30 (11)
Barpeta	2.18	1.90	1.58	1.41	-12.80 (18)	-17.21 (17)	-10.37 (21)	-35.29 (19)
Nalbari	2.37	2.20	2.11	2.08	-7.24 (14)	-3.77 (9)	-1.36 (10)	-11.95 (13)
Kamrup	9.65	7.73	6.46	5.81	-19.88 (23)	-16.43 (16)	-10.00 (20)	-39.74 (22)
Darrang	3.72	3.52	5.26	5.85	-5.32 (13)	49.47 (3)	11.24 (2)	57.43 (4)
Sonitpur	3.86	4.07	3.63	3.50	5.38 (9)	-10.73 (13)	-3.66 (14)	-9.37 (12)
N.Lakhimpur	3.36	4.59	7.52	8.05	36.64 (3)	63.86 (2)	7.03 (3)	139.64 (2)
Dhemaji	4.02	3.32	4.86	5.98	-17.33 (21)	46.35 (4)	22.99 (1)	48.82 (6)
Morigaon	3.80	4.54	6.03	5.88	19.53 (5)	32.93 (5)	-2.49 (12)	54.94 (5)
Nagoan	5.23	5.89	5.22	5.28	12.72 (7)	-11.42 (14)	1.15 (7)	0.99 (9)
Golaghat	2.14	2.09	2.71	2.88	-2.50 (12)	29.78 (7)	6.17 (4)	34.34 (7)
Jorhat	4.95	4.07	3.48	3.32	-17.82 (22)	-14.40 (15)	-4.77 (19)	-33.01(17)
Sibsagar	8.24	6.83	4.90	5.13	-17.05 (20)	-28.24 (22)	4.60 (6)	-37.75 (21)
Dibrugarh	2.13	2.54	2.49	2.50	19.38 (6)	-1.99 (8)	0.21(8)	17.25 (8)
Tinsukia	3.32	4.29	2.16	1.81	29.19 (4)	-49.69 (23)	-16.10 (23)	-45.47 (23)
Karbi Anglong	8.97	9.22	8.75	8.58	2.71(10)	-5.07 (12)	-1.90	-4.36 (10)
N.C. Hills	5.44	4.75	4.51	4.32	-12.76 (17)	-4.98 (11)	-4.31(15)	-20.68 (14)
Karimganj	1.87	1.69	1.38	1.34	-9.81(15)	-18.51(18)	-2.39 (11)	-28.27 (16)
Hailakandi	2.77	2.40	1.93	1.84	-13.19 (19)	-19.83 (19)	-4.61(17)	-33.61(18)
Cachar	3.54	5.80	7.56	7.92	63.82 (2)	30.42 (6)	4.84 (5)	124.01(3)
Correlation	R ₂₃ = .928 (11.42), R ₃₄ = .818 (6.51), R ₄₅ = .986 (27.38), R ₂₅ = .589 (3.337)				*R ₆₇ = .395 (1.972), *R ₇₈ = .593 (3.374), *R ₈₉ = .161 (.748), *R ₆₉ = .597 (3.409)			

Notes: (i) The * indicates rank correlation and the others are product moment correlations. (ii) The terms in the parentheses are t-values

Table-5.5
District-wise Variation in Area under Eri Host Plant to Total Land of the District
during 1993-94 to 2005-06

1	2	3	4	5	6	7	8	9
	Ranking in terms of Percentage of Geographical Area under Eri Host Plant				Ranking in terms of Growth in Percentage of Area Used for Eri Host Plant			
District/Year	1993-94	1998-99	2002-03	2005-06	1993-4 to 1998-9	1998-9 to 2002-3	2002-3 to 2005-6	1993-4 to 2005-6
Dhubri	6	8	12	12	16	20	22	20
Kokrajhar	8	6	10	11	8	21	16	15
Bongaigaon	23	23	14	14	1	1	18	1
Goalpara	1	1	2	2	11	10	13	11
Barpeta	20	22	23	23	18	17	21	19
Nalbari	14	15	15	15	14	9	9	13
Kamrup	4	7	8	9	23	16	20	22
Darrang	13	14	6	7	13	3	2	4
Sonitpur	19	19	21	21	9	13	14	12
N.Lakhimpur	9	4	3	3	3	2	3	2
Dhemaji	11	13	7	6	21	4	1	6
Morigaon	3	2	1	1	5	5	12	5
Nagoan	10	10	11	10	7	14	7	9
Golaghat	22	21	18	18	12	7	4	7
Jorhat	7	11	13	13	22	15	19	17
Sibsagar	2	3	5	5	20	22	6	21
Dibrugarh	21	20	20	20	6	8	8	8
Tinsukia	17	12	22	22	4	23	23	23
Karbi Anglong	18	18	17	17	10	12	10	10
N.C. Hills	12	16	16	16	17	11	15	14
Karimganj	15	17	19	19	15	18	11	16
Hailakandi	5	5	9	8	19	19	17	18
Cachar	16	9	4	4	2	6	5	3
Correlation	$R_{23} = 0.918, R_{34} = 0.809, R_{45} = 0.997, R_{25} = 0.733$				$R_{67} = 0.395, R_{78} = 0.593, R_{89} = 0.665, R_{69} = 0.597$			

Sources: (1) Directorate of Sericulture, Government of Assam, Guwahati.

(2) Directorate of Economics and Statistics, Government of Assam (2006), *Statistical Hand Book*, Table-1.01, P-2.

From table-5.5, it is noticed that in the year 1993-94 and 1998-99, Goalpara ranked first in terms of percentage of total geographical area of the district under eri host plant. Sibsaagar was in second in 1993-94 but relegated to 3rd position by Marigoan in 1998-99 and then further to 5th in the subsequent years. Morigaon went on to improve its position and occupied 1st position since 2002-03. On the other hand, Bongaigoan was at the bottom position in the earlier years when a small portion of the district was used for eri feed plantation. But later on it went on to improve its position

in terms of percentage of land allocated to feed plants. The district of Barpeta however always stood among the last two in terms of proportion of geographical area under eri host plant though there has been a continuous increase in the absolute area under it. This is because of relatively faster growth of area under castor in other districts of the state.

Comparing ranking of growth in percentage of area under host plant in different sub-periods and that of the whole period with the rank of percentage of area under host plant in different years, it is observed that the districts who have been in the top ranking in terms of allocation of their area for eri feed plantation recorded much lower growth rate as they had already reached a saturation point in terms of allocation of area for castor plantation. For further increase they require to shift developed land area from the cultivation of more remunerative crops to eri feed plantation, which is not economical for them. On the other hand, the districts where very less percentage of area were allocated for eri feed plantation exhibited faster growth over the years as there were much scope for increase in area for eri feed plantation over the unused underdeveloped areas that cannot be used for more remunerative crops at the present technological set up. Also, growth looks faster in those districts because of the lower base year value. However, the frontrunner districts still remain in the front in terms of contribution to total area under eri feed plantation of the state.

5.5 District-wise Variation in Output of Eri Cocoon per Hectare of Land under Eri Host Plant

In Assam, Karbi Anglong is the largest district in terms of geographical area followed by Sonitpur and N. C. Hills. On the other hand, Hailakandi is the smallest one and Morigoan and Karimganj are the second and third smallest districts of the state.

From table-5.6, it is noticed that production of eri cocoon per hectare of land under eri host plant has declined (in most of the districts) during 1993-94 to 2005-06. It indicates operation of diminishing returns in land under eri host plant. However, in case of some districts, production of eri cocoon per hectare is observed to increase. Marigoan is the district where production per hectare increased continuously during the same period, which indicates operation of increasing returns in land and thus there is more scope to increase as it generates positive externality for the growers. Similar is the case of Barpeta. In the year 1993-94, production of eri cocoon per hectare was the highest in Bongaigoan with one M. T. followed by N. Lakhimpur with 0.602 M.T. per hectare and Karbi Anglong with 0.412 MT. It was due to proper use of land for plantation of eri host plant. On the other hand, production per hectare was the lowest in Morigoan with 0.023 M.T. followed by Hailakandi with 0.093 and Kamrup with 0.126 M.T. It is primarily because of keeping this area under host plant to grow without taking much care intensively. However, during 2005-06, output per hectare was the highest in the district of Barpeta (0.670 M.T.), which was only 0.39 M.T. per hectare in 1993-94. Since, alternative occupations has not come up in Barpeta, those who are engaged in ericulture are much dependent on it for their sustenance (though it is a part time occupation) and thus people intensively use their land for the production of ericocoon. On the other hand, during the same period, production per hectare was the lowest in Dhubri with 0.029 M.T. and followed by N. Lakhimpur and Hailakandi.

Inter-district variation in output of cocoon per unit of area has increased significantly over the years, which is however not due to the faster growth in productivity in the formerly advanced districts than those of formerly backward district in terms of ericulture activity. It is observed that, the inter-district variation in area under feed plantation has declined first and then increased though over time changes in

coefficient of variation are not significant. On the other hand, inter-district variation in production of cocoon had increased significantly during 1993-94 to 1999-2000 before being declined again in 2005-06 significantly. It indicates that many of the districts where area increased at faster rate has failed to increase output in the same manner and even declined in some cases. Whereas in some districts, where area under host plant has not increased significantly; production has been maintained or even increased due to incentive activity as mentioned earlier.

Table-5.6
District-wise Variation in Output of Eri Cocoon Per Hectare of Land under Host Plant

District/Year	Area under Host Plant (Hectare)			Production of Cocoon (MT)			Production of Cocoon Per Hectare		
	1993-94	1999-2000	2005-06	1993-94	1999-2000	2005-06	1993-94	1999-2000	2005-06
Dhubri	119.61	187.00	238.00	21	19	7	0.176	0.102	0.029
Kokrajhar	137.48	239.00	340.00	39	29	36	0.284	0.121	0.106
Bongaigaon	6.46	54.00	155.00	NA	12.4	18	NA	0.230	0.116
Goalpara	160.57	291.00	472.00	22	9	22	0.137	0.031	0.047
Barpeta	50.74	74.00	103.00	20	20	69	0.394	0.270	0.670
Nalbari	55.03	88.00	152.00	14	14	26	0.254	0.159	0.171
Kamrup	224.28	296.00	424.00	28.3	30	45	0.126	0.101	0.106
Darrang	86.46	137.00	427.00	20.4	31	27	0.236	0.226	0.063
Sonitpur	89.69	161.00	255.00	22.4	29.4	32	0.250	0.183	0.125
N.Lakhimpur	78.08	196.00	587.00	47	30.2	21	0.602	0.154	0.036
Dhemaji	93.39	137.00	436.00	21	24.2	27	0.225	0.177	0.062
Morigaon	88.26	193.00	429.00	2	14.4	35	0.023	0.075	0.082
Nagoan	121.52	245.00	385.00	22	23	32	0.181	0.094	0.083
Golaghat	49.83	84.00	210.00	15	21	12	0.301	0.250	0.057
Jorhat	115.15	171.00	242.00	24	31	15	0.208	0.181	0.062
Sibsagar	191.50	268.00	374.00	26	31	36	0.136	0.116	0.096
Dibrugarh	49.48	137.0	182.00	15	15	24	0.303	0.109	0.132
Tinsukia	77.16	107.00	132.00	26	26	19	0.337	0.243	0.144
Karbi Angl	208.64	360.00	626.00	86	137	83	0.412	0.381	0.133
N.C. Hills	126.59	205.00	315.00	49	68.3	20	0.387	0.333	0.063
Karimganj	43.55	65.00	98.00	6	2	18	0.138	0.031	0.184
Hailakandi	64.34	98.00	134.00	6	3	5	0.093	0.031	0.037
Cachar	82.25	255.00	578.00	21	11	71	0.255	0.043	0.123
Assam	2325.06	4048.00	7248.00	548.57	628	700	0.236	0.155	0.097
Coeff. of Var.	54.70	47.85	51.18	75.68	99.89	65.58	57.20	60.89	107.68

Source: Directorate of Sericulture, Government of Assam, Guwahati.

NA: Not Available.

5.6. Reasons for Inter-district Variation in Area, Production and Family Engaged in Ericulture

Reasons behind the inter-district variation in area under eri host plant, production of eri cocoon and number of families engaged is examined by running a OLS regression of the form $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + U_i$. Here, X_{2i} , X_{3i} , X_{4i} , X_{5i} and X_{6i} are population, sum total of percentage of SC and ST population, density of population, literacy rate and per capita net district domestic product (NDDP) of i^{th} district respectively in 2001. Y_i is area under host plant or production of eri cocoon or number of families engaged in ericulture in the i^{th} district during 2001-02. U_i is the random disturbance term having usual classical linear regression properties.

Table-5.7
Impact of Population Size and its Characteristics, per Capita NDDP on the Inter-District Variation in Area under Feed Plants, Production of Eri Cocoon and Number of Families Engaged in Ericulture in Assam

	Area		Production		Family Engaged	
	Co-Efficient	t-Value	Co-Efficient	t-Value	Co-Efficient	t-Value
Population	0.00012	2.17**	-1×10^{-07}	-0.723	0.00082	0.4071
Percentage of SC and ST	4.27	2.12**	-0.0094	-1.77*	-148.65	-1.96*
Density	-0.0052	-0.0203	-0.0005	-0.724	-12.53	-1.30
Literacy Rate	0.856	0.224	-0.000124	0.0123	295.43	2.05**
Per Capita NDDP	0.0004	0.0644	-8.3	-0.505	-0.326	-1.39
R²	0.362		0.1834		0.311	

Note: * indicates that the coefficient is significant at 5 per cent level of significance by one tailed test.

** indicates that the coefficient is significant at 5 per cent level of significance by two tailed test.

The results displayed in table-5.7 show that population size and percentage of SC and ST together to the total population has significant positive impact on the area allocated or left for the growth of castor (feed plants). Large size of population indicates more people remain unemployed and thus due to lack of opportunity more people are compelled to adopt easily available ericulture activities. Percentage of poverty also may be an important determinant of it. But due to lack of information at the district level, it is not incorporated as an explanatory variable. Though percentage

of SC and ST is positively related to the area allocated for ericulture, it is negatively related to the production and number of families engaged across the districts. Actually, number of families engaged is more in the districts having more ST population (Karbi Anglong) but not proportional to the percentage of SC or ST. Therefore, percentage of SC and ST is inversely related to the number of families engaged. Moreover, majority of the SC and ST population are illiterate as observed from the sample data who practice by traditional method and hence it has negative impact on the productivity and hence production. Whereas a few of them, who are literate; instead of remaining unemployed prefer to be engaged in ericulture activities. But it does not indicate the relatively higher educated people are engaged in it. The higher educated people rather do not like this occupation.

5.7 Conclusion

In a nutshell, it can be said that ericulture is not uniformly practised across different districts of Assam. In terms of percentage contribution to total state production, Karbi-Anglong, Kokrajhar and N. C. Hills are among the top five-eri cocoon producing districts while Hailakandi and Karimganj have been the two bottom districts during 1990-91 to 2005-06. In the generation of employment of families through ericulture, districts like Karbi Anglong, North Lakhimpur were among the top five districts in Assam during 1995-96 and continued to be at the top still 2005-06 also. Similarly, the districts like Hailakandi, Karimganj, Goalpara, Bongigoan were among the bottom five districts in terms of contribution to state total employment through ericulture throughout the period of discussion. However, unlike production, the gap between contribution of top five and bottom five districts to total family employment in ericulture has increased during the period. In terms of contribution to state total

ericultural land, Bongaigaon, Karimganj and Dibrugarh districts were at the bottom three positions respectively. Since 1998-99, the share of Karbi Anglong to state total ericultural land has been the highest.

In terms of share to total area under ericulture of the state, though ranking has not changed much in the subsequent years, significant changes in ranking in terms of proportion of area of each district used for ericulture have been observed over the years. Goalpara, Morigaon and N. Lakhimpur have recorded leading positions in terms of allocation of area for raising eri feed plants. Moreover, the growth in proportion of area allotted for this purpose is much higher in the districts of Bongaigaon, N. Lakhimpur and Darrang than the others as observed from the significant rise in their ranking. However, majority of the districts maintained their relative ranking over the years. Size of population and percentage of SC and ST are found to be the major reason for the differences in allocation of land for growing eri feed plants. But percentage of SC and ST is not significantly positively related to the number of families engaged. Rather it is inversely related. It is due to the fact that though in absolute sense the districts having more percentage of ST population record larger number of families in ericulture in absolute sense that is not proportional and in those districts these people use or collect castor leaves from larger area. That means they do not use the area properly and scientifically to grow feed leaves and hence production is inversely related though not highly significant.

References

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Appendix-5.1

District-wise Variation in Contribution of Ericulture Proper to the Families Engaged in Assam during 1995-96 to 2005-06

District/Year	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Dhubri	4342	3157	3262	4355	4391	2165	2193	2193	2193	2514	2514
Kokrajhar	1658	3635	9459	2586	4942	1608	1161	1161	1161	1573	8074
Bongaigaon	2502	2865	3096	2217	2700	1642	1604	1604	1604	1604	1604
Goalpara	886	1798	1735	1400	2376	2433	3421	3421	3421	3421	1573
Barpeta	4422	901	1296	4321	860	3262	3794	3889	3889	4343	3421
Nalbari	5771	3003	3228	3761	2997	3141	4484	4484	4484	5670	4345
Kamrup	5031	3760	4766	5038	3563	6525	6525	6552	6552	6552	5671
Darrang	3165	4587	3692	4421	4269	5471	6066	6066	6066	6066	6554
Sonitpur	5704	3714	4790	8232	4081	9706	9428	9428	9428	9428	6066
N.Lakhimpur	6788	6774	10189	3037	7207	3569	2687	2687	2687	3367	12286
Dhemaji	3168	2396	3054	4191	2446	6150	7324	7365	7365	8073	11834
Morigaon	8670	8983	8311	7444	7903	7560	7560	7560	7560	6458	3368
Nagoan	9639	8912	6556	9321	13717	8067	7951	12061	12061	12061	9428
Golaghat	5686	7947	9747	7185	5774	8320	9969	9969	9969	9969	9971
Jorhat	8159	4978	6116	10349	14683	11932	11932	11932	11932	12285	12062
Sibsagar	6346	3168	5071	5261	5939	9636	9636	11833	11833	11833	6460
Dibrugarh	7263	5909	5061	5181	6169	7166	5501	5501	5501	5508	5508
Tinsukia	4358	5529	2769	1867	1360	908	1396	1396	1396	1560	1560
Karbi Angl	4102	3292	2853	2472	2052	2051	2608	2608	2608	2608	14580
N.C. Hills	635	283	562	471	175	313	354	497	497	497	5012
Karimganj	426	580	291	219	160	219	235	235	235	235	498
Hailakandi	16250	12729	13557	20590	14381	12599	14579	14579	14579	14579	236
Cachar	4215	7592	7119	7064	7389	5012	5012	5012	5012	5012	2612
Assam	119186	106492	116580	120983	119534	119455	125420	132033	132033	135216	135237

Source: Directorate of Sericulture, Government of Assam, Guwahati.

District/Year	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05
Dhubri	4342	3157	3262	4355	4391	2165	2193	2193	2193	2514
Kokrajhar	1658	3635	9459	2586	4942	1608	1161	1161	1161	1573
Bongaigaon	2502	2865	3096	2217	2700	1642	1604	1604	1604	1604
Goalpara	886	1798	1735	1400	2376	2433	3421	3421	3421	3421
Barpeta	4422	901	1296	4321	860	3262	3794	3889	3889	4343
Nalbari	5771	3003	3228	3761	2997	3141	4484	4484	4484	5670
Kamrup	5031	3760	4766	5038	3563	6525	6525	6552	6552	6552
Darrang	3165	4587	3692	4421	4269	5471	6066	6066	6066	6066
Sonitpur	5704	3714	4790	8232	4081	9706	9428	9428	9428	9428
N.Lakhimpur	6788	6774	10189	3037	7207	3569	2687	2687	2687	3367
Dhemaji	3168	2396	3054	4191	2446	6150	7324	7365	7365	8073
Morigaon	8670	8983	8311	7444	7903	7560	7560	7560	7560	6458
Nagoan	9639	8912	6556	9321	13717	8067	7951	12061	12061	12061
Golaghat	5686	7947	9747	7185	5774	8320	9969	9969	9969	9969
Jorhat	8159	4978	6116	10349	14683	11932	11932	11932	11932	12285
Sibsagar	6346	3168	5071	5261	5939	9636	9636	11833	11833	11833
Dibrugarh	7263	5909	5061	5181	6169	7166	5501	5501	5501	5508
Tinsukia	4358	5529	2769	1867	1360	908	1396	1396	1396	1560
Karbi Angl	4102	3292	2853	2472	2052	2051	2608	2608	2608	2608
N.C. Hills	635	283	562	471	175	313	354	497	497	497
Karimganj	426	580	291	219	160	219	235	235	235	235
Hailakandi	16250	12729	13557	20590	14381	12599	14579	14579	14579	14579
Cachar	4215	7592	7119	7064	7389	5012	5012	5012	5012	5012
Assam	119186	106492	116580	120983	119534	119455	125420	132033	132033	135216

Source: Directorate of Sericulture, Government of Assam, Guwahati.S C and S T

Population Distribution in Various District of Assam in 1991 and 2001 Census

District	1991		2001	
	S C (Percentage to total population)	S T (Percentage to total population)	S C (Percentage to total population)	S T (Percentage to total population)
Dhubri	4.82	2.42	3.86	1.97
Kokrajhar	3.76	41.15	3.44	33.67
Bongaigaon	10.74	17.53	10.25	12.23
Goalpara	5.50	17.23	4.80	16.03
Barpeta	6.54	7.97	5.70	7.48
Nalbari	8.78	17.67	7.51	17.63
Kamrup	7.54	10.72	6.76	9.93
Darrang	4.95	17.32	4.55	16.61
Sonitpur	5.69	10.71	5.23	11.60
N. Lakhimpur	8.01	23.57	7.88	23.49
Dhemaji	6.37	43.92	5.33	47.29
Marigaon	13.78	15.40	12.93	15.55
Nogoan	10.02	3.69	9.30	3.86
Golaghat	5.59	10.25	5.41	9.93
Jorhat	7.61	12.09	7.87	12.32
Sibsagar	3.56	3.80	3.40	7.95
Dibrugarh	4.02	7.95	4.05	7.45
Tinsukia	2.61	5.35	2.72	5.85
Karbi Anglong	4.22	51.56	3.63	55.69
N.C. Hills	2.60	65.54	1.79	68.28
Karimgang	14.58	0.17	12.99	0.29
Hailakandi	12.05	0.16	10.91	0.15
Cachar	14.70	1.36	14.41	1.29
Assam	7.40	12.82	6.85	12.41

Source: Directorate of Economics and Statistics, *Statistical Handbook*, (2006, 1996), Table- 1.08, P-20 and Table-1.13, P-31.

District wise Literacy Rate in Assam in 1991 and 2001

District	1991	2001
Dhubri	38.36	48.21
Kokrajhar	40.47	51.63
Bongaigaon	49.06	59.33
Goalpara	46.81	58.03
Barpeta	43.24	56.24
Nalbari	55.99	67.23
Kamrup	65.04	74.16
Darrang	42.00	55.44
Sonitpur	48.14	59.00
N. Lakhimpur	58.96	68.56
Dhemaji	53.84	64.48
Marigaon	47.99	58.53
Nogoan	54.74	61.73
Golaghat	58.54	69.38
Jorhat	65.51	76.33
Sibsagar	64.46	74.47
Dibrugarh	58.32	68.96
Tinsukia	50.28	60.95
Karbi Anglong	45.57	57.70
N.C. Hills	57.76	67.62
Karimgang	54.71	66.24
Hailakandi	53.07	59.64
Cachar	59.16	67.82
Assam	52.89	63.25

Source: Directorate of Economics and Statistics, *Statistical Handbook*, (2006), Table- 1.06, P-17.

Gross District Domestic Product of Assam

District	2000-01		1997-98		1994-95	
	TGDDP (Lakh Rs)	Per Capita (Rs)	TGDDP (Lakh Rs)	Per Capita (Rs)	TGDDP (Lakh Rs)	Per Capita (Rs)
Dhubri	110183	6801	90888	6027	84625	5875
Goalpara	62140	7643	48831	6459	42538	5892
Kokrajhar	99284	11081	55582	6128	57698	6666
Bongaigaon	68186	7619	64990	7111	50954	5837
Barpeta	196138	12040	179361	11432	97886	6534
Nalbari	92805	8169	65581	5703	65689	5978
Kamrup	556181	22292	375313	16577	189360	8758
Darrang	111101	7466	78839	5369	66555	4740
Sonitpur	138405	8323	91007	5646	92861	6031
N. Lakhimpur	73567	8341	58869	6918	58554	7208
Dhemaji	43025	7602	27789	5127	32045	6191
Dibrugarh	228688	19513	199075	16645	90857	8062
Tinsukia	201507	17707	78882	7244	104007	9998
Jorhat	165391	16723	115379	11702	65503	6955
Golaghat	119731	12792	77831	8298	58148	6496
Sibsagar	226716	21779	175322	17055	97568	9940
Nagoan	185054	8081	148148	6982	122617	5991
Morigaon	63707	8295	42342	5848	36526	5282
Karbi Anglong	77298	9638	59333	7911	87705	6675
N.C. Hills	32171	17296	24371	14169	28224	5813
Karimgang	88448	8880	75867	8105	56414	6309
Hailakandi	41658	7758	29475	5802	42432	5922
Cachar	166177	11621	117528	8523	22917	14060
Assam	3147561	11937	2280602	8989	1651703	6816

Source: Directorate of Economics and Statistics, *Statistical Handbook*, various issues.

District-wise Variation in Area under Eri Host Plant in Assam during 1995-96 to 2005-06 (Hectares)

District/Year	1993-94	1995-96	1998-99	1999-00	2000-01	2002-03	2004-05	2005-06
Dhubri	119.61	140.07	175.46	187.00	208.00	231.13	238.00	238.00
Kokrajhar	137.48	211.68	244.28	239.00	264.00	307.75	340.00	340.00
Bongaigaon	6.46	16.30	26.37	54.00	107.00	140.86	155.00	155.00
Goalpara	160.57	205.21	267.74	291.00	321.00	423.56	472.00	472.00
Barpeta	50.74	58.96	73.12	74.00	87.00	99.53	103.00	103.00
Nalbari	55.03	73.71	84.36	88.00	104.00	133.47	152.00	152.00
Kamrup	224.28	247.90	296.96	296.00	363.00	408.03	423.00	424.00
Darrang	86.46	116.06	135.29	137.00	173.00	332.47	426.00	427.00
Sonitpur	89.69	119.80	156.20	161.00	190.00	229.26	255.00	255.00
N.Lakhimpur	78.08	126.83	176.32	196.00	304.00	475.02	585.00	587.00
Dhemaji	93.39	107.29	127.60	137.00	205.00	307.03	436.00	436.00
Morigaon	88.26	118.32	174.35	193.00	267.00	381.05	424.00	429.00
Nagoan	121.52	178.73	226.38	245.00	386.00	329.67	385.00	385.00
Golaghat	49.83	53.44	80.29	84.00	133.00	171.32	210.00	210.00
Jorhat	115.15	126.04	156.39	171.00	179.00	220.09	242.00	242.00
Sibsagar	191.50	234.94	262.51	268.00	289.00	309.69	374.00	374.00
Dibrugarh	49.48	73.55	97.62	137.0	151.00	157.31	182.00	182.00
Tinsukia	77.16	91.37	164.74	107.00	115.00	136.27	132.00	132.00
Karbi Anglong	208.64	270.21	354.14	360.00	452.00	552.71	623.00	626.00
N.C. Hills	126.59	157.30	182.51	205.00	244.00	285.12	315.00	315.00

Karimganj	43.55	59.72	64.91	65.00	72.00	86.96	98.00	98.00
Hailakandi	64.34	72.77	92.31	98.00	111.00	121.67	133.00	134.00
Cachar	82.25	132.87	222.68	255.00	354.00	477.49	576.00	578.00
Assam	2325.06	2993.07	3842.53	4048.00	5079.00	6317.46	7279.00	7294.00

Source: Directorate of Sericulture, Government of Assam, Guwahati

Table-5: District-wise Variation in Production of Eri Cut Cocoons (In lakh Kilogram)

Dist/year	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2004-05	2005-06
Dhubri	0.225	0.222	0.21	0.16	0.174	0.24	0.23	0.21	0.19	0.152	0.18	0.19	0.16	0.07
Kokrajhar	0.28	0.33	0.39	0.35	0.30	0.27	0.30	0.26	0.29	0.333	0.39	0.43	0.37	0.36
Goalpara	0.18	0.16	0.22	0.11	0.13	0.12	0.122	0.13	0.09	0.084	0.09	0.10	0.09	0.22
Bongaigaon	NA	NA	NA	0.064	0.11	0.11	0.18	0.11	0.124	0.18	0.180	0.16	0.03	0.18
Barpeta	0.22	0.21	0.20	0.183	0.19	0.20	0.214	0.20	0.20	0.21	0.22	0.17	0.38	0.69
Nalbari	0.18	0.15	0.14	0.113	0.094	0.09	0.09	0.114	0.14	0.13	0.13	0.17	0.24	0.26
Kamrup	0.21	0.26	0.283	0.31	0.29	0.28	0.29	0.303	0.30	0.31	0.30	0.27	0.28	0.45
Darrang	0.20	0.22	0.204	0.284	0.22	0.21	0.27	0.24	0.31	0.26	0.25	0.33	0.35	0.27
Sonitpur	0.21	0.22	0.224	0.274	0.224	0.23	0.25	0.29	0.294	0.292	0.26	0.26	0.56	0.32
Nagaon	0.19	0.22	0.22	0.29	0.23	0.21	0.19	0.24	0.23	0.29	0.24	0.30	0.36	0.32
Marigaon	0.14	0.10	0.02	0.09	0.08	0.11	0.12	0.13	0.144	0.163	0.16	0.12	0.18	0.35
Sibsagar	0.214	0.25	0.26	0.31	0.40	0.32	0.303	0.293	0.31	0.28	0.23	0.24	0.27	0.36
Jorhat	0.23	0.27	0.24	0.26	0.28	0.30	0.29	0.27	0.31	0.22	0.19	0.18	0.29	0.15
Golaghat	0.20	0.19	0.15	0.19	0.24	0.264	0.29	0.15	0.21	0.30	0.29	0.19	0.10	0.12
N.Lakhimpur	0.19	0.21	0.47	0.33	0.23	0.17	0.11	0.193	0.302	0.26	0.27	0.21	0.22	0.21
Dhemaji	0.15	0.13	0.21	0.05	0.154	0.15	0.13	0.132	0.242	0.23	0.26	0.27	0.26	0.27
Dibrugarh	0.164	0.12	0.15	0.13	0.16	0.152	0.123	0.17	0.15	0.143	0.14	0.16	0.19	0.24
Tinisukia	0.19	0.22	0.26	0.294	0.23	0.22	0.24	0.35	0.26	0.19	0.21	0.29	0.28	0.19
Cachar	0.18	0.15	0.21	0.134	0.15	0.13	0.12	0.11	0.11	0.11	0.14	0.10	0.14	0.71
Hailakandi	0.054	0.04	0.06	0.05	0.07	0.06	0.03	0.04	0.03	0.024	0.03	0.03	0.03	0.05
Karimgang	0.09	0.02	0.06	0.03	0.03	0.04	0.034	0.043	0.02	0.02	0.03	0.2	0.20	0.18
Karbi Anglong	1.07	1.03	0.86	1.18	1.13	1.24	0.95	1.47	1.37	1.32	1.30	1.55	1.11	0.83
N.C. Hills	0.24	0.47	0.49	0.60	0.47	0.744	0.654	0.95	0.683	0.52	0.50	0.50	0.23	0.20
Total	4.945	5.181	5.483	5.82	5.58	5.85	5.50	6.40	6.28	5.95	5.99	6.42	6.32	7.00

Source: Directorate of Sericulture, Government of Assam, Guwahati

Chapter-6

Comparative Study of Eri, Muga, Mulberry and Tasar in Assam

6.1. *Introduction*

The state of Assam has a dubious distinction of culturing all four varieties of sericulture. Eri, muga and mulberry have been the traditional practices of the indigenous people of Assam. However, Tasar culture is completely new to them. Initially it was introduced in the two hill districts of Assam, viz. Karbi Anlong and North Cachar Hills during 1975-76 on experimental basis. Still now it is at its infant stage and unable to acquire popularity among the Assamese people. Therefore, its contribution to total silk production, generation of employment and contribution to Net State Domestic Product is negligible.

This chapter is devoted to the comparative analysis of different silk culture in terms of their capacity to generate employment and contribution to income. First of all, a comparative analysis of temporal variation in the production of all varieties of raw silk in Assam during 1980-81 to 2004-05 has been made on the basis of secondary data collected from Directorate of Sericulture, Government of Assam. Thereafter, relative importance of eri, muga and mulberry culture in the total workforce of Assam in the last two censuses has been discussed. It is followed by a comparative discussion of variation in families engaged in eri, muga and mulberry culture in Assam during 1990-91 to 2005-06. Also, cost, gross income and net profit generated per unit of output as well as profit per unit of investment in all varieties of silk have been estimated and compared on the basis of primary data collected in the district of Barpeta as mentioned earlier that throws light on the efficiency of different silk culture in Assam. Finally,

relative contributions of eri and muga products to the export earning of the country in general that has been originated from Assam and their temporal variations have been analysed on the basis of data acquired from the Assam Weavers and Artisans Co-operative Federation Limited (ARTFED).

6.2. Temporal Variation in Eri, Muga, Mulberry and Tasar Raw Silk Production in Assam during 1980-81 to 2004-05

Though Eri, muga and mulberry (locally known as *pat*) have been practiced by the rural Assamese community for a long period of time, tasar culture is a recent innovation in the silk culture of Assam. Moreover, mulberry cultivation has not been practiced extensively in the state. Production of all the four varieties of silk in Assam during 1980-81 to 2004-05 is displayed in table-6.1.

From table-6.1, it is noticed that the production of total raw silk has increased in absolute term from 150 MT in 1980-81 to 562.46 MT in 2004-05, i.e., it grew by 275 per cent during last 25 years. In other words, total raw silk production in Assam has increased by an annual average 11 per cent rate during this period. Major portion of raw silk production has been contributed by eri throughout the period, which shows the unique position of eri raw silk in Assam. Production of eri raw silk has increased from 95 MT in 1980-81 to 474 MT in 2004-05 with marginal decline in some intervening years i.e., it increased to around five times to that of its 1980-81 figure. Production of eri silk has increased because of increase in number of families practising ericulture along with increase in land under eri host plant as shown in chapter-4. In percentage term, its contribution to total raw silk production has also increased from around 63 per cent in 1980-81 to around 84 per cent in 2004-05. Also, it is supported by the rising demand in the market. In spite of lack in product variation unlike muga and mulberry, due to relatively lower price compared to that of other varieties of silk there is no dearth

Table-6.1: Production of Eri, Muga, Mulberry and Tasar Raw Silk in Assam during 1980-81 to 2004-05

Year	Eri Raw Silk (MT)	Muga Raw Silk (MT)	Mulberry Raw Silk (MT)	Tasar Raw Silk (MT)	Total Raw Silk (MT)	Percentage of Eri to Total Raw Silk	Percentage of Muga to Total Silk	Percentage of Mulberry to Total Silk	Percentage of Tasar to Total Raw Silk
1980-81	95	48	7	NA	150	63.33	32.00	4.66	0
1981-82	110	44	7	NA	161	68.32	27.32	4.34	0
1982-83	135	37	10	NA	182	74.17	20.32	5.49	0
1983-84	173	50	13	NA	236	73.30	21.18	5.50	0
1984-85	177	55	16	NA	248	71.37	22.17	6.45	0
1985-86	222	52	15	NA	289	76.81	17.99	5.19	0
1986-87	222	55	11	NA	288	77.08	19.09	3.81	0
1987-88	275	58	17	NA	350	78.57	16.57	4.85	0
1988-89	305	45	11	NA	361	84.48	12.46	3.04	0
1989-90	310	57	15	NA	382	81.15	14.92	3.92	0
1990-91	318	69	18	NA	405	78.51	17.03	4.44	0
1991-92	358	73	18	0.06	449.06	79.72	16.25	4.00	0.01
1992-93	370	60	20	0.17	450.17	82.19	13.32	4.44	0.03
1993-94	405	75	28	0.12	508.12	79.70	14.76	5.51	0.02
1994-95	420	74	24	0.013	518.013	81.07	14.28	4.63	0.01
1995-96	405	86	23	0.01	514.01	78.79	16.73	4.47	0.01
1996-97	425	72	18	0.01	515.01	82.52	13.98	3.49	0.01
1997-98	402	59.6	14.7	NA	476.3	84.40	12.51	3.08	0
1998-99	475	70.00	16	NA	561	84.67	12.47	2.85	0
1999-00	460	81.6	18.20	0.01	559.81	82.17	14.57	3.25	0.01
2000-01	422	94.32	16.89	NA	533.21	79.14	17.68	3.16	0
2001-02	424	91.7	11.7	NA	527.4	80.39	17.38	2.21	0
2002-03*	456.5	92.85	10.35	NA	559.7	81.56	16.58	1.84	0
2003-04	489	94.00	9.00	NA	592	82.60	15.87	1.52	0
2004-05	474	80.75	7.71	NA	562.46	84.27	14.35	1.37	0

Sources: Directorate of Sericulture, Government of Assam, Guwahati.

Notes: (i) * Interpolated figures are considered as those were not available from the secondary sources; (ii) NA means not available.

of buyer in the market. Despite rise in price over time (shown later), still now it is cheaper and hence can reach a wide number of middle and lower-middle income population.

Next to eri, muga raw silk occupies the second position among all the four varieties in terms of its contribution to total production of silk in Assam. The total production of muga raw silk has increased from 48 MT in 1980-81 to 80.75 in 2004-05 with frequent fluctuations in the entire period. Muga rearing is an outdoor sericulture activity. Therefore, it is often influenced by changes in climate, specifically rainfall and therefore the resultant outcome has been heavily dependent on the climatic condition. If the nature is in favour of muga-culturists, the output shoots up and vice versa. On the one hand, it is a costly venture and on the other hand it involves more risk than the other sericulture activities like eri. Though output of muga raw silk has increased over time, in terms of percentage its share to total raw silk production of Assam has recorded a drastic fall from 32 per cent in 1980-81 to 14.35 per cent in 2004-05. The steady fall in percentage of muga to total raw silk production of Assam is attributed to relatively higher rate of growth of eri silk production.

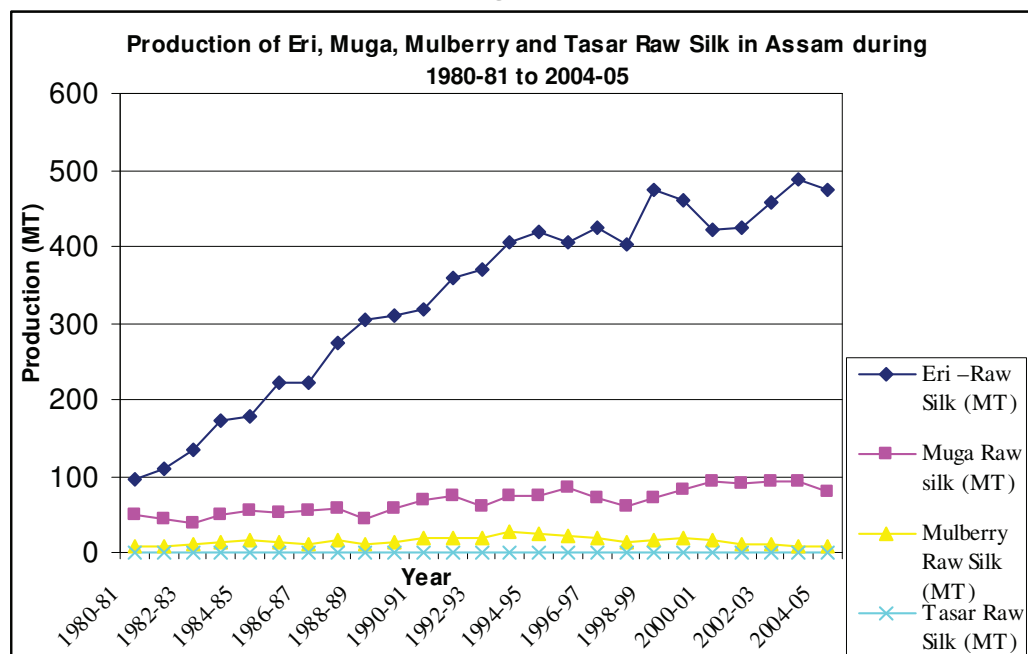
Mulberry raw silk stands third in the total silk production of Assam. Although production of raw silk had increased in the earlier years, it has declined in the last few years. In 2004-05, its position in terms of absolute production turned back to the condition where it was twenty-five years before. Its percentage contribution to total silk production in the state was 4.66 in 1980-81 that increased to 6.45 in 1984-85 and thereafter continuously declined to 1.37 per cent in 2004-05. Actually, the quality of mulberry raw silk of Assam is inferior in comparison to the imported raw silk from Karnataka and China. The majority of commercial weavers of Assam specifically, the weavers of Sualkuchi village (also known as Manchester of Assam) within the Kamrup district do not prefer to use local silk in producing fabrics due to the lack of appropriate

twisting quality. As a result, price of this indigenous silk remained at a very low level and thus mulberry culture in Assam has always been less remunerative and unattractive. Moreover, mulberry silkworms are vulnerable to different diseases and highly sensitive to changes in temperature of climate. Therefore, it also involves high risk and the rearers are not much interested in culturing mulberry silkworm.

Tasar culture is purely a new practice to the Assamese people. It is still confined to only a few people operating on a few hectares of land in the two hill districts of Assam as mentioned earlier. Therefore, its production is very much insignificant in comparison to other varieties of silk. In terms of percentage, its contribution to total silk production is less than even one per cent.

In Assam, eri silk is incomparable with other varieties of silk in terms of production and generation of employment. Therefore, by Assam silk if some one wants to mean eri silk, it would not be an exaggeration at all. Comparative pictures of changes in production of various raw silks over time have also been presented in diagram-6.1.

Diagram-6.1



Here, annual exponential rate of growth of production during 1980-81 to 2004-05 has been estimated by running semi logarithmic regression of the form $\ln Y_t = \alpha + \beta.t + U_t$, (as used in chapter-4), where Y_t is the quantity of output at time t ; t is the time in year; α and β are the two parameters. U is the random disturbance term with usual classical regression properties and β represents the annual exponential rate of growth of Y_t , (output in the present case).¹ The regression result represented by equation-6.1 shows that the annual average exponential rate of growth of eri raw silk production during 1980-81 to 2004-05 was 5.9 per cent, while it was 3.2 per cent in case of muga raw silk production (equation-6.2). Though annual average growth rates of eri and muga are highly significant, exponential growth rate of eri raw silk has been almost double to that of muga.

$$\ln Y_t^{\text{Eri Silk}} = 4.95 + 0.059 t^* \dots\dots\dots R^2 = 0.825 \dots\dots\dots (6.1)$$

(0.006)

$$\ln Y_t^{\text{Muga Silk}} = 3.76 + 0.032 t^* \dots\dots\dots R^2 = 0.790 \dots\dots\dots (6.2)$$

(0.003)

$$\ln Y_t^{\text{Mulberry Silk}} = 1.90 + 0.116 t^{**} - 0.0003 t^2 - 0.00017 t^3 \dots\dots\dots R^2 = 0.78 \dots\dots (6.3)$$

(0.058) (0.005) (0.0001)

$$\ln Y_t^{\text{Tasar Silk}} = -1.41 - 0.56 t \dots\dots\dots R^2 = 0.66 \dots\dots\dots (6.4)$$

(0.203) for the period 1991-92 to 1996-97

Notes: $Y_t^{\text{Eri Silk}}$, $Y_t^{\text{Muga Silk}}$, $Y_t^{\text{Mulberry Silk}}$ and $Y_t^{\text{Tasar Silk}}$ represent production of eri silk, muga silk, mulberry silk and tasar silk in Assam at time t respectively.

Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two tailed test.

** indicates that the coefficient is significant at 10 per cent level of significance by two tailed test.

The terms in the brackets represent standard error of corresponding coefficient.

In case of mulberry silk, annual average exponential rate of growth is estimated to be insignificantly negative, which was -0.0073 per cent (equation-6.3). On the other hand, tasar silk production declined significantly at an annual exponential rate of 56 per cent during

¹ In case of mulberry polynomial of degree three yields best fit of the data.

1991-92 to 1996-97, which is shown in equation-6.4. Though some people in the areas of Karbi Anglong and N. C. Hills initially started through government support, they found it not much remunerative and with gradual decline in government support many of them withdrew from it.

6.3. Contribution of Eri, Muga and Mulberry Culture to Total Workforce in Assam

In Assam, thousands of people practice different types of sericulture viz. ericulture, mugaculture, mulberry culture and tasar culture². The 1991 Census reports that only 6.93 per cent of total workforce in Assam was engaged in total sericulture. During 2001, contribution of sericulture as a whole to total workforce both in absolute and percentage terms declined. In percentage term, it declined to 5.43 per cent. It is because of the relatively faster growth of the tertiary sector as happened in other parts of the country during this period. Moreover, many newly educated youths hesitate to take up sericulture as a means of livelihood and move to urban and semi urban areas in search of government or private jobs.

In the total sericulture, contributions of different sericulture activities have not been uniform. Ericulture occupies the prime position in terms of employment generation both in 1991 and in 2001. Of course, its contribution to total workforce of the state was not very remarkable.³ Moreover, its contribution to total workforce has declined from 4.55 per cent to 3.95 per cent in spite of increase in absolute number from 3.68 lakhs to 3.76 lakhs during 1991 to 2001.

² Secondary data on number of people engaged in tasar culture is not available in Assam. Also the number is very insignificant as realized from the production of it in the state. Therefore, number of people engaged in this occupation is not considered here.

³ The Census only reports about the number and percentage of workforce engaged in the agricultural part of various sericulture activities. People engaged in the industrial part (spinning/reeling and weaving) of these are shown along with textile industry and marginal workers for the unorganised petty cottage activities and thus not included here.

In comparison to ericulture, the contribution of mugaculture and mulberry culture to total workforce of Assam is very much limited. In the total workforce of Assam, the share of muga-culture and mulberry culture in percentage terms was only 0.99 and 1.39 respectively in 1991. In the year 2001, unlike ericulture the number of people engaged in both muga and mulberry culture declined. Consequently, percentage contribution of both cultures to total workforce of the state also declined drastically to 0.68 and 0.81 respectively in 2001. Number of people practising muga declines because of fall in per capita land holding and conversion of some *somanies* to other highly remunerative cultivation like tea garden. Moreover, mugaculture involves high risk and it is tedious to operate. Similarly, number of families practising mulberry culture has fallen due to its low demand (for the uncompetitive quality owing to climatic and technical limitations) and thus consequent low price.

Table-6.2
Contribution of Eri, Muga and Mulberry Culture to Total Workforce of Assam

Year →		1991	2001	Change in Percentage
Workforce (Number)		8088935	9538591	17.92
Number of Families	Eri	122672	125420	2.24
	Muga	26757	21831	-18.41
	Mulberry	37407	25667	-31.38
	Total	186836	172918	-7.45
Number of Rearers	Eri	368016	376260	2.24
	Muga	80271	64493	-19.66
	Mulberry	112221	77001	-31.38
	Total	560508	466420	-16.79
Percentage to Total Workforce	Eri	4.55	3.95	-13.19
	Muga	0.99	0.68	-31.31
	Mulberry	1.39	0.81	-41.73
	Total	6.93	5.43	-21.65

Source: (i) Directorate of Economics and Statistics, Government of Assam (1997), *Statistical Handbook*, Table-1.13, P-30.

(ii) Directorate of Economics and Statistics, Government of Assam (2005), *Statistical Handbook*, Table-1.10, P-28

(iii) Government of India, Directorate of Census Operation, 1991 and 2001, *Census of India*, 1991 and 2001.

Note: *Total numbers of rearers is estimated by multiplying the number of families by 3 (the average member of rearers in a family in the study area).

6.4. Generation of Employment in Eri, Muga and Mulberry Culture in Assam during 1990-91 to 2005-06

Eri, muga and mulberry culture have been a source of employment to thousands of people partially or fully in Assam for centuries. This primary sector provides employment at various levels of activities viz. rearing of silkworm, spinning or reeling of cocoon, weaving and marketing of fabrics. In this section, the role of eri, muga and mulberry respectively in the generation of employment of families in Assam is analysed and also a comparison is made among these three sericulture activities.

Table-6.3 illustrates the temporal pattern of variation in number of families engaged in eri, muga and mulberry culture in Assam during 1990-91 to 2005-06. From the table, one can notice that number of families engaged in total sericulture increased in absolute sense from about 1.81 lakh in 1990-91 to 1.95 lakh in 2005-06 in spite of a drastic fall in the year 1995-96. Though all categories of sericulture activity had a setback in terms of number of families engaged in that year, muga and mulberry culture were worse affected and the reasons have already been explained in chapter-4.

In case of ericulture, number of families associated with ericulture increased from about 1.18 lakh in 1990-91 to 1.35 lakh in 2005-06 with minor ups and downs in the middle years. In terms of percentage to total sericulture families also, its contribution has increased from 65.22 per cent in 1990-91 to 69.29 per cent in 2005-06. The main reason for its attractiveness among the sericulturists is low required investment, easy to operate, less risk and finally it's by-product pupae that also fetches some revenue along with providing substitute portentous food to the poor eri practicing families.

The number of families engaged in mugaculture also increased initially from about 26087 in 1990-91 to 29409 in 1994-95. It was followed by a negative trend in the next two

years, after which it grew continuously and reached a figure 32814 in 2005-06. The fall in number of families during 1995-96 and 1996-97 was because of the devastating flood for which numbers of muga rearers had to abandon their practice during 1995-96 as mentioned earlier and also for the conversion of some *somanies* into more remunerative tea gardens in some areas of upper Assam. But in the subsequent years, as more and more waste land were brought under cultivation of host plant, the situation improved, the number of families practising mugaculture also increased. With the increase in number of families connected with mugaculture, its contribution to total sericulture families also improved slowly from 14.37 per cent in 1990-91 to 16.82 per cent in 2005-06.

Table-6.3
Families Engaged in Sericulture in Assam during 1990-91 to 2005-06

Year	Eri	Muga	Mulberry	Sericulture Total	Percentage to Sericulture		
					Eri	Muga	Mulberry
1990-91	118410	26087	37052	181549	65.22	14.37	20.41
1991-92	122672	26757	37407	186836	65.66	14.32	20.02
1992-93	123327	26974	37506	187807	65.67	14.36	19.97
1993-94	124024	27209	37635	188868	65.67	14.41	19.93
1994-95	128021	29327	38763	196111	65.28	14.95	19.77
1995-96	128186	29409	38822	196417	65.26	14.97	19.77
1996-97	113492	14363	25375	153230	74.07	9.37	16.56
1997-98	116580	14230	22188	152998	76.20	9.30	14.50
1998-99	121003	14910	26201	162114	74.64	9.20	16.16
1999-00	119534	17882	31385	168801	70.81	10.59	18.59
2000-01	119320	21569	25965	166854	71.51	12.93	15.56
2001-02	125420	21831	25667	172918	72.53	12.63	14.84
2002-03*	128727	22687	27691	179105	71.87	12.67	15.46
2003-04	132033	23543	29715	185291	71.26	12.71	16.04
2004-05	135216	27880	27070	190166	71.10	14.66	14.23
2005-06	135237	32814	27101	195152	69.30	16.81	13.89

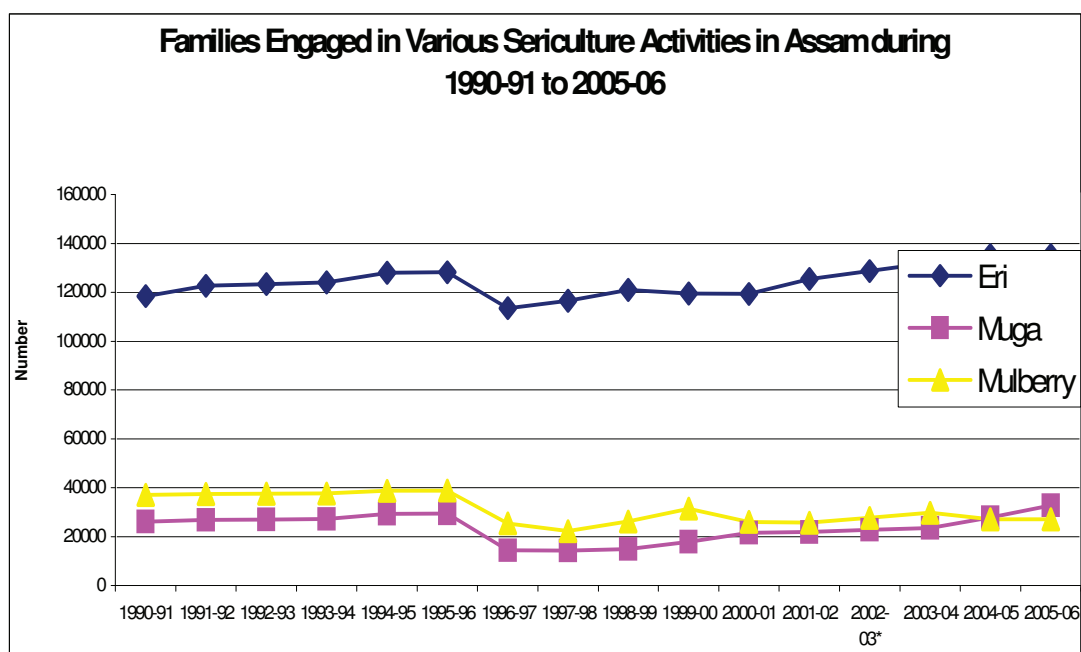
Source: Directorate of Sericulture, Government of Assam, Guwahati.

Note: * Interpolated figures are considered, as those were not available from the secondary sources.

The position of mulberry culture in the generation of employment of families in Assam is not satisfactory at all. Although the number of families engaged in mulberry culture increased initially from 37052 in 1990-91 to 38822 in 1994-95, it had a radical fall

like other two sericulture activities in the year 1995-96. It was because of the same flood, which affected the entire sericulture. After the worse hit due to flood, though number of families connected with eri and muga culture recovered and improved a lot, the mulberry culture could not register any improvement. It is because of stiff competition from low priced relatively better quality mulberry silk of Karnataka and that of the neighbouring country China. As a result, number of families in mulberry culture and its percentage to total sericulture in Assam declined noticeably during the whole period of discussion. Diagram-6.2 and 6.3 also shows that during the years when sericulture faced a set back though all three categories of it declined in absolute sense, percentage of ericulture increased due to larger negative effects on muga and mulberry than ericulture.

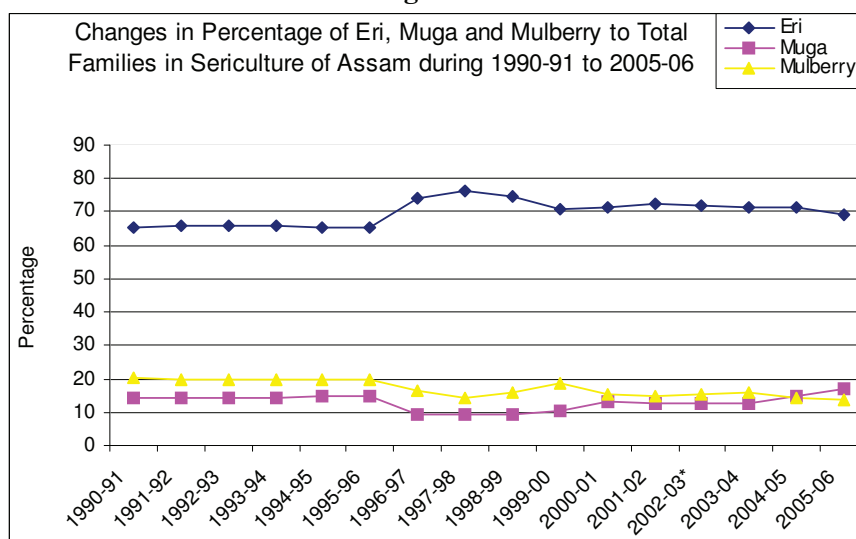
Diagram-6.2



The regression result shows that the annual average exponential rate of growth of families engaged in sericulture as a whole, during 1990-91 to 2005-06 was 2.56 per cent (equation-6.5). Among eri, muga and mulberry culture, the annual exponential rate of

growth of families is the highest in mugaculture, which was about 8 per cent (equation- 6.7) and followed by eri and mulberry culture with figures recorded at 1.92 and 1.28 per cent respectively (equations-6.6 and 6.8) during 1990-91 to 2005-06. In spite of higher rate of growth, proportion of muga families is still lower as it started with a very lower base and still now majority of families prefer ericulture.

Diagram-6.3



$$\ln Y_t^{\text{Employment in Sericulture}} = 11.76 + 0.0256 t^* \dots \dots \dots R^2 = 0.9617 \dots \dots \dots (6.5)$$

(0.0017)

$$\ln Y_t^{\text{Employment in Eri}} = 11.51 + 0.0192 t^* \dots \dots \dots R^2 = 0.9324 \dots \dots \dots (6.6)$$

(0.0014)

$$\ln Y_t^{\text{Employment in Muga}} = 9.002 + 0.0801 t^* \dots \dots \dots R^2 = 0.9068 \dots \dots \dots (6.7)$$

(0.0088)

$$\ln Y_t^{\text{Employment in Mulberry}} = 10.05 + 0.0128 t^* \dots \dots \dots R^2 = 0.8798 \dots \dots \dots (6.8)$$

(0.0071)

Notes: $Y_t^{\text{Employment in Sericulture}}$, $Y_t^{\text{Employment in Eri}}$, $Y_t^{\text{Employment in Muga}}$ and $Y_t^{\text{Employment in Mulberry}}$ represent employment in sericulture, ericulture, mugaculture and mulberry culture in Assam at time t respectively.

Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two tailed test.

The terms in the brackets represent standard error of the corresponding coefficient.

6.5. Contribution of Eri, Muga and Mulberry Raw Silk to Net State Domestic Product of Assam during 1980-81 to 2004-05

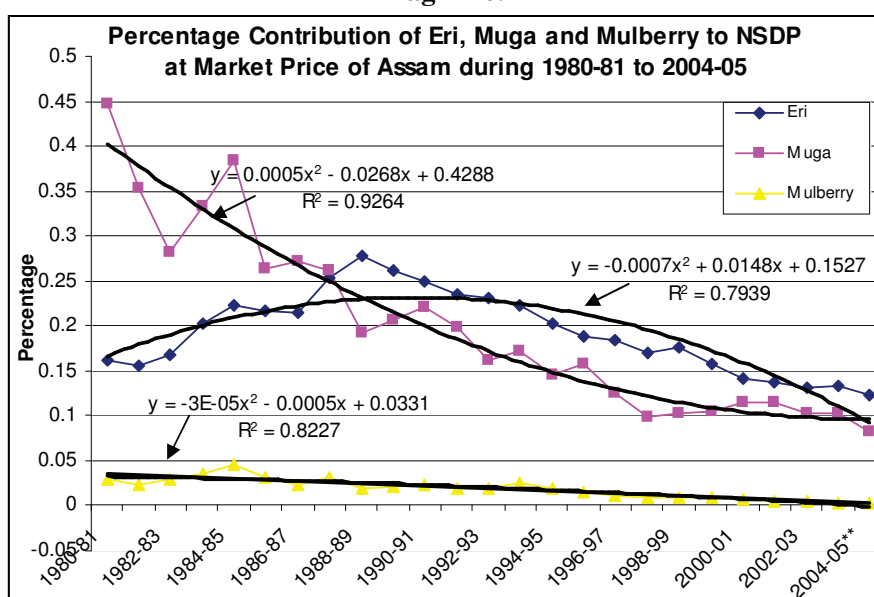
The share of sericulture to NSDP of Assam is not substantial and the contribution of different components of sericulture viz., eri, muga and mulberry also has not followed a uniform trend. However, if the industrial part of sericulture is concerned the total contribution will not be insignificant at all. Moreover, its importance cannot be taken at a discount as it provides sustenance to a large section of rural population and also helps rural women to earn economic security and respect in their society. In Assam, government procurement price of raw silk is available from the secondary sources. But hardly any spinner or reeler sale their raw silk to the government department as market price of raw silk is much higher than the procurement price offered by the government. Therefore, market prices of silk is taken from the rearers and from the personal record of field officers of sericulture department, Government of Assam and using those figures contribution of eri, muga and mulberry raw silk to NSDP at market price of Assam is estimated for the period 1980-81 to 2004-05, which is presented in table-6.4.

From table-6.4, it is observed that total market value of raw silk output in Assam has increased from 15.06 crores in 1980-81 to 80.81 crores in 2004-05 i.e., it increased by more than five times during this 25 years. Value of total raw silk increased because of increase in both prices as well as output. However, its contribution to NSDP is still below one per cent and its contribution declined from 0.639 per cent in 1980-81 to 0.209 per cent in 2004-05 despite rise in total absolute value. This has been due to higher rate of growth recorded in other sectors, especially tertiary sector of the state.

In case of eri raw silk, absolute value of output increased significantly from 3.8 crores in 1980-81 to 47.4 crores in 2004-05. It indicates that value of raw silk increased by

more than 15 times within a period of 25 years. It is attributed to the rise in production of raw silk from 95 MT in 1980-81 to 474 MT in 2004-05 and also rises in its price from Rs.400 to Rs.1000 per kg during the same period. In terms of percentage, the share of eri raw silk to NSDP of Assam though increased initially from 0.162 in 1980-81 to 0.278 in 1988-89, it declined in the subsequent years and reached to 0.123 in 2004-05, which is also depicted in diagram-6.4.

Diagram-6.4



Note: **indicates that the figure of NSDP is provisional

The contribution of muga raw silk to NSDP of Assam at market price is much lower than that of eri. Initially, muga raw silk was at first position in terms of absolute value and proportional contribution to NSDP among all varieties of sericulture. But after 1987-88, it was relegated to 2nd position by eri whose production and price both grew at faster rate than that of muga (though number of families in muga-culture has increased at a faster rate than that of eri). The total value of muga raw silk has increased from 10.56 crores in 1980-81 to 32.3 crores in 2004-05 with greater yearly fluctuations than that of eri. During this period,

Table-6.4
Contribution of Eri, Muga and Mulberry Raw Silk to NSDP at Market Price of Assam during 1980-81 to 2004-05

Year	NSDP at Market Price	Production of Raw Silk (MT)			Price of Raw Silk (Rs)			Values of Different Raw Silk Outputs (Rs)			
		Eri	Muga	Mulberry	Eri	Muga	Mulberry	Eri	Muga	Mulberry	Total
1980-81	2356	95	48	7	400	2200	1000	3.8	10.56	0.7	15.06
1981-82	2978	110	44	7	420	2400	1020	4.62	10.56	0.71	15.89
1982-83	3398	135	37	10	420	2600	1020	5.67	9.62	1.02	16.31
1983-84	3766	173	50	13	440	2500	1050	7.61	12.5	1.36	21.47
1984-85	3725	177	55	16	470	2600	1050	8.31	14.3	1.68	24.29
1985-86	5118	222	52	15	500	2600	1100	11.1	13.52	1.65	26.27
1986-87	5476	222	55	11	530	2700	1150	11.76	14.85	1.26	27.88
1987-88	5993	275	58	17	550	2700	1150	15.12	15.66	1.95	32.74
1988-89	6563	305	45	11	600	2800	1180	18.3	12.6	1.29	32.19
1989-90	7741	310	57	15	650	2800	1180	20.15	15.96	1.77	37.88
1990-91	8905	318	69	18	700	2850	1190	22.26	19.66	2.14	44.06
1991-92	10632	358	73	18	700	2900	1200	25.06	21.17	2.16	48.39
1992-93	11543	370	60	20	720	3100	1210	26.64	18.6	2.42	47.66
1993-94	13477	405	75	28	740	3100	1210	29.97	23.25	3.38	56.60
1994-95	15615	420	74	24	750	3100	1250	31.5	22.94	3.00	57.44
1995-96	17170	405	86	23	800	3150	1250	32.4	27.09	2.87	62.36
1996-97	18465	425	72	18	800	3250	1280	34	23.4	2.30	59.70
1997-98	20211	402	59.6	14.7	850	3350	1290	34.17	19.96	1.89	56.03
1998-99	22710	475	70	16	850	3350	1300	40.37	23.45	2.08	65.90
1999-00	26273	460	81.6	18.2	900	3400	1300	41.4	27.74	2.36	71.51
2000-01	28262	422	94.32	16.89	950	3500	1320	40.09	33.01	2.22	75.33
2001-02	29418	424	91.7	11.7	950	3700	1350	40.28	33.92	1.57	75.78
2002-03	33516	456.5	92.85	10.35	970	3700	1380	44.28	34.35	1.42	80.06
2003-04	35700	489	94	9	980	3900	1400	47.92	36.66	1.26	85.84
2004-05**	38624	474	80.75	7.71	1000	4000	1450	47.4	32.3	1.11	80.81

Sources: (1) Directorate of Sericulture, Government of Assam, Guwahati

(2) Government of India, *Economic Survey*, Various Issues, P-S-11

Notes: * Prices of eri, muga and mulberry raw silk are the average price collected from the rearers of sampling area of Barpeta district and field officers of Sericulture Department, Government of Assam.

** Figure of NSDP of Assam during 2004-05 is provisional.

Table-6.4 (continued)

Year	Percentage of Raw Silk to NSDP of Assam			Percentage of Total Silk to NSDP
	Eri	Muga	Mulberry	
1980-81	0.162	0.448	0.029	0.639
1981-82	0.155	0.354	0.023	0.533
1982-83	0.167	0.283	0.030	0.479
1983-84	0.202	0.332	0.036	0.571
1984-85	0.223	0.383	0.045	0.652
1985-86	0.217	0.264	0.032	0.513
1986-87	0.215	0.271	0.023	0.509
1987-88	0.253	0.261	0.032	0.546
1988-89	0.278	0.192	0.019	0.490
1989-90	0.261	0.206	0.022	0.489
1990-91	0.249	0.221	0.024	0.494
1991-92	0.236	0.199	0.020	0.455
1992-93	0.231	0.161	0.020	0.412
1993-94	0.222	0.172	0.025	0.420
1994-95	0.202	0.146	0.019	0.367
1995-96	0.188	0.157	0.016	0.363
1996-97	0.184	0.126	0.012	0.323
1997-98	0.169	0.098	0.009	0.277
1998-99	0.177	0.103	0.009	0.290
1999-00	0.157	0.105	0.009	0.272
2000-01	0.142	0.116	0.007	0.266
2001-02	0.137	0.115	0.005	0.257
2002-03	0.132	0.102	0.004	0.238
2003-04	0.134	0.102	0.003	0.240
2004-05**	0.123	0.083	0.002	0.209

Sources: (1) Directorate of Sericulture, Government of Assam, Guwahati
(2) Government of India, *Economic Survey*, Various Issues, P-S-11

Note: * Prices of eri, muga and mulberry raw silk are the average price collected from the rearers of sampling area of Barpeta district and field officers of Sericulture Department, Government of Assam.

** Figure of NSDP of Assam during 2004-05 is provisional.

production of it has increased from merely 48 MT to 80.75 MT. However, its percentage contribution to NSDP has declined drastically from 0.448 in 1980-81 to 0.083 in 2004-05 except a sharp increase during 1983-84 to 1984-85 as shown in diagram-6.4. Among the three major sericulture activities, the contribution of mulberry raw silk to NSDP of Assam at market price is the lowest. It was due to both slow growth of production of mulberry raw silk as well as its price. Though value of mulberry raw silk increased marginally from 0.7 crores in 1980-81 to 1.11 crores in

2004-05, its share to NSDP of Assam has been very insignificant. Moreover, a downward trend of percentage contribution has been recorded from 0.029 in 1980-81 to 0.002 in 2004-05.

From table-6.4 it is also observed that among three major varieties of silk, muga raw silk has always been the dearest and eri raw silk has always been the cheapest, which is the prime reason that in spite of less product variation eri final product reaches to most of the people in the state as against muga that reaches to only a particular richer section of population.⁴ But over time variation in price shows different pattern for these three varieties. Price of muga raw silk during 1980-81 was Rs.2200 per kilogram and that increased to Rs.4000 during 2004-05. It is followed by mulberry whose price was Rs.1000 per kilogram in 1980-81 and rose to Rs.1450 during 2004-05 and price of eri raw silk increased from only Rs.400 per kilogram to Rs.1000 during the same period. There has been consistently higher demand for eri silk (in spite of rising production), which is clear from the rise in price of it at relatively faster rate than the other two varieties. Still now it is the cheapest among all these three varieties. Hence, production of eri silk has grown at a faster rate than the other two varieties as observed earlier.

In spite of having low level of production of muga raw silk, total value of output and its contribution to total sericulture output was the highest during 1980-81. But due to the higher rate of growth of eri silk and its price after 1987-88 total value of eri silk output overtook that of muga. The estimated regression results represented by equations-6.9, 6.10 and 6.11 also show that the annual average exponential rate of growth of price of eri, muga and mulberry silk during 1980-81 to 2004-05 was 4, 2.1 and 1.4 per cent respectively. But the growth of eri-silk price is associated with higher fluctuations. Yet, its temporal growth is significantly higher than that of others. In case

⁴ The ordinary people (in the middle or lower middle income group) purchase muga fabrics only on some special occasions like marriage and other important social activities.

of value, eri, muga and mulberry silk increased by annual average exponential rate of 10, 5.3 and 2.2 per cent respectively (equations-6.12, 6.13 and 6.14) during the same period.

$\text{Ln } Y_t^{\text{Price of Eri Silk}} = 5.99 + 0.040 t^* \dots\dots\dots R^2 = 0.969 \dots\dots\dots (6.9)$ <p style="text-align: center;">(0.002)</p>
$\text{Ln } Y_t^{\text{Price of Muga Silk}} = 7.74 + 0.021 t^* \dots\dots\dots R^2 = 0.976 \dots\dots\dots (6.10)$ <p style="text-align: center;">(0.001)</p>
$\text{Ln } Y_t^{\text{Price of Mulberry Silk}} = 6.92 + 0.014 t^* \dots\dots\dots R^2 = 0.970 \dots\dots\dots (6.11)$ <p style="text-align: center;">(0.001)</p>
$\text{Ln } Y_t^{\text{Value of Eri Silk}} = 1.73 + 0.100 t^* \dots\dots\dots R^2 = 0.901 \dots\dots\dots (6.12)$ <p style="text-align: center;">(0.007)</p>
$\text{Ln } Y_t^{\text{Value of Muga Silk}} = 2.29 + 0.053 t^* \dots\dots\dots R^2 = 0.925 \dots\dots\dots (6.13)$ <p style="text-align: center;">(0.003)</p>
$\text{Ln } Y_t^{\text{Value of Mulberry Silk}} = 0.237 + 0.022 t^* \dots\dots\dots R^2 = 0.161 \dots\dots\dots (6.14)$ <p style="text-align: center;">(0.011)</p>
<p>Notes: (i) $Y_t^{\text{Eri Silk Price}}$, $Y_t^{\text{Muga Silk Price}}$ and $Y_t^{\text{Mulberry Silk Price}}$ represent price of eri silk, muga silk and mulberry silk, while $Y_t^{\text{Value of Eri Silk}}$, $Y_t^{\text{Value of Muga Silk}}$ and $Y_t^{\text{Value of Mulberry Silk}}$ represent value of eri, muga and mulberry silk in Assam at time t respectively.</p> <p>(ii) Here, * indicates that the coefficient is significant at both 1 and 5 per cent level of significance by two tailed test. The terms in the brackets represent standard error of the corresponding coefficients.</p>

6.6. Production of Eri, Muga and Mulberry Raw Silk per Hectare and per Family

In this section, productivity of per hectare of land under the growth of host plant and variation in output per average rearing family is measured in terms of production of raw silk. Table-6.5 shows the comparative picture of production of eri, muga and mulberry raw silk per rearing family and per hectare under host plant of each category during 1990-91 to 2004-05. Eri silk production per family has increased continuously from 2.68 kilogram in 1990-91 to 3.51 kilogram in 2004-05. Production of muga raw silk per family also increased from 2.65 to 2.89 kilogram during the same period. Its production has increased in spite of decline in number of families practising muga culture during the period. It is due to fact that the existing families have been culturing muga extensively as area under each family and hence availability of host plant has increased during the period. In case of mulberry, though production of silk per family

has increased from 0.48 kilogram to 0.59 kilogram during 1990-91 to 1995-96, it declined again to 0.46 in 2001-02 and then further to 0.28 kilogram in 2004-05. During the period, production per eri rearing family has increased at faster rate than of muga and mulberry.

Table-6.5
Production of Raw Silk per Family and per Hectare of Land under Host plants
during 1990-91 to 2004-05

	Year	1990-91	1995-96	2001-02	2004-05	Percentage
Production of Raw Silk (MT)	Eri	318	405	424	474	Growth during 1990-91 to 2004-05
	Muga	69	86	91.7	80.75	
	Mulberry	18	23	11.7	7.71	
Engagement of Families (Number)	Eri	118410	128186	125420	135216	
	Muga	26087	29409	21831	27880	
	Mulberry	37052	38822	25667	27070	
Area under Host Plant (Hectare)	Eri	2005.37	2993.07	5694.38	7279	262.98
	Muga	1667.99	2624.25	5007.24	7172	329.98
	Mulberry	1134.61	2986.07	3921.46	3811	235.89
Production of Raw Silk per Family (kg)	Eri	2.68	3.16	3.38	3.51	30.97
	Muga	2.65	2.93	4.20	2.89	9.06
	Mulberry	0.48	0.59	0.46	0.28	-41.67
Production of Raw Silk per Hectare (Kg)	Eri	158.58	135.31	74.46	65.12	-58.94
	Muga	41.37	32.78	18.32	11.17	-73.00
	Mulberry	15.87	7.71	2.98	2.03	-87.21
Area under Host Plant per Rearing Family	Eri	0.02	0.02	0.05	0.054	170.00
	Muga	0.06	0.09	0.23	0.26	333.33
	Mulberry	0.03	0.08	0.15	0.14	366.67

Source: Directorate of Sericulture, Government of Assam.

However, production of all the three varieties of raw silk per hectare of land under host plant has declined radically during 1990-91 to 2004-05. It means that though land under host plant per family has increased significantly, the increased area have not been used intensively by the associated families. From the table it is observed that area per family in case of mulberry has increased at much higher rate (366 per cent) and its output per hectare has declined at a faster rate (-87.21 per cent) i.e., there is a significant inverse relationship between increase in area under host plant per family and the output per hectare which is also examined by running regression of output per

hectare on the area per family and comparing the coefficients of these three varieties statistically.⁵

6.7. Mode of Working and Cost, Revenue and Profit per Unit Output of Eri, Muga and Mulberry Cocoon among the Sample Families

Cost, revenue and profit are important aspects that determine the effectiveness and desirability of any economic activity. Here selling price of cocoon at any point of time is almost fixed (by the offer price of the middlemen traders) as the market is dominated by the cocoon buyers. Therefore the total revenue is determined by the quantity of the output only. Therefore, profit per unit of output is determined by the cost per unit of output, which is affected by the efficiency of the farm (though technology used by all of them are almost identical in the study area) and the scale of production. Here components of cost in sericulture are classified into two broad categories, viz. explicit cost and implicit cost. The explicit cost includes cost of seed, feed of worms, wages paid to hired labour (which is almost absent in the sample), depreciation of rearing appliances and rearing house and transport cost for the collection of food leaves and marketing if any. These can also be termed, as capital cost. On the other hand, implicit cost is the cost of household labour that are not paid explicitly but there is opportunity cost of those labourers who could do some other activities during the time engaged in sericulture (of course not very high as there is lack of opportunities to them). As many of the sample families do not weave eri cocoon and all the sample muga and mulberry rearing families do not weave silk cloths, here

⁵ For the comparison of differences in impact of area per family on output per hectare is done by using the following test statistics.

$$F_{n_1-2, n_2-2} = \frac{(\beta_1 - \beta_2)}{\{(n_1-2)s_1^2 + (n_2-2)s_2^2\}/(n_1+n_2-4)}$$

comparison of cost and benefit is made only for the cocoon production up to which data are available.

As eri and mulberry silkworm rearing is a part time occupation of the family members in most cases and the members are not fully engaged throughout the day, the number of people engaged cannot be equated with the number of man-days generated in this occupation as mentioned earlier (in chapter-4). Here generation of employment is estimated through the number of working-hours required from the collection of leaves to the production of eri cocoons. In case of eri and mulberry, normally every day three hours are required for the maintenance i.e., collection of leaves, supply of food leaves to the worms and clearing of the rearing trays. Gestation period of eri and mulberry are found to be same. Usually 20 days of gestation period are there for the harvesting of one brood of cocoon during the summer, which is lengthened to maximum 28 days during winter season. Therefore, the total man-hours required to harvest one brood of cocoon is 60 man-hours ($= 3 \times 20$), i.e., equivalent to 7.5 working days during summer⁶. Whereas during winter season, number of man-days required for harvesting a brood of cocoon is about 10.5 equivalent man-days.

In case of muga-culture, constant engagement of labour is necessary from the time of placing tiny worms on the feed plants just after breeding till maturity stage. The rearers have to stay round the clock in the *somanies* to protect the silkworm from the attack of birds, monkeys etc and to shift the worm from one plant to another as they crawl down in search of feed leaves. In general, the gestation period of muga worm is 23 days during summer and 42 days in winter. These jobs are performed mainly by the adult male members of the family. Sometimes, hired labourers are also engaged in rearing. Therefore, cost of labour is considerably higher in muga-culture than that in eri

⁶Here eight hours is considered to be equal to one man-day.

and mulberry culture. Similarly, it is difficult to estimate the quantity of leaves and cost of leaves used by the rearers to feed worms. In case of eri, most of the rearers collect leaves free of cost grown in nature or from their homestead or from Eri Concentration Centres. Similarly, the mulberry rearers collect leaves from the primary host plant *Nuni* grown in and around their homestead and sometimes from the Collective Mulberry Gardens⁷ (CMGs) at free of cost. But there is a hidden cost in it. That is the cost of transport and imputed labour cost for the collection of food leaves that varies proportionately with the distance to be covered (time spent) for the collection of leaves by the rearers. However, in case of muga-culture, plantation of host plant is necessary, which increases the cost per unit of output considerably as compared to that of eri. Of course, some muga rearers perform their activities in Village Grainage Reserves (VGR) at free of cost i.e., no rent is paid for the use of rearing house and host plant.⁸

The equipments used in rearing of silkworms are traditional and very simple and made of locally available bamboo and cane. The equipments used for rearing are *dola*⁹, *chalni*, *dang*¹⁰, *pachi*¹¹, bamboo racks etc. A large section of the rearers prepare these equipments at home from their own or borrowed bamboo and cane from others. Other rearers, who cannot prepare, purchase the required equipments from their local markets. Though price of these equipments varies from place to place the rates are very nominal and these last for a considerable number of years implying that the depreciation costs on equipments are negligible. Usually, the equipments can be used

⁷ Collective Mulberry Gardens have been set up by the state government and maintained by the government employees to supply feed leaves to the rearers.

⁸ Village Grainage Reserves are set up and nourished by Assam government to facilitate *Som tree*, the muga host plant to the muga rearers at free of cost.

⁹ Dola is a small bamboo tray used in rearing.

¹⁰ Dang is a bamboo bar kept horizontal to drop the food leaves with eri and mulberry silkworm for feeding purpose.

¹¹ Pachi is a small basket made of bamboo used to keep the cocoon by the rearers.

for 3 to 5 years and some even for longer period depending on the quality. In case of rearing house, cent percent rearers are found to use a part of their dwelling houses.

Eri and mulberry cocoons are sold in terms of weight. Conversely, muga cocoons are sold in terms of number. Therefore, to make a comparison of revenue and profit among eri, mulberry and muga, muga cocoons are converted into kilogram. During field investigation, one kilogram of muga cocoon was found to contain on an average 374 cocoons. Hence, the value of 374 cocoons is considered to compare with the value of one kilogram of eri and mulberry cocoons.

Cost, revenue and profit of rearing eri, muga and mulberry cocoon are estimated and presented in table-6.6, 6.7 and 6.8. From table-6.6, it is observed that 180 sample families generated a sum of Rs.368064.5 total revenue from the production of 1267.63 kilogram of eri cocoon (revenue from cocoon and pupae) during the previous one-year. A sum of Rs.19947 was spent by the rearing families in the form of annual depreciation of rearing appliances, cost of seed, and cost of transport for the collection of leaves etc. Thus, the rearers together earned a gross profit over the explicit cost of Rs.348117.5. Gross profit from a kilogram of cocoon production is Rs.274.62. Of course, this gross profit includes the imputed cost of self-employed labour. Imputed labour cost is much higher than the explicit cost of production of cocoon. Taking into account the wage of similar other activities (existing agricultural wage), a sum of Rs.185592.5 would be the opportunity cost of family labour used for the purpose. Therefore, total net profit earned by the rearers would be only Rs.162525. Net profit per kilogram of cocoon production was Rs.128.21 while gross profit per kilogram was Rs.274.62. Gross profit as well as net profit per kilogram of cocoon production was the highest in Gahia village within Sarukhetry block with Rs.313.88 and Rs.160.48 respectively, while it was the lowest in Agdia village with Rs.228.61 and Rs.41.77 within the same block. In the

village Agdia, gap between gross and net profit per kilogram of eri cocoon was much higher due to relatively higher wage rate that these villagers can earn working in agriculture compared to their counterpart in other villages.

Table-6.6
Cost, Revenue and Profit in Eri Cocoon Production of the Sample Households
during 2005-06

Block	Village	Production of Cocoon (Kg)	Total Revenue (Rs)	Total Explicit Cost (Rs)	Gross Profit over Total Explicit Cost (Rs)	Implicit Labour Cost (Rs)	Net Profit over Total Cost (Rs)	Gross Profit per Kg (Rs)	Net Profit per Kg (Rs)
Sarukhetri	Gohia	148.0	49090	2637	46453	22702.5	23750.5	313.88	160.48
	Agdia	79.0	19690	1630	18060	14760	3300.00	228.61	41.77
	Garartari	120.6	36446.75	1985	34461.75	16965	17496.75	285.76	145.08
	Sub-Total	347.6	105226.8	6252	98974.75	54427.5	44547.25	284.74	128.16
Gobardhang	Bashbari	106.73	29812.45	1495	28317.45	14480	13837.45	265.32	129.65
	Nimua	249.55	77245.5	4220	73025.5	34680	38345.5	292.63	153.66
	Khusrabari	76.45	20537.5	1010	19527.5	10479	9048.5	255.43	118.36
	Sub-Total	432.73	127595	6725	120870	59639	61230.95	279.32	141.50
Jalah	Salbari	93.5	25695	1365	24330	14238	10092	260.22	107.94
	Hahchara	150.5	41282.5	2100	39182.5	22407	16775.5	260.35	111.47
	Bhuyapara	243.3	68266	3505	64761	34881	29880	266.18	122.81
	Sub-Total	487.3	135243.5	6970	128273.5	71526	56747.5	263.24	116.45
Grand Total		1267.63	368064.5	19947	348117.5	185592.5	162525	274.62	128.21

Source: Compiled from field survey.

Notes: (1) Total revenue includes the revenue from cocoon as well as pupae.

(2) Total cost includes expenditure incurred on seed, rearing house, annual appliances cost and transport cost of collection of leaves of feed plant.

Though cost, revenue, profit etc are estimated for all the sample villages in case of ericulture, in case of mulberry and muga these are estimated at the block level only as very few families practice muga and mulberry and hence village level data are scanty. Table-6.7 displays the cost, revenue and profit per unit of mulberry cocoon production in the sample households. From the table, it is observed that out of 180 eri rearing families only 19 families practice mulberry culture and all of them together produced 174 kilogram of mulberry cocoon during the previous year and that generated total revenue of Rs.15660. For the production of this output, the rearers together incurred explicit cost of Rs.3070 in seeds, feeds and annual depreciations of capital. Thus a sum of Rs.12590 was earned as gross profit margin over the total explicit cost.

Imputed labour cost was also very high and the total figure was Rs.11910 that made the net profit too low. Gross profit and net profit per kilogram of cocoon production was only Rs.72.36 and Rs.3.91 respectively. Gross profit per kilogram of cocoon production earned by the rearers was almost same across the three blocks. Of course, there is a difference in net profit per kilogram of cocoon. Net profit rate per kilogram of cocoon was the highest in Gobardhana block due to prevailing low wage rate. On the other hand, per kilogram net profit was lowest and the figure was negative in Jalah block in spite of the having highest gross profit. The main reason behind negative net profit was the higher agricultural wage rate, which has been considered for the calculation of net profit. Though the rearers are incurring losses in terms of net profit per kilogram, the rearers are practising this mulberry culture as they consider the entire gross profit and do not bother about the net profit. They hardly have any other more remunerative alternative opportunities and hence look at the gross profit margin that is realised by them in the whole process.

Table-6.7
Cost, Revenue and Profit of Mulberry Cocoon Production of the Sample Households during 2005-06

Block	Number of Families	Production of Cocoon (Kg)	Total Revenue (Rs)	Total Explicit Cost (Rs)	Gross Profit over Total Explicit Cost (Rs)	Implicit Labour Cost (Rs)	Net Profit over Total Cost (Rs)	Gross Profit per Kg (Rs)	Net Profit per Kg (Rs)
Sarukhetri	01	05	450	110	340	320	20	68.00	4.00
Gobardhana	12	114	10260	2040	8220	7470	750	72.11	6.58
Jalah	06	55	4950	920	4030	4120	-90	73.28	-1.6
Grand Total	19	174	15660	3070	12590	11910	680	72.36	3.91

Source: Compiled from field survey.

Notes: (1) Total revenue includes the revenue from cocoon.

(2) Total cost includes expenditure incurred on seed, rearing house, annual appliances cost and transport cost of collection of leaves of feed plant.

Table-6.8 reveals that out of 180 eri rearing families, 19 families practice muga along with eri and they together produced 2513.37 kilogram of muga cocoon during the previous year. Maximum production of muga was observed in Jalah block (1390.37 kilogram). From the total production of muga cocoon, rearers generated a sum of

Rs.470000 as total revenue. Total explicit cost incurred by the rearers in the form of cost of seeds, feeds, wages paid to hired labour and other costs like cost of kerosene etc. was Rs.207400. Thus the rearers together earned gross profit margin of Rs.262600 over the total explicit cost. However, unlike eri and mulberry culture, implicit labour cost was much lower than explicit total cost in mugaculture, which was Rs.29417. Total net profit margin of the rearers was of Rs.233183. Gross and net profit per kilogram of muga cocoon were Rs.104.48 and Rs.92.78 respectively. Unlike eri and mulberry, the gap between gross and net profit was very less in case of muga cocoon. It was because of the use of maximum hired labour in the process whose cost was already taken into the explicit cost account. Gross and net profit margin per kilogram of muga cocoon was the highest in Jalah block with figures Rs. 104.65 and Rs.93.53 respectively. It was due to systematic plantation of host plant and scientific rearing of silkworm. Gross and net profit is the lowest in Sarukhetri block with Rs.102.81 and Rs.83.46. The inter-block differences were also observed to be insignificant unlike the case of eri and mulberry.

Table-6.8
Cost, Revenue and Profit of Muga Cocoon Production of the Sample Households during 2005-06

Block	Number of Families	Production of Cocoon (Kg)	Total Revenue (Rs)	Total Explicit Cost (Rs)	Gross Profit Margin over Explicit Cost (Rs)	Implicit Labour Cost (Rs)	Net Profit over Total Cost (Rs)	Gross Profit per Kg (Rs)	Net Profit per Kg (Rs)
Sarukhetri	01	53.5	10000	4500	5500	1035	4465	102.81	83.46
Gobardhana	09	1069.5	200000	88400	111600	12926	98674	104.35	92.26
Jalah	09	1390.37	260000	114500	145500	15456	130044	104.65	93.53
Grand Total	19	2513.37	470000	207400	262600	29417	233183	104.48	92.78

Source: Compiled from field survey.

Notes: (1) Total revenue includes the revenue from cocoon.

(2) Total cost includes expenditure incurred on seed, rearing house, annual appliances cost, rent on land, wages to hired labour and maintenance of *Somanies*.

Table-6.9 shows the comparative picture of revenue, cost and profit generated by the rearers on an average per kilogram of eri, muga and mulberry cocoon production in the sample villages.

Table-6.9
Revenue, Cost and Profit per Kilogram of Cocoon Production (Rs.)

Silk Variety	Average Revenue per Kg of Cocoon	Average Explicit Cost	Average Implicit Cost	Average Gross Profit	Average Net Profit
Eri	290.36	15.74	146.41	274.62	128.21
Muga	186.99	82.52	11.71	104.48	92.78
Mulberry	90.00	17.64	68.45	72.36	3.91

Source: Compiled from tables-6.6, 6.7 and 6.8.

From table-6.9, it is observed that average revenue from eri cocoon is the highest among the three varieties of silk, which is Rs.290.36, followed by muga (Rs.186.99) and mulberry (Rs.90.00). Though the price of final product of muga is the highest in the state, in the study area price of eri cocoon is the highest. Actually, the quantity of yarn reeled from one kg of muga cocoon is much lower than the quantity of yarn obtained from a kg of eri cocoon as the pupae remains inside the muga cocoon and hence the effective price is much higher than the cri cocoon. In terms of explicit cost incurred in the production of a kilogram of cocoon, eri stands at the bottom position with Rs.15.74. As a result, gross profit margin from a kilogram of eri cocoon is the highest with Rs.274.62. However, net profit margin per kilogram of eri cocoon is only Rs.128.21. It is due to the fact that ericulture is the most labour intensive among all these three categories and as the activities are carried out by the family labourer (not paid in cash) there is high implicit labour cost involved in the production. In case of muga, explicit cost per kilogram of cocoon production is the highest (Rs.82.52) and implicit cost is the lowest (Rs.11.71) as hired labourers are also used in rearing activities along with plantation of host plants. Mulberry culture is the least remunerative sericulture activities in the study area. Price, explicit cost, gross and net profit margin from per kilogram of mulberry cocoon production is the lowest among the three varieties of silk.

Though the earlier discussion provides us some idea about the efficiency and relative profitability in terms of unit production of each category of sericulture activity, the cost involved in the unit production varies significantly across those activities. Moreover, the outputs are heterogeneous in terms of quality and their utility to the users. Hence it is wise to bring them under a common denominator and look at the profit margin generated from the investment of unit capital expressed in rupee. From table-6.10 it is observed that gross profit margin per rupee investment is the highest in ericulture, while net profit margin is the highest in muga-culture. On the other hand, gross profit per rupee investment is the lowest in muga and highest in eri.

Though net profit margin is highest in muga-culture it has some disadvantages. Firstly, hired labourers are used in the activities for which the producers have to spend in advance for rearing. Where as in ericulture, mostly family labourers are used that involves no advance payment and the implicit wage also remains with them when they have no other source of income. Hence they give more emphasis on the gross profit margin and not the net profit margin. Secondly, muga-culture involves greater risk than the ericulture and hence chance of loss is more as capital intensity and required investment is also more than the ericulture. Thirdly, the women at home can also practice ericulture, where as mugaculture is purely outdoor activity and hence either male family member or hired labourer is essential. Finally, the quantity of cocoon can be produced from the plantation of unit area is much higher in case of eri than that of muga. These justify more prospect of eri than muga and also mulberry in the area.

Table-6.10
Revenue and Profit Rate per Investment of One Rupee in Eri, Muga and Mulberry

	Revenue per Explicit Cost (Rs)	Revenue per Total Cost (Rs)	Gross Profit per Rupee Investment (Rs)	Net Profit per Rupee Investment (Rs)
Eri	18.45	1.79	17.45	0.79
Mulberry	5.11	1.05	4.11	0.045
Muga	2.27	1.98	1.27	0.98

Source: Compiled from field survey.

6.8. Capital and Labour output ratio in Eri, Muga and Mulberry

Sericulture is basically a labour intensive and there is hardly any change in capital-labour ration due to lack of capital of the poor rearers as well as innovative spirit. But the capital intensity varies across different categories of sericulture. This section provides a comparative picture of the technique of production as well as partial productivities as observed from the sample observations. Like the earlier cases, as the number of muga and mulberry rearers is small these are estimated at the block level as against eri which is presented at the village level.

Table-6.11

Capital and Labour Output Ratio in Ericulture in the Sample Households during 2005-06

Block	Village	Number of Rearers	Value of Output (Rs)	Cost of Capital (Rs)	Imputed Cost of Labour (Rs)	Capita Output Ratio	Labour Output Ratio	Capital Labour Ratio
Sarukhetri	Gohia	23	49090	2637	22702.5	0.054	0.462	0.117
	Agdia	10	19690	1630	14760	0.083	0.750	0.111
	Garartari	17	36446.75	1985	16965	0.055	0.465	0.118
	Sub-Total	50	105226.8	6252	54427.5	0.059	0.517	0.114
Gobardhana	Bashbari	18	29812.45	1495	14480	0.050	0.486	0.103
	Nimua	32	77245.5	4220	34680	0.055	0.449	0.122
	Khusrabari	10	20537.5	1010	10479	0.049	0.510	0.096
	Sub-Total	60	127595	6725	59639	0.053	0.467	0.113
Jalah	Salbari	14	25695	1365	14238	0.053	0.554	0.096
	Hahchara	21	41282.5	2100	22407	0.051	0.543	0.094
	Bhuyapara	35	68266	3505	34881	0.051	0.511	0.100
	Sub-Total	70	135243.5	6970	71526	0.052	0.529	0.098
Grand Total		180	368064.5	19947	185592.5	0.054	0.504	0.107

Source: Compiled from field survey.

From table-6.11, it is observed that 180 families together have produced at cocoon stage worth of Rs.368064.5 during the year 2005-06. Total cost of capital incurred by the rearers together has been Rs.19947, while that of labour has been Rs.185592.5. Average capital output ratio of the sample households in the production of eri raw silk is 0.054 while labour output ratio is much higher with 0.504. Therefore, the capital-labour ratio is very low in case of eri. Capital output ratio does not differ much across the villages except the village Agdia where both the capital and labour

output ratio is quite high due to the fact that many of the rearers of that village have to travel a long distance to collect eri leaves that raises both transport as well as implicit labour cost. However capital labour ratio varies insignificantly across the villages, which is due to the adoption of almost same appliances in rearing. Labour output ratio is the lowest in Nimua of Gobardhana block (0.449). It is because of the fact that the rearers of that village are not required to move long distance to collect leaves as they collect the same from Eri Concentration Centres located in Nimua and Bajegaon Pather. On the other hand, labour output ratio is the highest in Agdia of Jalah block (0.75) as the rearers of that village do not have such facilities and have to move distance places in search of leaves¹².

Table-6.12
Capital and Labour Output Ratio in Mulberry culture in the Sample Households during 2005-06

Block	Number of Families	Production of Cocoon (Kg)	Total Revenue (Rs)	Cost of Capital (Rs)	Cost of Labour (Rs)	Capita Output Ratio	Labour Output Ratio	Capital Labour Ratio
Sarukhetri	01	05	450	110	320	0.25	0.72	0.347
Gobardhana	12	114	10260	2040	7470	0.19	0.73	0.260
Jalah	06	55	4950	920	4120	0.18	0.83	0.217
Grand Total	19	174	15660	3070	11910	0.20	0.76	0.263

Source: Compiled from field survey.

Table-6.12 depicted the capital and labour output ratio in the production of mulberry cocoon in the sample households across the blocks. Here, average capital labour ratio is observed to be 0.263. Within the three sample blocks, 19 mulberry-rearing families produce cocoon worth of Rs.15660 incurring total capital and labour cost of Rs.3070 and Rs.11910 respectively. Capital output ratio in the production of cocoon is 0.20, while labour output ratio is Rs.0.76. Capital output ratio is the highest in Sarukhetri block and the lowest in Jalah block. It is the lowest in Jalah block due to availability of Community Mulberry Garden from where the rearers can obtain

¹² Also, there is no systematic plantation of eri host plant done by the rearers in the block.

mulberry leaves at free of cost. Where as the rearers of Sarukhetri block are deprived of such facility.

Table: 6.13
Capital and Labour Output Ratio in Muga-culture in the Sample Households during 2005-06

Block	Number of Families	Production of Cocoon (Kg)	Total Revenue (Rs)	Cost of Capital	Cost of Labour	Capital Output Ratio	Labour Output Ratio	Capital Labour Ratio
Sarukhetri	01	53.5	10000	3360	2235	0.336	0.223	1.507
Gobardhana	09	1069.5	200000	55375	46426	0.277	0.232	1.194
Jalah	09	1390.37	260000	69830	60956	0.268	0.235	1.140
Grand Total	19	2513.37	470000	128565	109617	0.274	0.234	1.171

Source: Compiled from field survey

Table-6.13 shows the capital and labour output ratio in the production of muga cocoon among the 19 muga-rearing families. Unlike eri and mulberry rearing, muga-rearing activities is found to be capital intensive. Here, average capital labour ratio is observed to be 1.171 in the rearing of muga cocoon. Total expenditure on capital and labour of the sample families are Rs.128565 and Rs.109617 respectively. Average capital output and labour output ratios in the production of muga cocoon are 0.274 and 0.234 respectively. Although block wise figures of capital output ratio are found to be different, labour output ratio is almost same across the blocks.

Table-6.14
Capital Labour Ratio in the Production of Cocoon in the Sample Households

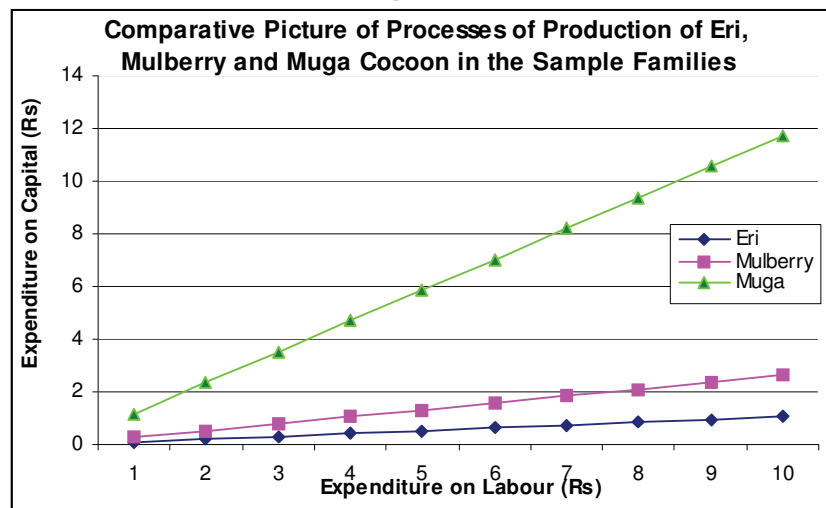
	Eri	Mulberry	Muga
Capital Output Ratio	0.054	0.20	0.274
Labour Output Ratio	0.504	0.76	0.234
Capital Labour Ratio	0.107	0.263	1.171

Source: Compiled from tables-6.10, 6.11 and 6.12

From table-6.14, it is noticed that capital labour ratio is the lowest in case of eri and the highest in muga, which is also shown in the diagram-6.5. Also, comparing the tables-6.11, 6.12 and 6.13 it can be said that the variation in capital intensity across the blocks is the highest in case of muga-culture and lowest in case of ericulture. Capital output ratio is the highest in case of muga and the lowest in case of ericulture. It

indicates that even the poor families who have less capital can also culture eri. On the other hand, muga culture requires relatively more capital and hence it is concentrated among the relatively richer section of the rearers. In case of labour output ratio, it is the highest in case of mulberry culture followed by eri and muga. But, in spite of its high partial labour productivity, the number of mulberry rearers is very less because of its low profitability.

Diagram-6.5



6.9. Capital-Labour Substitution Across the Rearing Families of Eri, Muga and Mulberry

There is hardly any substitution between capital and labour at the existing level of production technology used by the rearing families in all the cases of eri, muga and mulberry. Scatter diagram-6.6 of unit isoquant for eri cocoon production rather shows a positive relationship between the labour and capital used instead of substitution among them, which seems to be uneconomic. The fact is that for the rearing families, who have to collect feed leaves from distant places have to spend more on transportation as well as labour that raises their cost on both capital and labour and thus a positive relationship is observed. It thus has an adverse impact on their profit. However, if all

the rearers would collect feed leaves from an identical condition then definitely a negatively sloping equal product curve would have been observed.

Diagram-6.6

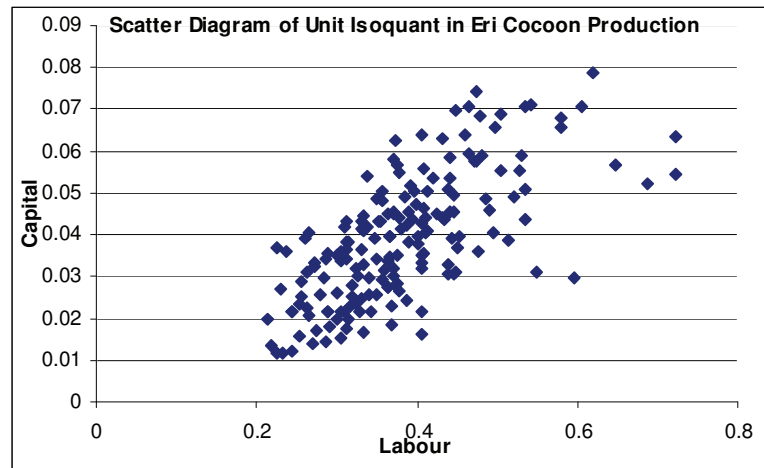


Diagram-6.7

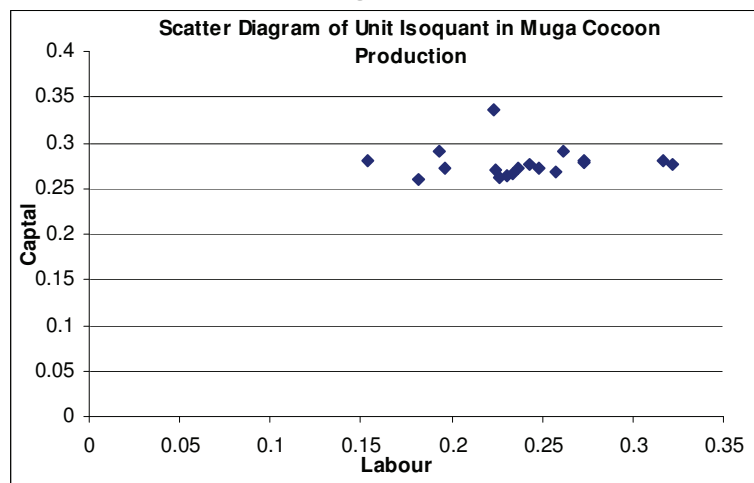


Diagram-6.8

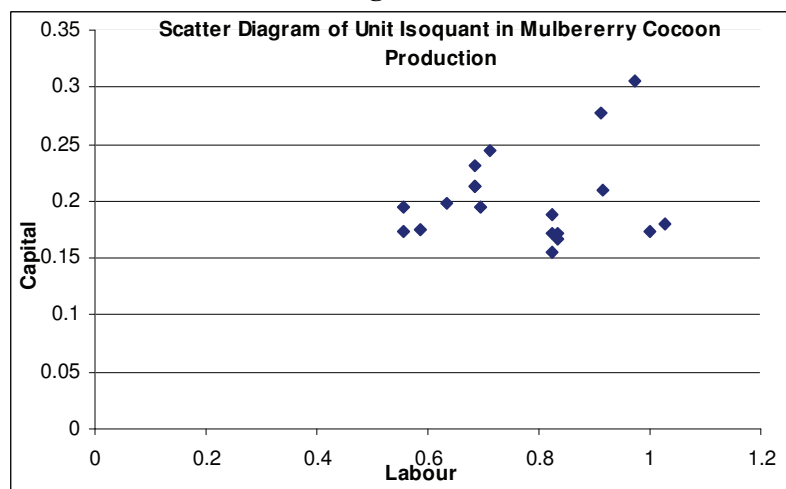


Diagram-6.7 also shows that the requirement of capital for unit production of muga cocoon is the same at the existing state of technology used by the rearers whatever be the labour cost. The variation in labour requirement is due to the differences in efficiency of labourer but it cannot substitute the minimum required labour and hence the equal product curve in this case is almost horizontal. From diagram-6.8 however, no relationship is observed between the capital and labour requirement for the unit production of mulberry cocoon within the sample households.

6.10. Comparative Picture of Eri and Muga in the Earning of Foreign Exchange in Assam

Trading in silks from India is very old, as old as the art and tradition of weaving itself. While the Silk Road in connection with China is well known in the history of silk trade, Indian silk by the name of Indian is not very old (Nagarajan, 1994). In the export of Indian silk Assam has been occupying an important place for a long period of time. Assam has been exporting wild silk especially eri and muga since time immemorial. The traditional importers of Assam silk were Bhutan, Tibet, Great Britain etc. Towards the end of 18th century, there was a regular trade in eri and muga cocoon between Assam and the then Calcutta and through Calcutta to Europe, which is supported by a report of about 25000 kilogram of eri cocoon export to Europe from “Cossimbazar Silk Kuti” during that time. A share of eri silk of 96 sicca weights approximately cost one rupee in those days (Sarkar, 1988). These cocoons were collected mainly from Upper Assam. The fabrics produced in upper Assam were also procured by traders in exchange of commodities required by the producers of silk fabrics and then those final silk products were exported. The Bhutanese also used to take with them considerable quantity of eri cloths and yarn from the Bhutan Fairs used to held in the foothills of Assam annually. During the first decade of 19th century 2000 pieces of eri cloth and eri

yarn worth about at Rs.43000/- were exported to Bhutan annually. It was also exported to Lhasa by the “Kampa Bhutias”. Generally, export of eri cloth used to be done through the trade centre of “Hydra Chawki” at Assam border (Sarkar, *op cit*).

With the establishment of Spun Silk Mills in Europe towards the end of the nineteenth century, the demand for eri cocoons (raw silk) increased manifold. About 1.50 lakhs kilogram of eri cocoons were exported to those European mills annually during that time. But the market started deteriorating because of the lack of organized procurement as well as adulterations of cocoons by the traders. However, the exports received a boost during the First World War; but this was short lived and thereafter continued to decline in the world silk trade due to the markets captured by the other countries (Choudhury, 1982).

At present, the major exporter of eri and muga products from Assam is Assam Apex Weavers and Artisans Co-operative Federation Limited (ARTFED). ARTFED has been exporting eri and muga products since 1997 by taking part in fairs and exhibitions held in abroad especially USA, UK, Germany and Turkey as well as in other parts of India. However, eri and muga products are also exported by some individual exporters. *But the information about their exports is not recorded and thus not available.* Moreover, mulberry and tasar though are grown on a limited scale in Assam; those are not exported from the state. The trend of exports of eri and muga by the ARTFED and their contribution to total export earning of the state since 2001 (for which the data are available) has been approximated and described in table-6.15.

It is already mentioned that muga and eri are the major sericulture items exported from Assam by ARTFED. The main export eri items of Assam are 48 inches width fabric, bed cover, pillow cover and duvet cover. These products have been mostly exported to USA, UK, Germany and Turkey. The value of export of eri products

has increased from Rs 18.22 lakhs in 2001-02 to Rs 36.90 lakhs in 2006-07 i.e., it increased by more than 100 per cent during last five years. However, its contribution to total export of Assam has declined from 0.65 per cent in 2002-03 to 0.43 per cent in 2006-07. The total value of muga items exported has also increased continuously from Rs 43.35 lakhs in 2001-02 to Rs 216.70 lakhs in 2006-07, which indicates a sharp increase in demand for muga silk of Assam abroad. Unlike eri, percentage contribution of muga to total export of Assam has increased marginally from 2.06 per cent in 2002-03 to 2.51 per cent in 2006-07. Percentage contribution of eri and muga products to total export earnings of Assam during 2001-01 to 2006-07 has also been depicted in diagram-6.5.

Table-6.15
Percentage Changes in Value of Exports of Eri and Muga Products by ARTFED to Total Export of Assam during 2001-02 to 2006-07

Year	Eri (Lakh)	Muga (Lakh)	Other Export (Lakh)	Total Export (Lakh)	% of Eri to Total Export	% of Muga to Total Export
2001-02	18.22	43.35	N.A.	N.A.	N.A.	N.A.
2002-03	19.48	61.75	2912	2993.23	0.65	2.06
2003-04	23.86	168.11	5011	5202.97	0.46	3.23
2004-05	32.8	195.48	3064	3292.28	0.99	5.93
2005-06	33.66	201.96	5323	5558.62	0.61	3.62
2006-07	36.9	216.7	8359	8612.60	0.43	2.51

Sources: (1) Assam Apex Weavers and Artisans Co-operative Federation Limited (ARTFED).

(2) Office of the Commissioner of Custom, North Eastern Region, Shillong, *Official Statistical Records*.

Notes: (i) Here, only export of eri and muga done by ARTFED, Assam is considered. But some individual exporters also export some quantities of raw silk to other states for processing and some final products of eri and muga also to other states as well as abroad. Those are not included here owing to the lack of information.

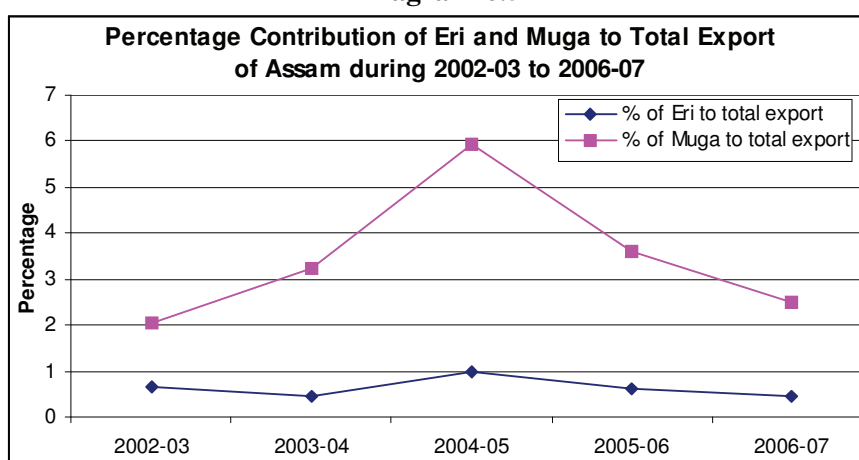
(ii) Here other export includes the items exported through different land custom stations of Assam. But those land custom stations have also been engaged in exporting some items (like coal, limestone) produced in Meghalaya along with the items of Assam, which is included in this other export figures and hence there would be an upward bias. Similarly, a good amount of foreign exchange is earned from the export of tea (it is the major export earner of Assam) and that takes place mainly through the Kolkata port, which is also not included in the total export figure due to lack of information. We have the information on export of tea from India (including that of Assam, West Bengal and other states) and that makes it difficult to take into account. Therefore, there might be some bias in the figures of percentage contribution of eri, muga silk etc to total export earning of Assam. For a correct measure one should include the value of tea export from Assam and export of silk by individual exporters and exclude the value of products of other states that pass through the land custom stations Assam.

(iii) N.A. indicates not available

The reason for the decline in percentage share of ericulture products to total export from Assam here may be due to the inclusion of export of coal, limestone etc;

which are mainly the products of Meghalaya but exported through Assam and the export of those have grown at very faster rate during last few years. Of course, the figures would also be different if the export of tea were considered. However it can be said safely that even though percentage share of ericulture products or endi-products has not been very high and that has declined during last few years, in absolute sense the export is not insignificant at all in comparison to the level of investment in this sector. Moreover, there is further scope for the expansion of export and earning through the diversification of output and technological innovation.

Diagram-6.5



6.11. Conclusion

From the over all discussion of this chapter it can be said that ericulture occupies a unique position among all the varieties of silk in terms of its contribution to total silk production as well as generation of employment and income in sericulture of Assam. Its production has continuously increased at annual exponential rate of 5.9 per cent during 1980-81 to 2004-05, which is much faster than that of muga (3.2 per cent) and mulberry (1.16 per cent) and production of tasar raw silk has been very insignificant.

In terms of contribution to total workforce, eri is found to be incomparable. Though contribution of eri to total workforce has increased in absolute sense that of muga and mulberry declined during 1991 to 2001. However, percentage contribution to total workforce of all the three varieties of silk has declined during that period. Of course, the figures here represent only the contribution of raw silk production (agro-activities part) to the workforce. If the generation of employment due to spinning/reeling and weaving were incorporated the actual contribution would be much more as shown in chapter-4.

Number of families engaged in sericulture as a whole has increased significantly over the years and the rate of growth has been much faster in case of muga than that of eri and mulberry. However, as the number of muga families was very small in the beginning, still now the absolute figure is much lower than that of eri.

Contribution of eri, muga and mulberry to NSDP of Assam is not found to be highly significant. In this case also, the figures show the contribution of raw silk productions only i.e., the agricultural part of the activities and not the spinning/reeling, weaving and trade and considerable income is generated directly and indirectly by these sericulture and its associated activities. Moreover, the importance of sericulture in the economy of Assam is reflected from its contribution to the rural poorer section of population especially that of women who are mainly associated with such activities. Sericulture is mainly practised by the rural poor people and it helps many of them to overcome poverty and raise their standard of living especially of women. Among the three varieties of sericulture, contribution of eri to NSDP of Assam has been the highest during the last decade like that of employment.

Generation of revenue and gross profit over paid-out (explicit) cost per kilogram of eri cocoon production is also the highest in comparison with muga and

mulberry. On the other hand, paid-out (explicit) cost per kilogram of cocoon production is the lowest in case eri and highest in case of muga. In case of muga net profit per unit of investment is however the highest and followed by eri. As eri is cultured by the family labourer the implicit cost also forms a part of net income of those families and hence they are guided mainly by the gross profit and not the net profit. Moreover, initial investment required for the operation and risk involved in such activities (especially of pest attack, disease etc) are considerably higher in case of muga and that make ericulture more popular among the rural poor people of Assam especially to the low educated women, who find no other better alternative opportunity at their existing level of education and skill.

Finally, both eri and muga earns considerable amount through export. Though contributions of these to total export from Assam in terms of percentage is not very high and the figures of last few years show slight declining trend, in absolute sense the people who have been engaged in such activities earns some significant amount every year. As there is considerable demand in the export market and that can be enhanced further through the product diversification, prices have also been rising and there is considerable profit margin in the ericulture (which is more if ericulture is practised along with muga-culture) there is ample scope for the growth of ericulture in Assam, which is more than any other sericulture activity.

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Chapter-7

Problems and Prospects of Ericulture in Assam

7.1. Introduction

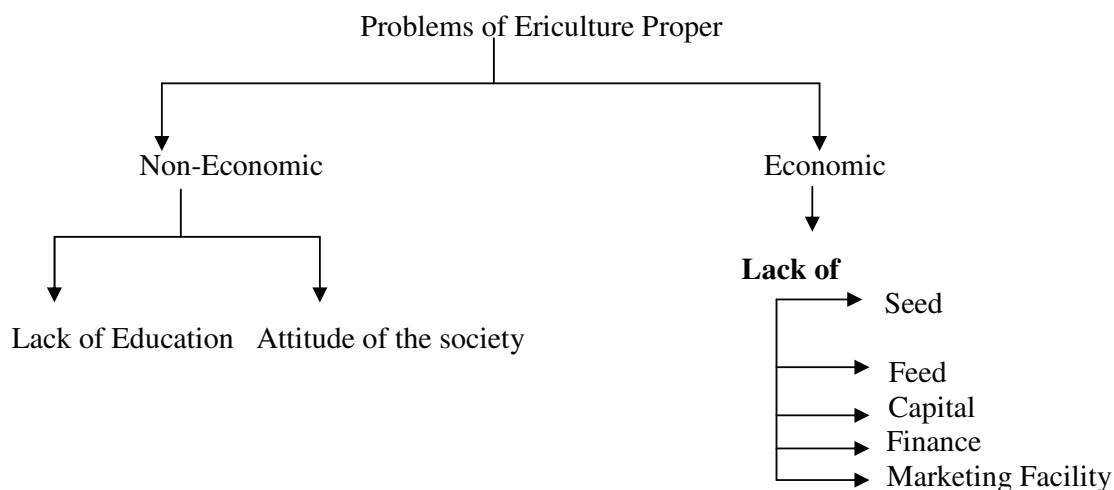
Although ericulture has been an occupation of many rural Assamese people for long time, it is still at the subsistence level. People have not abandoned it, which indicates that it provides something to those engaged in it. Also it is not growing at a very fast rate, which is clear from the engagement of a small percentage of whole population or workers in Assam till now. Moreover, there is demand for the eri products in the markets, which is proved by the significant growth of market price of cocoon (exponentially at 5.73 per cent annual rate during 1980-81 to 2004-05) along with the rise in production and supply of cocoon (at 5.99 per cent annual exponential rate during 1980-81 to 2004-05) during last two and half decade. Ericulture in Assam however has been facing a large number of economic and non-economic problems that needs to be addressed properly for the development of this sector. In this chapter an attempt is made to highlight the specific problems faced by the whole ericulture sector in Assam that is observed during the field survey. Here the problems are discussed in to two different parts.

- a) Problems associated with ericulture proper, and
- b) Problems associated with eri silk weaving.

Again, the problems of ericulture as well as weaving of silk are viewed from two different angles- (1) Non-economic and (2) Economic.

7.2. Problems Associated with Ericulture Proper

Problems associated with ericulture proper, may be classified as:



7.2.1 Non-Economic Problems

7.2.1.1 Lack of Education among the Rearers

Ericulture of Assam is mostly carried out by the illiterate or semiliterate persons. Not a single postgraduate or other degree holder is observed among the sample rearing families. Merely 0.36 per cent of the members of rearing families are graduates (table-7.1) and usually these educated youths do not come forward to take up this occupation rather they prefer even a class-IV job in nearby towns. Also there is a tendency of these few educated youths to migrate to the nearby towns or cities for any kind of jobs instead of seeking a self-employment opportunity in their village. That may be due to their higher opportunity cost and low profit in ericulture. Thus ericulture is mostly run by the illiterate people of the society, who have no idea about scientific as well as commercial process of rearing of silkworms. Also due to illiteracy and lack of information, the rearers cannot avail the opportunities given by the government to them from time to time. Of course, for encouraging the rearers and to provide necessary information, there are Seri-demonstrators, engaged by the state government, who would play important role in providing necessary assistance and disseminating relevant

information to the rearers. During field investigation, a large number of rearers reported that the demonstrators in their localities do not visit either to facilitate technical guidance or to inform them of the government's schemes of assistance. Due to inferiority complex also, the uneducated or little educated rearers do not feel easy to meet the senior officers of the department for help and guidance or to file complaints against the demonstrator. A few rearers reported that the employees of ericulture department demand bribes against the release of sanctioned grants.

Table-7.1
Sex wise Distribution of Sample Households According to their Educational Status during 2005-06

Educational Status	Sarukhetri			Gobardhana			Jalah			Grand Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Illiterate	22	36	58 (19.46)	40	50	90 (30.21)	64	86	150 (50.33)	298
Primary	30	16	46 (15.98)	44	56	100 (34.72)	60	82	142 (49.31)	288
Up to VIII	16	32	48 (26.67)	24	40	64 (35.56)	30	38	68 (37.78)	180
HSLC Passed	38	32	70 (29.92)	46	42	88 (37.61)	40	36	76 (32.48)	234
HSSLC Passed	16	26	42 (33.87)	14	22	36 (29.03)	24	22	46 (37.09)	124
Graduate	00	00	00	02	00	02 (50.00)	02	00	02 (50.00)	04

Source: Compiled from field investigation.

Note: The figures in the parentheses represent percentages.

In general, the rearers are found to have no interest in learning the improved technology on their own, which is due to the lack of exposure and entrepreneurship skill as well as scope of expansion of activities in the interior areas owing to other obstacles like financial capability, marketing, availability of loan etc. Moreover, due to their lack of knowledge the rearers and weavers are worst exploited by the middlemen and dishonest traders. It is observed that education at least increase their sales efficiency and help them getting relatively better price. The regression equation

$$PC = 328.58 - 5.69 \text{ Broods}^* + 1.81 \text{ Education, } R^2 = 0.102$$

(1.44) (2.98)

shows that the price of eri cocoon (PC) obtained by the rearers is negatively related to the number of broods (level of output) and positively related to the education though not significantly.¹ Hence some level of education helps the rearers earning more than those who do not have. Similar would be the case for the use of better technology.

7.2.1.2 Attitude of the Society

It is very difficult for the traditional eri rearers to be free from the customs, usages and conventions, which are intimately bound up with the cultural complexity in Assam. The illiterate and literates alike are not free from the prejudices against ericulture. In this modern commercial age some sections are still there who accord lower status in the society to the persons who have been engaged in rearing of silkworms. Though in other parts of the state a few rearers are found to belong to the general category of the society, in the sample collected from Barpeta all the rearers are found to belong to SC and ST. Here, 35 per cent of educated youth in the sample families reported that they hesitate to rear silkworm, as they dislike the emission of odour from the worms and cocoons and prefer government jobs or even dealing in endi-cloths. Therefore, it appears that besides other problems, for the fear of losing social status, the relatively rich traditional rearers have been leaving this occupation for the aforesaid reason. Many of the well to do families, who used to culture eri previously, has now stopped their practice and switched over to other more remunerative activities.

7.2.2 Economic Problems of Ericulture Proper

7.2.2.1 Lack of Healthy Seeds

The most serious and basic problem that ericulture in Assam face is the scarcity of quality and healthy seeds of standard breed for commercial rearing under natural

¹ Here 1 score is provided to the families having at least one member matriculate and 0 for the other families. The symbol * indicates that the coefficient is significant at 5 per cent level of significance.

atmosphere. The government institutions have failed to supply required seeds to the rearers at proper time. In case of ericulture, 92.22 per cent of the rearers use their own produced seed year after year which is shown in table-7.2. But sometimes, the rearers have to collect untested seeds from the local co-rearers. Also during 2005-06, 6.11 per cent of the rearers had collected seeds from their co-rearers.

Table-7.2
Distribution of Sample Families According to the Sources of Seeds during 2005-06

Block	Village	Household (Number)	Own Seeds	Co-rearers	Government
Sarukhetri	Gohia	23	20 (86.96)	00	03 (13.04)
	Agdia	10	09 (90.00)	01 (10.00)	00
	Garartari	17	16 (94.12)	01 (5.88)	00
	SubTotal	50	45 (90.00)	02 (4.00)	03 (6.00)
Gobardhan	Bashbari	18	17 (94.44)	01 (5.66)	00
	Nimua	32	30 (93.75)	02 (6.25)	00
	Khusrabari	10	10 (100)	00	00
	SubTotal	60	57 (95.00)	03 (3.00)	00
Jalah	Salbari	14	13 (92.86)	01 (7.14)	00
	Hahchara	21	19 (90.47)	02 (9.53)	00
	Bhuyapara	35	32 (91.43)	03 (8.57)	00
	Sub Total	70	64 (91.43)	06 (8.57)	00
Grand Total		180	166 (92.22)	11 (6.11)	03 (1.67)

Source: Compiled from field investigation.

Note: The figures in the parentheses represent percentages.

The government of Assam has already established 26 Eri Seed Grainages covering 183.04 hectares of land (2005-06) in various parts of Assam till date for the supply of healthy seeds and overall development of the culture. Out of this total land allocated to ESGs, only 124.69 hectares of land are under scientific eri feed plantation. The price charged by these (ESG) is Rs.1000 per kilogram of seed (Directorate of Sericulture, Government of Assam, 2005-06). But there is not even a single Eri Seed Grainages in the entire Barpeta district. Of course, some rearers of Gahia reported that sometimes government official supplies seed to them. Their contribution is only 1.67 per cent of the total requirement of the rearers. Here, 21.66 per cent of the sample households are found to suffer from shortage of healthy disease free seeds. The

activities of these 26 centres operating in different places are also not satisfactory and the target of production of adequate quality seeds has never been met. In order to meet the deficiency, sometimes different units of the sericulture department collect seed cocoons of all varieties from the rearers of certain localities and distribute such untested seeds among the rearers of other localities and hence, output is not obtained with full potential.

7.2.2.1 Shortage of Feeds of Silkworm

Shortage of eri feeds is another important problem faced by the rearers who are interested to engage in the rearing activities. It has been observed in chapter-4 that in the state as a whole, production of eri cocoon has grown as much faster rate than the eri feed plantation during 1980-81 to 2004-05. Also production per hectare of plantation has been declining during that period. It is an indication of availability of eri feed leaves in lesser quantity from the increased land under plantation. Moreover, the growth of feed leaves does not match (even if productivity of land remain same) with the growth of requirement of feed leaves, which is an important input of eri cocoon production. The root cause of shortage of feeds or lesser growth of area under plantation is pressure of population on wasteland for crop cultivation, recurring floods, erosion of river, lack of protective measures from the government to preserve naturally grown food plants. William Robinson observed in the mid-nineteenth century that eri plant was the only plant, which was cultivated purposefully, and there was scarcely a *raiat* who has not a small patch of it near his house, or on the edges of his field (Robinson, 1841). But now such plantation has become a rarity. During field investigation, not even a single-family was found who has grown eri plant systematically and scientifically. Some times they sow seed in their homestead.

At present, the state government provides food leaves to eri rearers through Eri Concentration Centres (ECCs). In Assam 94 ECCs have been operating in different

parts of the state covering 655.28 hectares of land. Only 370.66 hectares (i.e. 56.56 per cent) of land of the total allocated land are used for eri feed plantation (2005-06). In Barpeta district, three ECCs were established, one at Hahchara in 1975 with 6.80 hectares of land, another at Nimua in 1976 with 7.80 hectares of land and another at Bajegaon Pathar in 1979 with 12.90 hectares of land to cater the needs of leaves of eri rearers. In the year 2005-06, out of total 26.60 hectares of land allocated for these ECCs, only 14.97 hectares (i.e. 56.29 per cent) of land were utilised for eri feed plantation (Directorate of Sericulture, Government of Assam, 2005-06). But not even a single plant of castor is found at the time of field survey in Nimua ECC where there is a high demand for leaves. Thus the government institutions have also failed to optimise the use of areas under cultivation of host plants.

The distribution of sample families facing scarcity of leaves is shown in table-7.5. During 2005-06, 95.56 per cent of the sample households of Barpeta district reported to suffer from scarcity of food leaves significantly. Though maximum six broods can be practiced in a year, the rearers could culture on an average only 2.44 broods due to lack of leaves. Collections of leaves by the rearers from outside raises transport cost and thus total cost of production as well as supply price of cocoon and end products, which in turn adversely affects its demand.

Even though ericulture is a part time occupation, the rearers still have much time to spend for the rearing of silkworm, provided there is sufficient feed leaves available for the purpose. Also, those rearers are mostly marginal farmers and hence on their own they cannot expand cultivation much and have to depend on the naturally grown feed leaves. The big landowners also are not interested to grow and sell eri feed plants, as it is less remunerative. But if castor plant is cultivated for castor seed (for producing castor oil as happened in other parts of the country) then leaves will be a joint product and it will definitely be a highly remunerative one.

Although plantation of eri host plant is not done at the individual level in the Barpeta district, plantation is observed in other districts of Assam like Udalguri, Kamrup, Kokrajar etc. However with the plantation of host plant cost, revenue and profit from a kilogram of cocoon production changes and a comparison of information on that with those who collect leaves from wildy grown areas in Barpeta (sample collected from Barpeta) is presented in the table-7.3.

It is observed that if plantation of host plant is done by the rearers themselves and also they use separate rearing house in stead of their residential place, cost of production increases by several times. However, with regular supply of feed leaves, production of cocoon as well as pupae also increases. Increase in production helps them to attract better price for cocoon and pupae (the traders visit these places regularly as they can get cocoon in bulks and quality will be better). Hence revenue earned is also found to be much higher if all the pupae are sold at the reasonable price, which may be even higher than the revenue from cocoon (as observed here).

Table-7.3
Cost, Revenue and Profit per Kg of Eri Cocoon Production with and without
Plantation of Host Plant during 2005-06.

	Cost, Revenue and Profit per kg of Cocoon Production	*With Plantation (Rs)	Without Plantation (Rs)
Items of Cost	1. Plantation	172.76	00
	2. Fixed Cost	126.60	2.73
	(a) Rearing house	100.00	00
	(b) Appliances Cost	26.60	2.73
	3. Wages	175.00	146.41
	4. Others	32.50	12.85 (Transport Cost)
	Total Cost	506.87	161.99
Revenue	Revenue from Cocoon	280.00	209.26
	Revenue from Pupae	350.00	81.10
	Total Revenue	630.00	290.36
	Net Profit	123.13	128.37

Sources: (1) Compiled from Field Survey.

(2) *Office of the Directorate, Central Silk Board (North-Eastern Region), Guwahati.

Here it is observed that profit per kg of cocoon in case of those in other areas who cultivate feed leaves and maintain separate house for culturing eri cocoon is

slightly lower than that of rearers in Barpeta who collect leaves from nature. Although average profit per kg of cocoon is higher in case of naturally collected leaves, there is a constraint in the expansion of their activity (average 2.44 broods). If host plants are cultivated, more broods (maximum six) can be harvested and thus the rearers can generate more profit. Hence cultivation of feed leaves is not uneconomic if it is done scientifically as well as commercially.

Here however one point is to be noted that the rearers are at present mostly price takers as they are unorganised in most of the cases. But they receive different price for their eri cocoon not only due to differences in the quality of output but also due to their locational variation, lack of information, differences in bargaining skill, lack of financial strength etc. Hence it is most likely that they would try to adjust their cost through judicious use of capital and labour (technology) in order to maintain the profit rate. However, from the sample data we observe very poor correlation between the average cost and the price of cocoon which is only 0.0899 (insignificant). Also the log-log regression equation of average cost on the price is

$$\text{Ln AC} = 3.95 + 0.194 \text{ Ln PC} \\ (0.255), \quad R^2 = 0.0033.$$

Where, AC represents average cost of eri cocoon and PC is the price of cocoon that varies across the rearers (though they are price takers they are discriminated by the middlemen buyers). Here both the coefficient as well as coefficient of determination is highly insignificant. It indicates that the rearers are constrained by their technological and capital constraints.

7.2.2.3 Financial Problem

Finance is the main pre-requisite of every productive operation. According to Mathur (1979) every problem of the small producer concerning production or raw

materials, quality or marketing is ultimately a financial one. The very success of this tiny sector thus also depends on the availability of finance. Although meagre investment is required, the problem of finance in ericulture cannot be underestimated. Because, it is clear from the field investigation that the rearers have to depend basically on their own source of finance and many of them do not have adequate financial strength not only for the expansion of activity but also for the adoption of upgraded technology. During 2005-06, 85.56 per cent of the sample households found to depend only on their own finance (table-7.4). Negligible amount of government grant was available only to the few selected rearers that constitute of only 6.12 per cent of the total rearers. But such grant is also very small in quantity in comparison to the entire rearing expenditure, which is shown in chapter-8.

As most of the rearers are poor, they cannot undertake large scale rearing on commercial basis. The role of moneylender in financing ericulture is also negligible. They provide finance to merely 3.87 per cent of all the rearers. The most important drawback of borrowing from moneylender is the high rate of interest. The rate of interest varies between 60 to 120 per cent per year. Therefore, instead of borrowing from the moneylender, the rearers prefer to abstain from expanding the activity. One of the reasons for the high interest rate charged by the moneylender is of course the insecurity of loan repayment by these vulnerable rearers. The loan taken from the relatives of the rearers is also insignificant. Only 3.3 per cent of the sample rearers received loan from their near relatives. It is because of the deplorable pecuniary condition of their relatives². From the field investigation, it is understood that the ericulture sector suffers from the paucity of institutional finance for its development. The commercial banks in Assam are not interested in financing ericulturists because the

² Normally, relatives of the poor rearers are also poor and hence all the relatives have common problem and cannot greatly support each other.

rearers cannot offer sufficient land as collateral security against loans. During field investigation, not a single rearer was found who received loan from bank during 2005-06 or ever before. Thus deplorable financial condition of the rearers on the one hand and high rate of interest charged by moneylenders and negligence of commercial banks force the rearers to operate their activities on very small scale. Among the sample families, 22.78 per cent have reported to suffer from financial crunch even at their existing level of production. For the overall development of ericulture in Assam, provision of institutional finance at low rate of interest is thus an essential condition.

Table-7.4
Distribution of Sample Rearing Families According to Their Sources of Finance during 2005-06

Block	Village	Household (Number)	Own Fund	Relatives	Money lender	Government
Sarukhetri	Gohia	23	18 (78.26)	02 (8.69)	01(4.35)	02 (8.69)
	Agdia	10	09 (90.00)	01(10.00)	00	00
	Garartari	17	16 (94.12)	01 (5.88)	00	00
	Sub Total	50	45 (90.00)	02 (4.00)	01(2.00)	02 (4.00)
Gobardhan	Bashbari	18	15 (83.33)	01(5.56)	01(5.56)	01 (5.56)
	Nimua	32	27 (84.37)	02 (6.25)	01(3.12)	02 (6.25)
	Khusrabari	10	09 (90.00)	01(10.00)	00	00
	SubTotal	60	51 (85.00)	04 (6.67)	02 (3.33)	03 (5.00)
Jalah	Salbari	14	12 (85.72)	00	00	02 (14.28)
	Hahchara	21	19 (90.47)	01(4.76)	01(4.76)	00
	Bhuyapara	35	27 (77.14)	01(2.86)	03 (8.57)	04 (11.43)
	Sub Total	70	58 (82.85)	02 (2.86)	04 (5.72)	06 (8.57)
Grand Total		180	154 (85.56)	06 (3.34)	07(3.89)	11(6.12)

Source: Compiled from field survey.

7.2.2.4 Marketing Problem

Till now market for eri cocoon has been a buyers' market. The middlemen traders purchase the cocoon from the rearers moving from door to door. There is no organised market for the transaction of eri cocoon. Therefore, the rearers have to sell their cocoon to the traders at the price offered by them. Here, 28.34 per cent of the sample families have reported that they are compelled to sell at meagre price as very

few buyers visit them, which is also due to their low scale of production and remoteness as well as lack of transport, communication or information (table-7.5).

The Assam Spun Silk Mill Ltd was established primarily to help the eri rearers by utilising the bulk production of eri cocoons in Assam. The Spun Silk Mills were supposed to create demand for the eri cocoon so that the rearers could get the respectable price. However, Dutta (1988) had observed that even 25 per cent of the total production of eri cocoon was not utilised by the mills at that time. The mills together had consumed about 2.50 per cent to 4.15 per cent of the total output of eri cocoons during 1985-86 to 1986-87. However, these spun silk mills were utilising the large quantity of eri cocoons produced in Assam during the nineteen seventies. The consumption was about 38.33 per cent of the produced cocoon in the year 1971-72 (Chowdhury, 1982). It is known from a reliable source that a large quantity of eri cocoons were taken outside Assam (Bhagalpur, Bihar and some other places) by middleman traders through railway every year, but related data are not available in this regard. At present the spun mill is totally closed and hence not purchasing any cocoon from the rearers. The irregular production and supply of eri cocoon by the rearers throughout the year is one of the important reasons for its closure. However, steps have been taken again by the state Government for the establishment of two such mills in Bodo land areas for the revival of spinning activity and development of ericulture in the area. If these two spun mills come up in near future, it will certainly help the rearers of the area to receive good price of their reared cocoon.

It is generally alleged that the activities of the middlemen traders of cocoon should be controlled, as they exploit the innocent rearers and deprive them from getting a reasonable return on their investment. Sometime middlemen traders make advances to the known rearers before the commencement of actual rearing and compel the rearers to sell cocoon to them and in the process easily take the chance to exploit the rearers by

offering a low contract price. However the role-played by the middlemen traders is indispensable for the rearers as the Government authorised persons do not reach to the interior areas for the collection of cocoon. The middlemen collect the cocoons from the rearers of remote areas, from where collection of cocoons by the government officials is difficult at the present set up.

Moreover, the procurement price of government of eri cocoon is even much lower than the price offered by the middlemen traders. Where the Government procurement price is Rs.80/ per kg of cocoon, the price offered by the middlemen ranges between Rs.185/ to Rs.340/. Moreover, the rearers get cash on the spot from the middlemen traders after selling the cocoons. Whereas, if the rearers sell the cocoons to government agencies, they have to wait for long time or run after the concerned officials to get their dues. As the government procurement price is much below the market price there is no urge by the middlemen to increase the rate as they can easily buy at their existing price, which is of course increasing over time but not at the desired rate. Yet, the rearers can get relatively more price if they are organised (through Self Help Groups, Co-operatives etc.) and a major part of the profit that is taken away by the middlemen in the form of interest for advanced loan can also be controlled.

The middlemen collect the cocoon regularly and supply to the spinners, otherwise the spinners cum weavers would fail to get the supply of cocoons regularly. Of course, some of the middlemen collect and store the cocoons at the time of harvesting and release the same gradually. In this process, they have to bear the associated risks of damage and thus the rearers are relieved from the burden of storing and risk. That is another reason for keeping big margin in the process and offer lower price to the rearers.

From the above observations, it becomes apparent that the middlemen also have been playing some constructive role in keeping both ericulture and weaving industry in

spite of their exploitative role as well. Their exploitative role can be reduced by the upward revision of Government procurement price and extension of financial and other helps by the government or organisation of rearers.

7.2.2.5 Lack of capital

Two types of capital namely fixed and working are required for rearing eri worms. In ericulture, fixed capital consists of plantation ground, rearing house, and plantation equipments (like hoe, *dao* etc), rearing and grainage equipments (like microscope, ant locks, wooden rearing stands, chopping knife, chopping board, bamboo trays, cocoonage trays, leaf chambers etc). The fixed capital represents the assets bought for long term or permanent use. The working capital is required to continue the process of rearing activities. Usually, it consists of costs of seeds, labour charges in maintenance of plantation and rearing (if employed), fertilisers of plant, disinfections materials etc.

For rearing of eri silkworm, a minimum amount of Rs.10, 000/ is required for the construction of thatched house, measuring about 4.5 * 3.5 metres, which can be used for a long period. But it is very difficult to assess the exact value of rearing house or the rearing equipments accurately due to variation in the cost of construction of the rearing house and rearing equipments. In case of fixed assets, the cost of each item varies from Rs.100 to Rs.50000. But in case of modern scientific rearing house, the investment in rearing as well as grainage equipments may exceed even Rs 100000. It is worth mentioning that the implements used in rearing have much price variation across the state. Of course, the longevity of those equipments usually remains in between 2 to 5 years, although some rearing equipments like *saja* stand etc. can be used for comparatively longer period of time than the others.

Due to poverty of the rearers, they cannot afford to scientific rearing and as a result do not obtain desired results. Cent per cent of sample rearing families practise this culture in their dwelling house, which is not at all scientific. The poor rearers are unable to construct a separate rearing house even of a simple type without government assistance. During the tenth plan, only 3807 eri rearing families in Assam of which 83 rearing families in Barpeta district received Rs.10000 each from the government as financial assistance for the construction of eri rearing house (Directorate of Sericulture, Government of Assam, 2007). This is a minor positive step taken by the government. But the number of beneficiaries is very less as compared to the total rearing families in Assam as a whole and Barpeta district in particular.

Table: 7.5
Distribution of Sample Households According to the Reported Problems Faced by them in Rearing Silkworm for Different Reasons during 2005-06

Block	Village	Household (Number)	Worm Seed	Worm Feed	Finance	Marketing
Sarukhetry	Gohia	23	05 (21.74)	22 (95.65)	07 (30.44)	08 (34.78)
	Agdia	10	02 (20.00)	10 (100)	03 (30.00)	02 (20.00)
	Garartari	17	04 (23.53)	16 (94.12)	05 (29.41)	04 (23.53)
	SubTotal	50	11 (22.00)	48 (96.00)	15 (30.00)	14 (28.00)
Gobardhana	Bashbari	18	04 (22.22)	18 (100)	06 (33.33)	06 (33.33)
	Nimua	32	08 (25.00)	29 (90.63)	08 (25.00)	12 (37.5)
	Khusrabari	10	02 (20.00)	10 (100)	02 (20.00)	04 (40.00)
	SubTotal	60	14 (23.33)	57 (95.00)	16 (26.67)	22 (36.67)
Jalah	Salbari	14	03 (21.43)	14 (100)	01 (7.14)	02 (14.28)
	Hahchara	21	05 (23.81)	17 (80.95)	04 (19.05)	06 (28.57)
	Bhuyapara	35	06 (17.14)	35 (100)	05 (14.28)	07 (20.00)
	Sub Total	70	14 (20.00)	67 (95.72)	10 (14.28)	15 (21.43)
Grand Total		180	39 (21.66)	172(95.56)	41 (22.78)	51 (28.34)

Source: Compiled from Field Investigation.

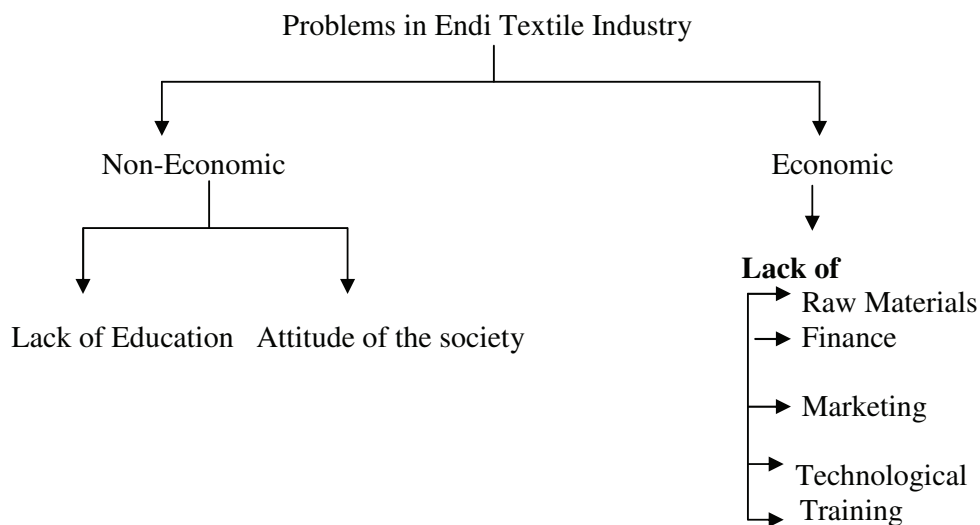
Note: The figures in the parentheses represent percentages.

The working capital is essential to meet the expenses on seed, labour (if hired labour is used), leaves, cleaning and disinfections materials etc. But, due to the lack of working capital (as shown in table-7.5 in connection with worm seed, feed, finance and marketing) many of the rearers cannot undertake rearing of silkworms in proper time

and sometimes avoid the same. Thus, majority of the rearers have been continuing ericulture as a tradition only without having much commercial prospect.

7.3 Problems Associated with Endi Textile industry

Like ericulture proper, the endi textile industry of Assam has some basic problems of its own, which needs proper elucidation and solutions. Like ericulture proper, the problem faced by this spinning and weaving sector can also be categorised in to economic and non-economic parts as shown below-



7.3.1. Non- Economic Problems

7.3.1.1 Lack of Education

In Assam, endi textile industry is also an occupation of the rural poor and most of them are illiterate. Due to illiteracy, the majority of weavers do not get information as regards to application of modern techniques of production, advanced training, availability of financial grant from government and other financial institutions time to time, information about the market (both domestic and foreign), etc. Above all, lack of education of the weavers affects the progress of the eri silk industry. A few of the sample eri cocoon rearers are found to be the weavers who are relatively better off in

terms of wealth but not very rich and in other respects they belong to the similar category like that of non-weavers.

7.3.1.2 Attitude of the Society

In Assam, the professional weavers of fabrics have been known as *Tanties* (belong to traditional Tantubai community whose traditional occupation has been handloom weaving). The present day Barpeta was known as *Tatikuchi* in the past, which means a place of weavers. Publicly, every one praises and honours the silk weavers. But, in reality, it is not so. It is an open secret that educated Assamese women today; particularly the urban womenfolk do not like weaving. Although the Handloom and Textile Department, Government of Assam claims that the numbers of handlooms are increasing. But, field investigation shows that many people with the improvement of the economic conditions abandoned endi-textiles. Also, many of the new generation of women in rural areas are not interested in weaving due to availability of mill made clothes at cheaper price. Most of them only rear worms for home consumption and to sell cocoons. A few weavers prepare endi cloths either for home consumption or for gifts. There is a lack of commercial look among most of the weavers. Therefore, eri silk weaving is confined to certain pockets in rural areas of Assam.

7.3.2 Economic Problems of Eri Silk Industry

7.3.2.1 Technological Improvement and Training

Improvement of technology and advanced training to artisans, are both correlated as advanced technology helps in large-scale production and reduction in per unit cost of production on the one hand and improvement in quality of the products on the other hand. Conversely, training also makes artisans more efficient and capable of using modern equipments and thus ensures quality production.

Still now, primitive and outdated technique of production are used in the eri silk industry involving a great deal of drudgery and fatigue in spinning and weaving, and thus the returns obtained by the artisans are not commensurate with labour and time involved. Therefore, the majority of present generation youth does not prefer these activities as a source of livelihood due to involvement of drudgery with meagre income³. During field survey, not even a single modern spinning machines like CSTR I Spinning machine is observed in the study area. All the spinners were found to use primitive *Takli* whose productivity is very less (only 50 grams of yarn in eight hours whereas CSTR I yields 200 to 250 grams of yarn during the same time. Similarly, in weaving there is mass use of traditional throw shuttle.

In order to face stiff competition from mill made synthetic and other fabrics, technological improvement is urgently necessary in eri silk industry. It is also necessary for increasing production as well as for reduction in cost of production, improvement in the quality of fabrics and diversification of products. It is worth recalling that power looms met the export demands for silk in Japan since 1890 (Allen, 1946). In India silk weaving (specifically mulberry silk) power looms are mainly operated in Karnataka, Kashmir and Andhra Pradesh. These looms usually produce standard fabrics for export purpose. But in Assam till today, it has not yet been possible to use power looms in the field of eri silk weaving due to lack of infrastructure facilities such as pre and post processing facilities like electricity, dying, printing, etc. It appears that through conversion of handlooms or semi automatic looms, the production will increase in physical terms and quality will also improve. But it might not be possible to meet the individual tastes for fabrics by power loom designs. But this does not imply that this “ancient and time honoured” handloom should remain a handloom. Power Loom

³ Report on Village and Cottage Industries, National Committee on the Development of Backward Areas, Planning Commission, Government of India (1981), Pp.17-18.

Enquiry Committee (1964), headed by Ashok Mehta also suggested the replacement of handlooms by power looms in a phased manner to meet the additional requirement of cloth for the increased demand in the country. It is expected that the installation of power looms in this manner will not create unemployment among the workers connected with weaving, rather they will simply switch over from a low productive sector to more productive as well as remunerative sector and what is more important, the high income generated by this sector may attract others and encourage occupational mobility among the rural population. But still now we do not observe any significant move in that direction in the state of Assam and nothing in Barpeta.

Simultaneously, steps should be taken to convert the existing primitive spinning units into modern units in phased manner as far as possible. In order to compete with other organisations in the same industry, production of cheap, but quality yarn is essential. Modernisation of spinning and weaving activities will increase the production of quality fabrics with substantial reduction in average cost. The resultant fall in prices will augment silk fabric market by creating additional demand from the masses. Hence, the time, energy and money spent by the handloom development agencies may be diverted towards installation of power-looms and other modern facilities related to handloom sector in such commercial zones. Besides schemes may be taken for conversion of some handloom to power-loom side by side with up-gradation of the handloom to automatic pick up loom, which is likely to assist diversification of products like weaving of synthetic fibre along with silk yarn etc.

The Khadi and Village Industries committee had also emphasised that all the traditional industries including khadi should be development oriented through inclusion of a programme for “progressive improvement of technique”, and it should be adopted with the objective of bringing such industries to a viable level. It was clearly advocated in the committee’s report that no encouragement by way of training facilities and other

assistance should be given to more persons to enter those traditional industries which used relatively inferior techniques⁴, as such encouragement would increase the number of technological unemployed in the future and saddle the government with the task of maintaining at “huge cost a large number of workers in technologically backward industries”⁵.

Technological improvement in silk weaving would be meaningless, if no simultaneous steps are taken to train up the traditional weavers with advanced technique of fabric production. Therefore, before application of advanced technology, training should be provided in advance as far as possible. For this, artisans should be motivated and trained to embrace the new technology on silk fabric production. At present, the Assam Textile Institute, Ambari, Guwahati provides two courses, namely, Diploma and Certificate courses with duration of three and two years respectively to the metric passed students, in different processes of textile technology including training on power-loom operation. But for the overall development of the silk weaving sector, and as a part of modernisation of the looms, the Government of Assam should take necessary measures and initiative for short term courses of advanced training facilities of dyeing, designing, printing, weaving, etc to the traditional weavers’ (usually illiterate and less educated) who have been shouldering the responsibility of silk industry since ancient time. Therefore, extensive training facilities on silk weaving in power loom and semi automatic looms should be organised in the above institute. In this regard, the Directorate of Handloom and Textiles may also extend its activities.

Thus, immediate transformation of silk handlooms to power loom or semi automatic looms may not be feasible. First of all, proper steps must be taken to increase the production of cocoons and yarn; otherwise power looms in silk weaving will turn

⁴Ministry of Commerce, Government of India (1964), *Reports on the Khadi and Village Industries Committee* p-13.

⁵ Ibid -p-13.

out to be a “white elephant”. Power loom requires heavy investment with high percentage of risk and as such may be initially less lucrative to private entrepreneurs. Hence, the Government should play a pivotal role in the establishment of power-looms under the rural development programme.

7.3.2.2 Marketing Problem

The terminology of market is not confined to sales only; rather it involves a comprehensive management philosophy to develop the right product for a specific group of customer in terms of functions, design, quality and price (Dutta and Ganguly, 1979). Marketing is consumer oriented. Marketing always starts with the customer and ends with the customer. In other words, the process of marketing begins with the analysis of market needs and ends with the satisfying those needs of the target market (Rao, *et al*, 2004). Marketing requirements undergo changes with economic development, technological changes, change in purchasing power and tastes and habits of the customers.

In India, during 1950s, the problem of marketing was not so much acute as it is today. Whatever goods and services were produced could easily be sold depending upon the economy of the consumers regardless of quality or prices (Dutta and Ganguly, 1979). It was more or less a seller’s market. But due to planned efforts of our national Government, a large number of industries both in the public and private sectors gradually come up. In addition to this, the Government’s restrictive import policy and emphasis on cottage and small scale industries led to emergence of large number of products produced indigenously since the second five year plan.

However, with the phenomenal change in technology and consumer’s tastes and habits as well as rising competition, the small-scale enterprises had to face marketing problem (Sarma, 1979). Nangia (1979) also observed marketing as the most serious

handicap of small unit at that time. Later various research studies also revealed that marketing of the products was one of the major reasons behind high incidence of sickness of small-scale industrial units of the North-East region. Endi textile is not an exceptional one.

In Assam, marketing facilities for non-organised weaver is not a satisfactory one. In most cases, the weavers sell their endi products to the middlemen traders at a very low price. Moreover, the weavers also sell in the local market and seasonal market held during some festivals like Bihu, Durga Puja etc. But the price received by these unorganised weavers for their products is very less as compared to the organised weavers as observed here also in case of spinners and weavers of Hahchara village within Jalah block who are well organised under SHG earn higher price for their products than those of other sample villages (chapter-4). Moreover, organised eri cloth weavers can sell their products to ARTFED who is in fact acting as an intermediary in selling endi cloths both in domestic and international market. Apart from government, some co-operatives and SHGs are also engaged in eri fabric marketing. Roje Eshanshali Co-operative Society Ltd set up on 11th September, 1996 headed by Mrs Malati Rani Narzary of Salakhati, Kokrajhar has been exporting various kinds of eri cloths like shawl, upholstery, saris, shirts, and scarf etc at a fair price to various states of India and even to abroad. Similarly, one commercial eri-weaving centre called “Indi Luo Enterprise” operating in Kokrajhar is also selling its products in different places of India.

In the post independence period both the central and state government have been undertaking various measures for the promotion and betterment of marketing of endi products. (i) Setting up of Assam Weavers and Artisans Co-operative Federation Limited (ARTFED) by Government of Assam was a milestone to promote sales of endi cloths. ARTFED has 54 sales outlets called “Jagaran” operating in different parts of

Assam. There are three Jagarans at Barpeta, Barpeta Road and Pathsala in the entire Barpeta district. Apart from Assam, ARTFED is also engaged in selling endi cloths in Kolkata, Indore, Jaipur, Kanpur and New Delhi. There is a purchase committee who has the responsibility to purchase silk fabrics from the weavers, organised under co-operatives. However, the committee does not purchase any product from unorganised weavers and thus the unorganised weavers are still deprived of better marketing facilities.

(ii) Assam Khadi and Village Industries Board (AKVIB) constituted in 1953 have a separate marketing section for the purpose of marketing of products produced in khadi and village industries. The marketing section procures items from khadi and village industries including silk fabrics and supplies those to 58 sales outlets called Khadi Gramodyog Bhandars (KGB) throughout Assam. Apart from those, there is another KGB called Khadi Gramodyog Bhaban located in Kolkata. The AKVIB also holds exhibitions to promote its sales in different parts of Assam from time to time and participates in the exhibition held outside Assam. But till today, it has not participated in any exhibitions held abroad.

(iii) Assam Government Marketing Corporation limited (AGMC established in 1969) also looks after marketing and development of handlooms, handicrafts and cottage industries' products. The AGMC provides marketing facility to the artisans and weavers through six sales emporia called "Pragjyotica"- Assam Emporium. There are other three emporia outside the state. These emporia initially used to supply raw silk to the unorganised weavers and purchase finished products from them at the going market price. But in many cases the artisans did not return the finished products to the AGMC that led to collapse of many emporia.

(iv) North-Eastern Handicrafts and Handloom Development Corporation Limited (NEHHDC set up in 1977) was formed with the objective to promote and

develop the handicraft and handloom of the entire North-Eastern region. Its task is to promote marketing of handicrafts and handloom products through different emporium named “Purbashree” located in Shillong, Kolkata, Guwahati, Mumbai, Chennai and Bangalore. The corporation has a policy of outright purchase of marketable finished items from artisans, weavers, SHGs and cooperatives etc. But from an internal reliable source of corporation it is learned that in many cases marketable items are purchased from the contractors (who collects from the weavers) at a higher price rather than actual weaver that deprives the actual weavers from getting respectable benefit. Thus, it has failed to meet the goal for which it was set up.

The problem of marketing of handloom fabrics (both silk and non-silk) in the North-Eastern region is also evident from the observation made by the Planning Commission, which states marketing activity is not well-organised and is limited to the establishment of sales outlet in Delhi and state head quarters. There is no direct link between the organisations (sales outlet) and the weaving community. From the point of view of the buyers also, now the emporia are not in a position to take bulk orders, as they have in turn to depend on a disorganised supply system⁶. In this connection the State Evaluation Committee also stated that there was a serious problem of marketing of handloom products. The weaver was not able to dispose of their products in the absence of variation in designs and assured marketing facilities⁷. Various government institutions relating to the production and marketing of silk fabrics as well as private entrepreneurs should diversify their products. More stress should be given in the production of designed and high quality garments with the help of professional fashion designers. Along with that attempts should be taken to capture foreign markets on the basis of information provided by Indian Silk Export Promotion Council (ISEPC),

⁶ Planning Commission (1977), *Reports on the Development of North Eastern Region*, p-114.

⁷ State Evaluation Committee (1976), Government of Assam, *Weaving Industries in India*, May, p-44.

Mumbai. Moreover, fairs and exhibitions of quality products should be held at national and international level. This process will definitely raise the income of the weavers and exporters of silk. Besides, there is a bright scope to blend eri fabrics with polyester fibres in the state, which will help to reduce cost of production and capture market. As a policy of sales promotion, the fabric producing organisations should undertake market research in different states of India as well as abroad about the nature of demand of the concerned people. For imparting advanced training on designing and embroidery, some centres should be established in commercial silk weaving zones. Also for the improvement in production and quality of fabrics all the government institutions, silk weaving co-operatives and commercial weavers should join their hands to initiate development programmes in order to meet demand from both internal and external markets.

7.3.2.3 Financial Problem

For the success of any industrial unit, finance is the first requisite. In case of small production units like endi textile handloom units, there is a special need for the arrangement of credit as the producers by themselves cannot manage very little of it. Any industrial unit needs three types of credit, viz. short, medium as well as long term credit. Short period loan is required for day-to-day operations of the business. In case of eri silk weaving, short period loans are required to purchase raw materials like cocoons and yarn, for the payment of wages and salaries to hired labour for spinning and weaving purpose etc. In short, it represents that part of productive capital, which is required during the cycle of operation in business often known as accounting year (Khandelwal, 1985). Along with that endi textile needs long term and medium term credit for fixed capital like purchase of land, construction of weaving house, modern weaving and spinning machinery, furniture etc.

But there is a dearth of credit in endi textile industry. Generally the weaver class belongs to poorer section of the society. These informal weavers cannot construct a separate house for weaving purpose, which cost around Rs.15000. Therefore; almost all the weavers put their handloom (*Sal*) in the veranda of their home. Most of them even cannot purchase spinning and weaving appliances. The average price of one simple handloom (*Sal*) with spinning appliances is about Rs.7000. Along with that one wooden frame is also necessary which cost around Rs.2000. Most of the interested rearers cannot pursue their weaving activity because of lack of fund to purchase handloom and frame. Therefore they sell cocoon to the traders visit their areas to buy products. Only 33.13 per cent of the produced cocoons by the sample rearers are used in spinning and weaving (chapter-4). The source of credit is very much limited in rural areas. Majority of them depend on their self-finance and a few of them sometimes take loans from their relatives and friends. Although all the major commercial banks along with Regional Rural Banks known as Assam Gramin Bikas Bank and Co-Operative banks are operating in Assam, weavers are unable to get the benefits of this institutional credit.

During field survey the poor and needy weavers and entrepreneurs reported that they are unable to obtain institutional finance because of the tedious and lengthy procedure of sanctioning loans and rigid terms and conditions. Besides, as Baishya (1986) observed, they have to prepare and submit scheme and project report, obtain non-encumbrance and valuation certificates from land records officers for collateral security, search for guarantor of loan etc, and what is more, the value of land offered as security falls far short of the norms insisted on by the institutions for the required amount of advance. Still now, the condition has not changed. It was also found that some of the entrepreneurs or needy owners of looms were not aware of the availability of institutional finance due to the information gap. Therefore, not even single person associated with endi textile in the whole Barpeta district has received financial

assistance from any banking institute. Hence, lack of finance at proper time is a handicap of endi textile industries in Assam.

Thus, the supply of adequate and timely credit at a reasonably low rate of interest is the need of the hour for the success of endi-textiles in Assam. Among the institutions, the most important agency can be the cooperatives or Self-Help Group. Besides government institutions, commercial banks and Regional Rural Banks can also come forward to meet the financial requirements of this sector.

7.4. Future Prospects of Ericulture in Assam

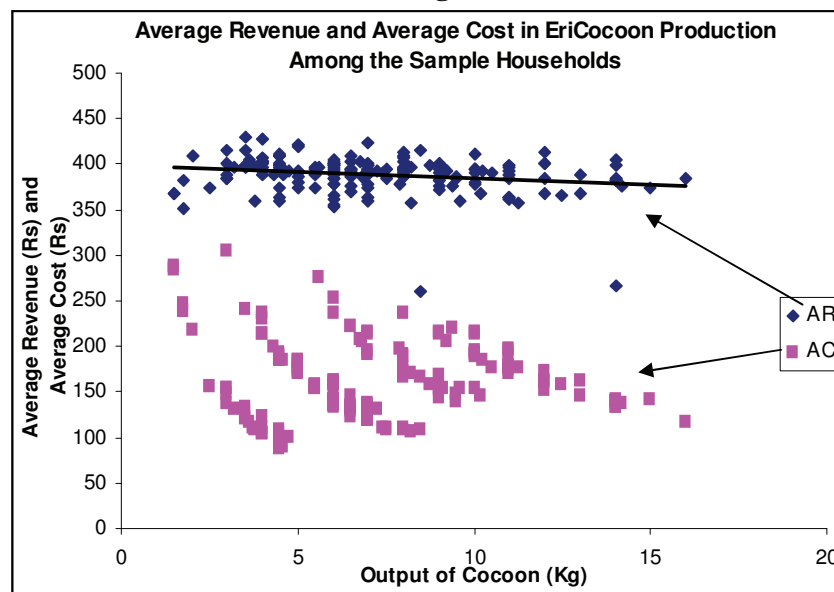
From the overall discussion, it is clear that ericulture in Assam (both ericulture proper and eri silk weaving) has been subject to several economic and non-economic problems. The rearers have been suffering from the lack of good quality seeds, feeds, poor financial condition etc. Also lack of technological development and marketing infrastructure are other obstacles of development of ericulture proper as well as endi textile industries in the state. In spite of these problems, people of Assam have been pursuing this occupation from where many of the rural people get their subsistence. Despite low earning from ericulture (mainly due to low scale production), due to availability of wildy grown castor (feed plants) in many areas to a certain extent and lack of suitable alternative opportunities the rural people especially the women have been continuing to be engaged in such occupation.

That is why P. Joy Oomen (2004) pointed out “*Ericulture* may soon become the new catch word among traditional sericulturists as well as farmers looking forward to enhance their agricultural earnings as there is a demand for eri silk (silk produced by *Philosamia ricini*) in the international market”. While addressing a seminar for the progressive farmers he highlighted the advantages of "ericulture", and said

“eri silk commanded better prices than mulberry silk in the market. In fact, it could be taken up by women in a small space to raise family income. The prospects for "eri silk" were good as its supply in the market was not adequate as far as India was concerned” (*The Hindu*, 2004).

One advantage of this occupation is that many of these people can engage themselves during their leisure time and work as part time with small investment at the traditional technology. Moreover, through inheritance, they have acquired efficiency in rearing as well as spinning and weaving at that level of technology. However, looking at the profitability compared to the level of investment and capacity of employment generation, there are ample scopes for the growth of this sector. But if the sector is to flourish and make it more profitable and compete with the mill made similar products, full-scale engagement of the people is necessary. That must be supported by the adequate technological development.

Diagram-7.1



From the diagram-7.1 it is observed that the average revenue curve is almost a horizontal straight line and there are four distinct layers of average cost curves corresponding to different (one, two, three and four) broods harvested by different

sample families. The average revenue curve always lies above the average cost curve across all levels of activities and hence there is substantial positive profit. But from the diagram it is clear that the rate of profit margin is more in case of smaller rearers. However, the scope of profitability rises with the level of output of eri cocoon, as the average revenue curve is almost horizontal and average cost curve is downward slopping and convex to the origin and becomes asymptotic after certain level of output and that varies for different size of farms. Below are given the level of performance and the scope of the rearers to enhance their production and thus earning even at the existence level of technology.

Diagram-7.2

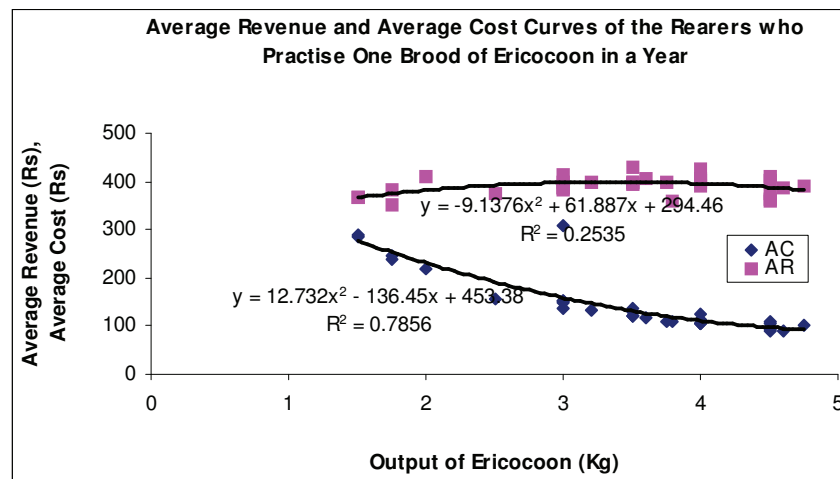


Diagram-7.3

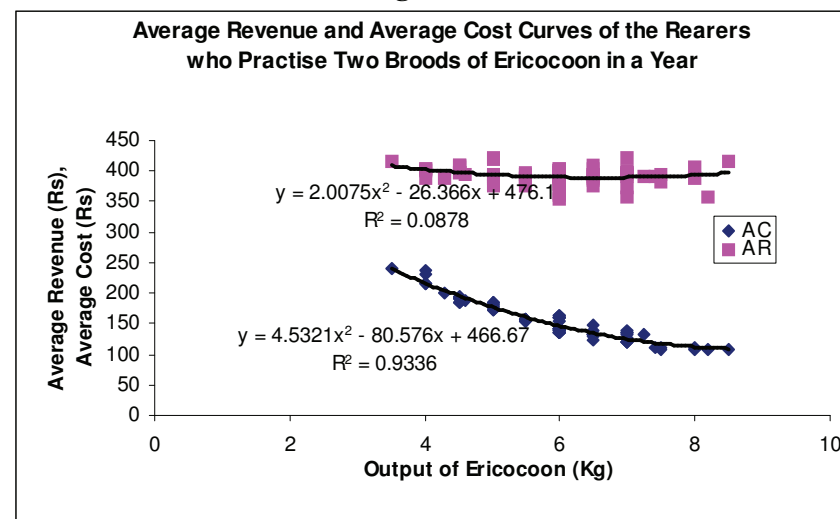


Diagram-7.4

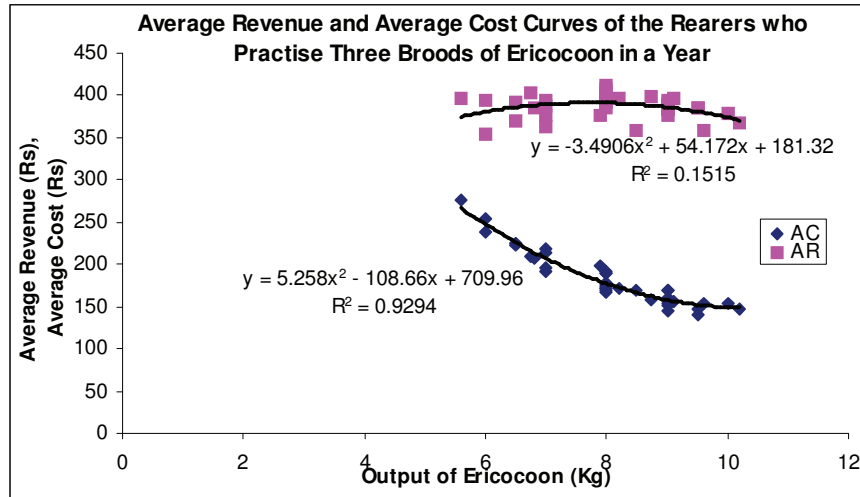


Diagram-7.5

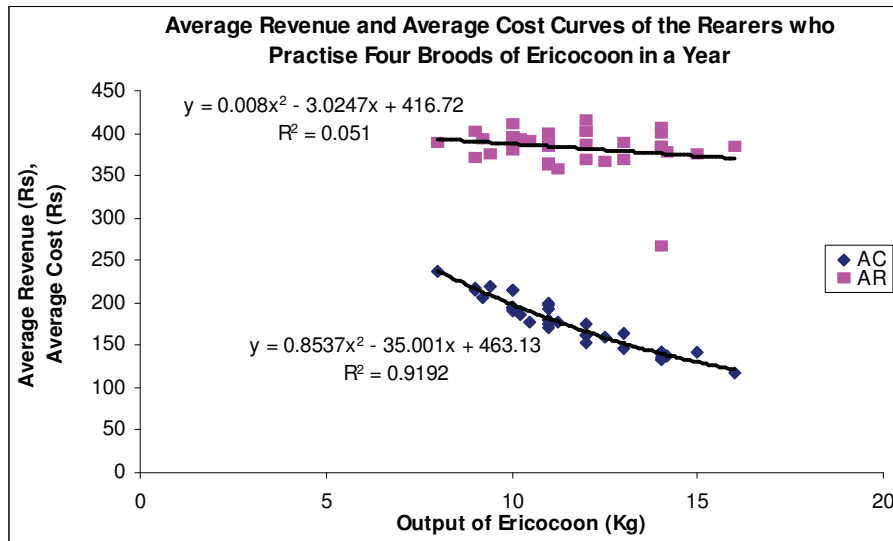


Table-7.5

Brood-wise Actual, Profit Maximising and Lowest Possible Average Cost Output of Eri Cocoon and Scope of Increasing Output & Profit as Obtained from the Estimated Result by Using Sample Data

No. of Broods	Average Yearly Output of Cocoon per Family (Kg)	Average Yearly Profit Maximising Output of Cocoon per Family (Kg)	Average Yearly Output of Cocoon per Family Corresponding to Lowest Average Cost (Kg)	Scope of Percentage Increase in	
				Output to Maximise Profit	Yearly Total Profit
1	3.428	5.615	5.359	63.80	64.56
2	5.920	14.400	8.890	143.24	168.06
3	8.038	10.488	10.330	29.98	31.60
4	11.597	24.460	20.500	110.92	130.01

Note: Output corresponding to lowest average cost and maximum profit is estimated by minimising best-fitted average cost function and maximising the best-fitted profit function as obtained from the sample data.

Diagrams-7.2 to 7.5 present the average revenue and average cost functions of different groups of rearers harvesting one to four broods of eri cocoon in a year. The results of table-7.5 show that at various levels the rearers produce well below their efficient level of productions. In order to maximise profit each producer at various levels can increase production on an average from 30 per cent to about 143 per cent in a year at the existing level of technology and even without increasing the number of broods harvested by each of them. Thereby, they can increase their level of profit ranging from about 32 per cent to 168 per cent approximately. Those who rear two broods, seriously under utilise their capacity. The under-utilisation in some cases may be due to the shortage of castor leaves (as mentioned earlier), which may be grown under the initiative of the rearers or may be supplied by others. If the feed leaves are cultivated then there is a chance of rise in cost of production (also shown earlier) of the extra unit of output and thus the average cost curve would shift upward. But still there is a profit as shown earlier and hence total profit will certainly increase if not exactly to the extent as estimated here. The rate of profit may even increase if better technology is used to reduce unit cost of production and the activity is carried on a larger scale that would generate economies of scale (as seen here an average rearer at each level is producing at the point on the downward falling portion of the average cost curve).

It is also observed from table-7.3 that even if castor is cultivated scientifically and marketing of main and by-products is done properly, profit rate would not reduce much rather it enhances the scope to increase aggregate profit through the rise in gross production. Therefore, to meet the shortages of feed leaves, systematic plantation of host plant may be advocated. If plantation of host plant (castor) is done scientifically, the rearers can have regular and adequate supply of leaves and thus can practise and harvest maximum possible broods, successively every year as full time occupation and earn good income (as shown in table-7.3). Apart from that, produced seeds of castor

can be used for the production of castor oil, which will definitely raise the income of the rearers. Though marketing of cocoon is found to be an important problem to the rearers, if the proposed two spun mills in Assam are materialised it will surely raise the demand for eri cocoon and help them to have remunerative price for their product in near future. Moreover, to eliminate the role of middleman traders, co-operatives, SHGs may be formed. This process will raise the bargaining strength of the rearers cum weavers and help them to have respectable price (as observed in case of the rearers of Hahchara village who have formed an SHG and able to get higher price as shown in chapter-4 and also Roje Eshanshali Co-operative Society Ltd of Kokrajhar has been successful in removing the plight of the rearers to a certain extent). Government marketing personnel (cocoon marketing Inspectors for cocoon) and agencies like ARTFED; AGMC etc (for eri fabric marketing) can be re-activated.

Moreover, only a section of the rearers (who are relatively well off) practise spinning and weaving and earn relatively more income. Due to poverty and lack of finance many of them in spite of having intension cannot adopt weaving. Here, 22.78 per cent of the sample households have been suffering from inadequate finance. Because of poverty only 33.13 per cent of the produced cocoon are sold to the visiting rearers at a through away price. Entrepreneurship can be promoted through the arrangement of modern spinning and weaving machines along with proper training to these rearers. It may help growth of rearing of cocoon and weaving of fabric simultaneously. The government of Assam may adopt a policy of persuading the banks and insurance companies through guarantee etc for financing ericulture in a liberal manner but not freely. Md Yunus has already proved that financing small investors is not altogether wastage. Formation of Self-Help Groups or Cooperative can help in receiving soft loans easily and also improve the chance of repayment of loan. Thus,

there is ample scope for the progress of ericulture provided the obstacles are removed from it and that may also attract new educated youths in this culture.

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Chapter- 8

Role of Various Financial Agencies in Erculture of Assam

8.1. *Introduction*

Finance is the key to the success of any economic activity. The provision of adequate finance at appropriate time is of basic importance for the smooth working of the economic activity and for its success. Economic activities need various types of credit, namely, short term, medium term and long term credit depending upon the level and type of investment. But simply, credit is not sufficient. Along with credit, terms and conditions as well as the rate of interest at which loan is available is also important. The availability of credit enhances the productive capacity of any enterprise, whether small or big. The small growers or entrepreneurs, who often suffer from the lack of credit, can also operate efficiently under suitable market structure and other socio-economic conditions and even can pay reasonably high interest rate and also grow. It has already been proved by Dr. Yunus through his continuous effort in Bangladesh and that is also appreciated and acknowledged worldwide. The conventional notion of inability of the small and poor entrepreneurs to repay the loan, on the basis of which they are discriminated against the big entrepreneurs in granting loan by the established banking authorities in many places, has been proved wrong and hence credit should be extended to all the motivated hard working entrepreneurs who want to extend their economic activities.

The financial sources can be broadly divided into two categories, namely, institutional and non-institutional. The institutional sources are commercial banks

including the Regional Rural Banks (RRBs), Co-operatives and the Government. On the other hand, non-institutional sources consist of moneylenders, traders and commission agents, landlords and relatives.

In this chapter, first of all an overview of different financial sources (both institutional and non-institutional) operating in Assam is given. It is followed by a brief description of the institutional sources and non-institutional sources operating in the district of Barpeta. Thereafter, the role of different sources of credit among the sample households has been analysed. Lastly, the role of central and state government in providing financial assistance to the ericulturists in Assam as well as in the district of Barpeta is discussed.

For the purpose of analysis, secondary information on bank branches, deposits, disbursement of loan etc. are collected from Directorate of Economics and Statistics, Government of Assam and Office of the Director of Central Silk Board (North-East), Government of India. Apart from secondary data, primary data on the loan taken by the ericulturists from different sources are also collected from 180 families chosen by multi-stage stratified random sampling from nine villages within three Community Development Block of Barpeta district as described earlier.

8.2. Sources of Finance in Assam

Almost all the financial institutions have been operating their financial business in Assam. The major financial institution operating in Assam is commercial banks. Almost all the nationalised banks including State Bank of India, Regional Rural Banks¹ and other scheduled commercial banks have been operating in the state. Apart from Indian banks, one foreign bank has also been running its banking business with only

¹ All the five RRBs, namely, Pragjyotish Gaonlia Bank, Subansiri Gaonlia Bank, Langpi Dehangi Rural Bank, Lakhmi Gaonlia Bank and Cachar Gramin Banks are amalgamated and renamed as Assam Gramin Vikas Bank

one branch in the state. Total number of bank branches, their deposit mobilisations and their deployment of credit in Assam are presented in table-8.1. Total number of bank branches operating in Assam was 1272 as on March 2005². On an average total deposit of a bank branch was Rs.1397.93 lakh on March 2005. Out of these deposits, credit granted per bank branch was Rs. 492.99 lakh. The credit deposit ratio was about 0.353, which was comparatively much lower than the developed region. Not only that, the credit deposit ratio for the Regional Rural Banks (RRBs) was only about 0.442; that indicates the loan advanced by RRBs to the rural sector is not significant. Apart from these banks, some Non-Banking Financial Institutions (NBFIs) like Life Insurance Corporation of India Limited (LICI), General Insurance Corporations of India Limited (GICI), Small Industrial Development Bank of India (SIDBI), Industrial Development Bank of India (IDBI), Industrial Finance Corporation of India (IFCI), Industrial Credit and Investment Corporation of India (ICICI), National Bank for Agriculture and Rural Development (NABARD), etc are also operating in Assam. Along with these institutional sources, some non-institutional sources have also been engaged in credit market in the state.

Table-8.1
Number of Bank Branches, their Deposits and Credits in Assam as on March 2005

Banks	Branches (Number)	Deposits (Rs in Lakh)	Deposit per Branch	Credit (Rs in Lakh)	Credit per Branch	Credit Deposit Ratio
SBI and Associates	215	675979	3144.08	234492	1090.66	0.346
Nationalised Banks	635	844395	1329.76	305648	481.34	0.362
Foreign Banks	01	16922	16922	145	145	0.008
RRBs	409	172033	420.62	76022	185.87	0.442
Other Scheduled Commercial Banks	12	68836	5736.33	10768	897.33	0.156
Total	1272	1778165	1397.93	627075	492.99	0.353

Source: Directorate of Economics and Statistics, Government of Assam, *Statistical Handbook*, 2006.

² Directorate of Economics and Statistics (2006), Government of Assam, *Statistical Handbook* Table-25.01, P-210.

8.3.1 Institutional Sources of Finance in Barpeta District

Almost all the institutional sources of finance are operating in the district of Barpeta and the most important institutional source in the district is commercial banks. All the major commercial banks have been in operation in the district. The number of commercial banks operating in the district was 09 with 38 branches on March 2005. Out of these branches, 28 branches are in rural and only 10 branches are in semi-urban areas. The major scheduled commercial banks are United Commercial Bank, Allahabad Bank, Union Bank of India, Syndicate Bank, Central Bank of India, etc. Punjab National Bank also started its operation at Barpeta Road (within Barpeta district) in 2005. Apart from these commercial banks, one Regional Rural Bank called Assam Gramin Vikas Bank has been operating with 20 branches (17 in rural and 03 in semi urban areas) in the district as on December 2005. Along with this, one co-operative bank called The Assam Cooperative Apex Bank Limited has also been running its banking business in the district with three branches at Barpeta, Barpeta Road and Pathsala. Also there is Land Development Bank in Barpeta district with only one branch whose prime objective is to provide long-term loan to the primary sector including sericulture of the economy. The number of villages per branch in Barpeta district was 1086 in 2004 (NABARD, 2005), which indicates that each branch covers a vast area of the district that precludes the chance of extending credit to the remote villages. The aggregate deposit mobilised by these banks in the district was Rs.443 crores, out of which Rs.208 crores was advanced in the form of credit as on March 2005³. Therefore, poor credit-deposit ratio is an indication of limited role of these banks in the general economic activities and thus the development of the district.

³ Directorate of Economics and Statistics (2006), Government of Assam, *Statistical Handbook*, Table-25.02, P-212.

8.3.2. Non-Institutional Sources of Finance in Barpeta District

Along with the various institutional sources of finance, numbers of private sources are also operating their credit businesses within the district of Barpeta. The major non-institutional sources of finance, operating in the district are moneylenders, traders, commission agents and relatives. Although it is not possible to have appropriate figure of their number and their credit deployment over the years, it is noticed that they have been playing a pivotal role in financing both productive and unproductive activities of rural and urban people. It is also observed that the rate of interest charged by these private sources ranges from one per cent to fifteen per cent per month, which is quite high in comparison to the institutional credit.

8.4. Eri culture and Financial Institutions in Barpeta district

Investment of capital in eri silk culture in the district of Barpeta is quite low. In spite of that, the poor ericulturists need financial assistance to make the silk rearing a viable occupation (Dutta, 1988). Eri culturists need short-term as well as long-term credit. They require short-term loan to purchase seeds, rearing appliances and for meeting other day-to-day expenses of rearing like payment of wages to the hired labour (if any), transport cost associated with the collection of leaves, etc. At the same time, the rearers need long-term credit to purchase land for cultivation of eri host plant, construction of rearing house etc. if possible. Similarly, in eri textile industries, the spinners and weavers require long-term loans to have expensive modern spinning devices like CSTR spinning device, loom etc. to make the industry commercially viable and profitable and expand the activities.

Although number of institutional sources is available in Barpeta district as mentioned earlier, there is not even a single institution which has so far come forward to extend their helping hand to the eri rearers and weavers during the last ten years. During the field survey the poor and needy entrepreneurs reported that they are unable

to obtain institutional finance because of the tedious and lengthy procedure of sanctioning loans and rigid terms and conditions. Besides, they have to prepare and submit scheme and project report (which is very difficult for them as most of them are illiterate), obtain non-encumbrance and valuation certificates from land records officers for collateral security, search for guarantor of loan etc, and what is more, the value of land offered as security in most cases falls far short of the norms insisted on by the institutions for the required amount of advance as they are the owner of very small land. Baishya (1986) had also observed the similar situation in case of all the sericulture activities in Assam. That means there has not been much change in the economic condition of the rearers during the last 20 years. It was also found that some of the entrepreneurs or needy rearers were not aware of the availability of institutional finance due to information gap or ignorance on their part. Therefore, not even a single person associated with ericulture in the entire Barpeta district is found who has received financial help from any banking or non-banking financial institution. Here, government has been found to be the only institutional source of finance of ericulture and endi textile industry, but the assistance provided by the government has not been sufficient as is observed from the field survey.

However, non-institutional sources like moneylenders/traders are always ready to advance credit to the needy rearers and weavers. It is because of the fact that they can take away the major portion of income generated in ericulture and endi textile (handloom) industry in the form of interest⁴. Also they can purchase the cocoon from the rearers at the very low price that is in many cases fixed at the time of advancement. Therefore, to avoid the exploitation by village mahajan, most of the rearers go by their own financing ability and limits their activities. It is also observed in chapter-4 that the

⁴ Because of non-organised and non-unionised the bargaining power of the rearers and crafts man is very poor.

relatively well off families adopt weaving along with rearing of cocoon, depending upon their financial conditions; whereas the poorer have less incentive to practise weaving as it is not much remunerative if they carry on with loan from mahajans. As the pecuniary plight of most of the rearers is deplorable, many of them have been practising it with their meagre investment capability by the traditional method and produce a limited amount for their home consumption in spite of the willingness of many of them to carry on this occupation commercially. However, a few rearers used to take credit advanced by village moneylenders (Mahajan). Table-8.2 provides the distribution of sample families according to the source of credit in the study area.

From table-8.2, it is observed that out of total 180 ericulturist families, 154 (85.56 per cent) families are dependent on their own source of finance. It indicates that self-finance is the major source of finance in ericulture⁵. Out of the three communities developments blocks, maximum ericulturist families of Sarukhetri (90 per cent) are dependent own their own finance. Gobardhana and Jalah blocks occupy second (with 85 per cent) and third position (with 82.86 per cent) respectively with respect to self-finance in ericulture.

Table-8.2
Sources of Finance of Ericulture in the Sample Household during 2005-06

Sources of Finance	Sarukhetri CD Block	Gobardhana CD Block	Jalah CD Block	Total
Village Mahajan	01 (2.00)	02 (3.33)	04 (5.72)	07(3.89)
Relative	02 (4.00)	04 (6.67)	02 (2.86)	08 (4.44)
Own Finance	45 (90.00)	51(85.00)	58 (82.86)	154 (85.56)
Government	02 (4.00)	03 (5.00)	06 (8.56)	11 (6.11)
	50	70	60	180

Source: Compiled from Field Survey.

Note: Figures in the parentheses represent percentage to total of the corresponding source of credit.

⁵ It may be due to two reasons. Both the producers/rearers are constrained by the limited market and hence for the limited production they do not receive advance capital from outside. On the other hand, it may be the fact that the major and attractive sources of capital are out of reach of those people, which may be due to the lack of security, information etc. Therefore, even though they are interested to expand their activities they are constrained by the non-availability of capital. It is however observed earlier that there is continuous rise in production and price of eri products over time and hence there is the possibility of expansion which may be more if the product is diversified and hence the second possibility is more likely to constrain the activities of the rearers.

Next important source of finance in ericulture is village mahajan. Only 3.89 per cent of the total ericulturist families in the study area take loan from the mahajans. The most important drawback of this private source is that they charge very high rate of interest. Also in few cases the rearers take loan from their own relatives. But their contribution is not very significant. Only 4.44 per cent of the ericulturists families take advance from this source. It is also because of almost same deplorable financial condition of their relatives. However, the rearers and weavers like to borrow from their relatives because most of the times they need not pay interest to the lenders. Of course, sometime they pay a nominal interest (in the form of gift) when their business becomes a successful one. Among the three blocks, the percentage of rearers receiving loan from the village mahajan together with the family relatives are comparatively higher in Gobardhana block (around 10 per cent) than the other two blocks; which happens to record more incidence of poverty (table-4.13). In spite of exploitative nature of the mahajans, reduction in the incidence of poverty is also higher in this block (as observed from table-4.14). Therefore, it can be said that if the rearers would receive soft loan from any source, say co-operatives, banks, SHGs, they could generate more income from ericulture activities. But, the role of banks, co-operatives and even of self-help groups in financing the ericulture activities in the sample households is found to be nil.

8.5. *Government Finance to Ericulture*

As other major institutional sources (particularly the commercial banks) are not coming forward to assist the ericulturist by advancing credit, the capital formation in ericulture is still very low and the ericulturists also cannot expand activities because of their low income. Under these circumstances, the government can take steps to develop this sector. Both state government as well as central government has been extending financial assistance in the form of grants to the sericulturist families, especially

ericulturist families of the state of Assam, but that too on a very limited scale. Recently, Government of Assam has started Tribal Sub Plan (TSP), Scheduled Caste Component Plan (SCCP) and Grant in Aid to General under which financial assistance is provided to the sericulturist families of the state. As per record, only Rs.5000 is granted to each of the nine beneficiaries under SCCP and six beneficiaries under TSP in 2006-07 in the entire Barpeta district. Therefore, the number of beneficiaries brought under this scheme is very negligible.

Grant is also given to the sericulturists of the state under Catalytic Development Project (CDP). Under this project, 90 per cent of the grant is contributed by the Central government while remaining 10 per cent is by the state government of Assam. The grant is offered to the rearers for augmentation of eri food plantation, construction of eri rearing house and also for obtaining eri-spinning devices. For augmentation of eri feed plantation, the financial assistance to the tune of Rs.600 is provided to each selected ericulturist family in a year. Under the same CDP scheme, government also provides Rs.600 to an eri rearer for purchasing eri-spinning devices in a year. The maximum assistance offered by the government to an eri rearer is for construction of eri rearing house under the same scheme. The grant given for the purpose is Rs.10, 000 to a single rearer. Every year different ericulturist families/ groups are chosen for the grant under each scheme. Government assistance allocated to the ericulturists of Assam for different activities under the CDP scheme during tenth plan (2002-03 to 2006-07) is presented in table-8.3.

During tenth plan, altogether 3872 ericulturists got financial benefit for the augmentation of eri feed plants. During the same period, only 3807 ericulturist families received financial assistance for the construction of rearing houses out of total 135237 ericulture practising families as recorded in 2005-06. Even if one fourth of them are poor, it is clear that the number of ericulture families brought under these programmes,

are very negligible. Not only that, the assistance provided to each beneficiary family is meagre compared to the required capital, which is of course comparatively smaller than other ventures of sericulture.

Table-8.3
Number of Eri Beneficiaries under CDP in Assam during Tenth Plan

Purpose	2002-03	2003-04	2004-05	2005-06	2006-07	Total
Augmentation of Eri Feed Plants	96	336	1255	1378	807	3872
Rearing House	00	330	550	1320	1607	3807

Source: Directorate of Sericulture, Government of Assam, Assam, 2007

Table-8.4
Number of Eri Beneficiaries under CDP in Barpeta district during 2000-01 to 2005-06

Year	Eri Feed Plantation	Rearing House	Spinning Devices
2000-01	05	00	00
2001-02	05	00	00
2002-03	00	00	00
2003-04	00	13	06
2004-05	30	30	00
2005-06	00	40	00

Source: Office of the Assistant Directorate of Sericulture, Government of Assam, Barpeta, Assam, 2006

Table-8.4 displays the number of beneficiaries in the district of Barpeta under CDP scheme for different ericulture activities during 2000-01 to 2005-06. During 2000-01, only five eri rearers together received a sum of Rs.3000 (Rs.600 each) for augmentation of eri host plant on 2.5 acres of land. In the following year, again some other five rearers were benefited with the same amount of money for the similar activity. But, no grant was offered to any eri rearers in 2002-03 in the entire Barpeta district though in the following year 13 eri rearers received Rs.10, 000 each for the construction of rearing houses. In the same year, other six rearers received Rs.600 each for purchasing eri-spinning devices. In the year 2004-05, number of beneficiaries under the programme of eri feed plantation and construction of rearing houses increased to 30 i.e., a total of 60 different rearers within the CDP scheme. But, the result of this assistance was almost nil as per the official records. During the personal investigation

also not even a single rearing house was observed among the rearers. Therefore, since 2005-06, in spite of offering cash in hand to the beneficiary rearers, the Directorate of Sericulture, Government of Assam has started providing assistance in the form of materials in different phases for the construction of rearing houses. It is done with a view to appropriate use of the provision. In the year 2005-06, forty rearers were benefited with an expenditure of Rs.4 lakhs for the construction of rearing houses.

Although Government officials claim that the eri rearers are mostly benefited under the CDP scheme in recent years, but during field investigation out of 180 families only 33 were found to have received grants under any of these programmes, which was mentioned in chapter-7. From the figures it is clear that whatever grants are received by the poorer eri rearers from the government is not sufficient in comparison to their needs, for which they are unable to expand their activities sufficiently to develop themselves.

8.6 Conclusion

In any modern commercialised economy, availability of cheap credit at appropriate time helps any economic activity to grow in a proper way. Although institutional and non-institutional sources are there in Assam in adequate number, their role is very much limited in financing ericulture. Still now, we do not observe any major step taken by the financial institutions towards the development of ericulture and endi textile industries in Assam. Though non-institutional sources are observed plenty in the district of Barpeta, the ericulturists are not willing to take credit from them as rate of interest charged is very high that reduce their profitability significantly and make it non-remunerative. Therefore, this age old sector though still existing but not growing at a desired rate. The ericulture activity is mainly constrained by the limited resources of the rearers themselves.

Government has been providing grants in aid to the rearers. But, the grants are either insufficient or mis-utilised and in some cases even misappropriated by the corrupt government officials in the name of rearers. Therefore, the actual rearers are not benefited at all. Proper policy should be framed to identify the actual rearers and also to monitor the programmes for the proper utilisation of whatever resources are available, by the eri rearers that can make them more competitive.

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Chapter-9

Summery and Conclusions

9.1. *Introduction*

The contribution of ericulture and sericulture as a whole to the total workforce of Assam and particularly in the district of Barpeta, growth of employment in ericulture in Assam, employment per hectare and per unit production of cocoon, contribution to the family income as well as changes in contribution to the NSDP of Assam, generation of employment and income in endi textile industries and its role in the eradication of poverty have been analysed elaborately in different chapters. Spatio-temporal variations in production, engagement of people, area under host plants, and productivity per unit of land under ericulture in Assam have also been analysed. Moreover, comparative study of eri, muga, mulberry and tasar raw silk in terms of production, generation of employment, cost, revenue and profitability per kg of cocoon production and per unit of investment, capital-labour ratio, contribution to foreign exchange earnings have been made elaborately in different sections. In addition to that the economic and non-economic problems of ericulture proper and endi textile industries and its possible prospects, role of various financial agencies in advancing credit to the ericulturists in Assam have been examined in some previous chapters. This chapter is devoted to describe the major findings of the forgoing study and also to throw some light on the policy conclusions emanated from the whole analysis and finally some recommendations have also been provided on the basis of the findings of the study.

9.2 Summary of Findings

The major findings of the study are given below

First of all, it is observed that North-Eastern States of India has been one of the major silk producing regions of India. Though the region contributed 16.44 per cent to total silk production of India in 1951-52, its contribution continuously declined and reached to 9.17 per cent in 2005-06 in spite of increase in absolute production in the region. It has been due to the faster growth in the production of silk in other parts of India.

Muga and eri are the two major varieties of silk produced in North-East India especially in Assam. Though mulberry is the major silk item of India, its production in the North-East India is negligible and that also has been declining since 1951-52. Tasar silk culture is also relatively new to this region and the region has always been contributing less than one per cent of the total production of India.

Assam ranked first in the production of muga and eri raw silk among all the North-Eastern states. In case of mulberry raw silk, although Assam stood first in the earlier years, it was relegated to the second position by Manipur in the year 1985-86 and since then stayed in the same position. Similarly in case of tasar raw silk Manipur ranks the top most position among all the North-Eastern States.

Record shows that the contribution of sericulture to the total workforce of Assam is not very significant. In the year 1991, sericulture contributed only 6.93 per cent to total workforce of Assam, which even declined to 5.44 per cent in 2001. But within sericulture, ericulture alone contributed 4.55 per cent to total workforce in 1991, which was 65.65 per cent of total sericulture. It is the highest among all the sericulture activities in Assam followed by muga and mulberry culture. Like other ventures of sericulture, contribution of ericulture to workforce also declined in 2001.

It was due to the rapid growth of other sectors, especially the tertiary sector of the economy. But one point is to be noted here that this figure of employment does not include the employment generated in the spinning and weaving of silk fabrics. Therefore, the total figure of employment generated due to the whole ericulture (including endi-textile activities) is much more than the figure supplied by the Directorate of Sericulture, Government of Assam. This is clear from the estimated figure of employment generation per kilogram of cocoon in the sample areas of Barpeta district (Chapter-4), which shows that the total employment generated in all such activities was around seven times to that of man-days generated in ericulture proper. But the whole produced cocoon in the region is not processed for weaving of cloths. About one third of the produced cocoon is used for spinning and weaving (observed from the sample) and if the whole produced cocoon is used for spinning and weaving, there is a great potential to generate further employment in it.

So far income generation is concerned; the contribution of eri cut cocoon to NSDP of Assam at market price during 1980-81 to 2004-05 is also not very significant. It is even less than one per cent. However, its contribution increased marginally during 1980-81 to 2004-05, which was mainly due to increase in production and price of eri cocoon. In case of family income, it is noticed that the average contribution of ericulture to the family income of the sample households was only 3.39 per cent. But whatever be the income generated from this occupation, it fairly supplements income of the rural poor rearers especially the tribal women in a significant way.

Though only about Rs.290 gross income is generated from one Kg of cocoon production in ericulture proper it increased to about Rs.1511 if that cocoon is converted into fabric by the rearers themselves. Therefore, if one-third of the

produced cocoon is processed (as observed from the sample) total revenue generated by the rearers and weavers' families of Assam would not be too small. Moreover, if the processing and weaving of the entire produced cocoon is done by the rearers, there is huge potential for the upliftment of the economic conditions of the ericulturists.

Families employed per kilogram of eri cocoon production and per hectare of land under host plant have declined in Assam during 1990-91 to 2004-05. Similarly, output of eri cut cocoon per hectare of land under host plant is observed to decline with the rise in area under host plant per family during the same period. Conversely, output of cocoon per unit of land with respect to families per unit of land has increased during the period. This is in conformity with the neo-classical law of diminishing marginal productivity.

In the district of Barpeta, ericulture has been the major source of employment among all the sericulture activities. It is mainly concentrated among the Bodo people in the northern part of the district. However, correlation between the annual number of broods reared and the annual family income of the sample households during 2005-06 is observed to be negative. Similarly, the correlation between the revenue generated annually from ericulture proper and the annual family income is also found to be significantly negative. It indicates that relatively poorer are more interested in practising ericulture than the relatively well off families as they have alternative opportunities. The rearers prefer to practice ericulture in winter to summer seasons because of the availability of castor leaves, which is much more during winter than summer and hence collection of it is easier in winter season.

Income earned by the rearers in ericulture proper consists of two important parts, viz. income from eri cut cocoons and income from pupae. Eri cut cocoons are the prime products while eri pupae are the subsidiary product of ericulture proper.

Major portion of income originated from ericulture of the sample families (around 72 per cent) was earned from cut cocoons. Of course, the rearers earned around 28 per cent of their ericultural income from subsidiary product, pupae. In some cases however from the sale of pupae people can earn substantial income. Moreover, pupae are a delicacy dish of the tribal people.

Endi textile is still in the form of a cottage industry in Assam. Earlier hand-spun eri yarn was only valued for man's wraps and women's scarves either for home consumption or for gift. But now the trend has changed. Some of the weavers are trying to meet the needs of present generation through variation of products. The product ranges from ladies garments *Mekhela Chaddar*, *Dokhanas*, skirts, midis, maxis to children and gents garments like jackets, *kurtas*; fashion accessories like ties, scarves, stoles, kerchiefs etc and bags, wallets, file folders, portfolios etc.

Although, a number of spinning devices are there, the poor spinners prefer to use traditional Takli. However, the productivity of Takli is very less compared to modern spinning devices. Out of all sample eri-rearing families, 43 per cent were found to be engaged in spinning activity. It is also found that though many families grow eri-cocoon, percentage of rearing families practice spinning and weaving across the villages rises with relatively higher average family income. It is found that, only about 33 per cent of produced cocoons were used for spinning by the sample families. On an average, approximately 800 grams of yarn was obtained from one kilogram of eri cut cocoons. Also, it appears that from spinning of one-kilogram of eri cut cocoon, 17.95 equivalent man-days were generated. On an average, one spinner earns gross revenue of Rs. 804.16 and net revenue of Rs.594.90 by spinning one kilogram of eri cocoons.

In Assam, usually throw shuttle loom is prevalent in weaving of eri fabrics by the weavers. Eri weavers of Assam prepare two special types of shawl suitable for male and female in winter respectively. On an average, 0.785 man-days were generated in the weaving of a shawl. Average revenue obtained from one male and female shawl was Rs.1340.88 and Rs.599.25 respectively.

From the analysis, it is observed that the ericulture activities have helped 5.2 per cent of the sample families to overcome poverty. Moreover, about 14 per cent of the families have been able to improve their condition from very poor to moderate poor due to the ericulture activities. However the impact on poverty is more in the village where relatively less families practise spinning and weaving along with the production of cocoon. The correlation between percentage reduction in poverty and percentage of ericulturist families engaged in weaving across the sample villages is negative which indicates that the relatively well off families practice weaving along with ericulture proper and hence the impact in terms of poverty alleviation is appeared to be insignificant there.

Growth of ericulture in Assam has been subject to wide spatio-temporal variation. Karbi-Anglong, Kokrajhar and N. C. Hills are among the top five eri cocoon producing districts and Hailakandi and Karimganj are the two bottom districts in terms of percentage contribution throughout the period since 1991-92. It is also found that the advanced districts that were contributing more to state total production in the earlier years are still contributing more. On the other hand, those who were contributing less in 1991-92 are still contributing less to total state production. However, the inter-district variation in contribution to total state production and its growth in different sub-periods have declined, which indicates that the laggard districts have been advancing at faster rate in terms of expansion of eri activities and

output than the relatively advanced districts. The inter-district variation is observed to be associated with the variation in per capita income (inverse but not very significant) and percentage of tribal population (positively) who focus more on eri activities than the other groups though all sections are found to be engaged in it.

It is also observed that the districts like Karbi Anglong, N. Lakhimpur who was among the top five districts in terms of generating employment in ericulture in Assam during 1995-96 was still at the top in 2005-06. Similarly, the districts like Hailakandi, Karimganj, Goalpara, and Bongigoan were among the bottom five districts in terms of contribution to state total employment through ericulture during the same period of time. Unlike production, the gap between contribution of top five and bottom five districts to total family employment in ericulture has increased during the period.

It is noticed that the district of Kamrup ranked first in terms of contribution to state total land under eri host plant in 1993-94 and followed by Karbi Anglong and Sibsagar. Conversely, Bongaigaon, Karimganj and Dibrugarh were at the bottom three positions in terms of contribution to state total ericultural land respectively. In the subsequent years 1998-99, 2002-03 and 2005-06, the share of Karbi Anglong to state total ericultural land was the highest, which is also the largest district in terms of area. In terms of share to ericultural area of the state though ranking has not changed much in the subsequent years, significant changes in ranking in terms of proportion of area of the district used for ericulture have been observed over the years. Goalpara, Morigaon and N. Lakhimpur have recorded leading positions in terms of allocation of area for raising eri feed plants. Moreover, the growth in proportion of area allotted for this purpose is much higher in the districts of Bongaigaon, N. Lakhimpur and Darrang

than the others as observed from the significant rise in their ranking. However, majority of the districts maintained their relative ranking over the years.

It is observed that production of eri cocoon per hectare of land under eri host plant has declined in most of the districts during 1993-94 to 2005-06. It indicates that the growth followed law of diminishing returns to land under eri host plant. However, some districts like Marigoan, Barpeta have recorded persistent rise in production of eri cocoon per hectare during the same period, which indicates operation of increasing returns from land.

From the analysis it is found that annual average exponential rate of growth of eri raw silk production during 1980-81 to 2004-05 was the highest among all the natural silk, while it was negative in case of mulberry and tasar silk. Similarly, in terms of contribution to workforce ericulture occupies the prime position among all sericulture activities both in 1991 and 2001. In the year 2001, unlike ericulture the number of people engaged in both muga and mulberry culture declined. Consequently, percentage contribution of both to workforce also declined drastically in 2001. Among eri, muga and mulberry culture, the annual average exponential rate of growth of families engaged is the highest in muga-culture, which was about 8 per cent and followed by eri and mulberry culture with 1.92 and 1.28 per cent respectively during 1990-91 to 2005-06.

Initially, muga raw silk was at the top position in terms of absolute value of output and proportional contribution to NSDP at market prices of Assam among all the varieties of sericulture. But after 1987-88, it was relegated to 2nd position by eri whose production and price both grew at faster rate than that of muga. Among the three major sericulture activities, the contribution of mulberry raw silk to NSDP at

market price is the lowest. It was due to both slow growth of production of mulberry raw silk as well as its price.

It is observed that eri and muga raw silk production per family has increased continuously during 1990-91 to 2004-05. Production of muga has increased significantly in spite of marginal increase in number of families practising muga-culture during the period. It is due to the fact that the existing families have been culturing muga extensively as area under each family and hence availability of host plant has increased during that period. In case of mulberry, though production of silk per family has increased marginally during 1990-91 to 1995-96, it declined thereafter in 2004-05. During the period production per eri rearing family has increased at much faster rate than that of muga. However, production of all the three varieties of raw silk per hectare of land under host plant has declined significantly during 1990-91 to 2004-05. It means that though land under host plant per family has increased significantly, the increased area have not been used intensively by the associated families. It is observed that area per family in case of mulberry has increased at much higher rate and its output per hectare has also declined at a faster rate i.e., there is a significant inverse relationship between increase in area under host plant per family and the output per hectare.

It is observed that gross profit and net profit per kilogram of cocoon production is the highest in case of eri, which is followed by muga and mulberry. Whereas average explicit cost per kg of cocoon is the highest in muga, followed by mulberry and eri, and average implicit labour cost is the highest in eri, followed by mulberry and muga. Eri is the most labour intensive among those three but highest yielding and hence it is practised by most of the rural families here. Though net profit per Kg of

cocoon was the highest in case of eri; per unit of investment it is the highest in case of muga.

It is observed that capital output ratio is the highest in the production of muga cocoon and lowest in case of mulberry. On the other hand, labour output ratio is the highest in the eri and lowest in mulberry culture and there is no payment for the hired labourer as it is done mainly by the family labourer. Capital-labour ratio is also very high in case of muga and followed by mulberry and eri. Even though net profit per unit of investment is much higher in case of muga, people prefer ericulture as gross revenue and profit is significantly higher in ericulture compared to the other two (implicit wage also remains at home) and for that comparatively very low initial investment is required. Also, male labour is essential in mugaculture as it is an outdoor practice. But ericulture as well as mulberry-culture can easily be carried out by the women members of the family.

Age-old ericulture sector has been suffering from a number of economic and non-economic problems. The non-economic problems faced by the ericulture are lack of education in the rearing families and lower status given to the ericulturists by the society. In addition to that the economic problems faced by this sector are the lack of healthy seeds, shortage of feeds to silkworms, marketing problems and lack of financial and other capital. Similarly, endi textile industries of Assam are confronted with a number of economic and non-economic problems. The economic problems are lack of technological improvement and training, marketing problems and financial problems. The economic problems are more serious than non-economic ones.

Majority of rearers and weavers in Assam, particularly in the district of Barpeta depend on their own financial capabilities. Around 85 per cent of the sample families depend on their self-finance at the existing level. Next source of finance is

found to be their relatives who provides loan to about 4.44 per cent of the rearers and lastly 3.89 per cent of the rearers are found to take advance from the village mahajan. Role of government is very limited in promoting ericulture in Assam. Although government has provided financial assistance to the eri rearers in the 10th plan under Catalytic Development Project (CDP), Tribal Sub Plan (TSP), Scheduled Caste Component Plan (SCCP) and Grant in Aid to General, those are not sufficient in comparison to the total number of rearers and their requirements.

In spite of several limitations, from the analysis of cost and revenue functions estimated from the collected data it is observed that there is ample scope for increasing ericulture activities in Assam that may help them reducing average production cost sufficiently and maximise their profit even at the existing level of technology. Not only that, if those problems are reduced and technological innovation is possible then it would help further expansion of this culture.

9.3. Conclusions and Policy Implications

Although ericulture has been a practice of rural Assamese women especially the tribal since time immemorial, it has not flourished sufficiently and at the same time, people has not left it. It is still practised by the traditional method, as it was earlier. From the forgoing analysis and observations, the following conclusions and recommendations can be made for the overall development of the ericulture in Assam.

Deficiency of eri feed plants is one of the important limitations for the growth of ericulture. The rearers can be encouraged to cultivate feed plants as it is observed that even if castor is cultivated scientifically, there is still sufficient profit in the culture. Moreover, the Government should establish more Eri Concentration Centres (ECCs) and expand the existing ECCs in collaboration with the department of social

forestry and encourage private entrepreneurs to establish ericulture farm. At the same time, indiscriminate cutting down of naturally grown silkworms' food plants should be prevented by strictly enforcing the existing law. Moreover, to meet the shortage of silkworms' food plants and to increase production of cocoons, the state government may acquire wasteland and allot the same to the local silk rearing Co-operatives, Self-Help Groups (if any) or diligent rearers for the growth of silk production. Extensive plantation of secondary feed plant like *Borkesseru*, Tapioca etc, can also be encouraged to meet the deficiency of food leaves for eri silkworms during the crisis of castor.

Government Eri Seed Grainages should be strengthened to produce more Disease Free Laying (DFLs). At the same time, certificates should be issued by the government to the private DFLs producers to meet the increasing demand.

Regulated Cocoon Markets should be established and certified rearers; spinners, weavers and government agencies should be allowed to participate in the auction of cocoon as well as final products. Transaction of cocoons outside the market should be controlled. Some Cocoon Collection Centres (CCC) may be opened in important silk rearing places, especially in the remote areas to save the rearers in the remote areas from the exploitation of middlemen and that will certainly help them to get respectable price. However, the CCC may be authorised to sale cocoon to the poor cum traditional spinners and weavers at reasonable rate so that they will also not be exploited by the middlemen.

Use of modern spinning devices like CSTR pedal cum motor operated machine should be made popular among the spinners. Necessary training and financial aid along with provision of electricity at a low tariff should be given to the spinners. It will undoubtedly increase the productivity and income of the spinners.

Traditional throw shuttle looms should be replaced, wherever possible, by power or semi-power looms. This substitution will increase labour productivity as well as income of the weavers and other people associated with it. For all these, adequate provisions may be arranged so that the poor rearers and weavers can acquire such instruments and enhance their productivity.

The weavers should be motivated and trained to produce fabrics to meet the taste and preference of the modern generation. Moreover, attempt should be made to blend eri with man-made yarn like polyester to reduce the cost, which will help the industry to expand its market size. For this, market research also should be conducted in order to assess the demand for the silk fabrics and its type. Proper steps should be taken to diversify the products and the selected fabrics/garments of fine grade should be displayed in national and international fairs and exhibitions for promotion of its sales.

No industry can prosper unless it is backed by research and extension services. Therefore, research and extension services of the sericulture should be expanded. The wide gap between the research institutions and rearers should be reduced and laboratory results should be brought to the rearers. The government may also take required steps to include sericulture course in the syllabus at the Higher Secondary and College level as an elective subject with provision for necessary facilities. This process would motivate the increasing educated youth towards this occupation.

To eliminate the financial problem of the rearers and weavers, the state government may persuade the commercial banks and other institutional sources to advance credit to sericulture and weaving sector at a low or subsidised rate of interest. Since the pecuniary plight of most of the rearers is deplorable with little agricultural land, they should be given credit without asking for mortgage. Moreover, steps should

be taken to reduce the misappropriation of government grants to promote ericulture. To remove the problem of capital, SHGs and Co-operatives may be formed among the rearers and weavers which will help them getting loans easily and that will also raise their bargaining power in selling cocoons and fabrics in the market. Moreover, it will help them to receive financial assistance from the sericulture department of the state government and technical assistance as well as other types of aid.

The information gap between the Government and the rearers as well as weavers, as regards sources of finance, availability of modern technology, market etc should be bridged by a network of publications, radio, television, public meeting etc. This will in turn, help emergence of entrepreneurs from the new generation. For that purpose also responsible officers with proper technical knowledge and managerial ability may be appointed to integrate production, marketing and other development activities in relation to silk weaving.

From the overall analysis it can be safely argued that there is a good prospect for the development of ericulture activities in Assam that may provide larger scope for the generation of employment and income in the rural areas and also thereby help alleviating poverty. For the adequate progress of it necessary arrangements are to be there for the removal of the limitations faced by this sector. Steps taken by the government so far is found to be not much productive and there is also the lack of persistent cooperation. Finally co-operation of various sections like officers, artisans, traders, rearers, weavers etc engaged in activities related to eri silk industry is necessary for the successful growth of the sector.

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