

Sericulture Manual

Standard Operating Procedures

Directorate of Sericulture, Assam.

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Directorate of Sericulture, Assam
Khanapara, Guwahati-22

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Directorate of Sericulture, Khanapara, Guwahati-22, Assam*

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OUR VISION

Transformation of Rural Economy of Assam through
Leadership in the International Silk Market.

This copy of Manual belongs to --

Shri / Smt. _____

Demonstrator / Supervisor / Farm Manager / Inspector / Extension officer / Superin-
tendent / Project officer / Asstt. Director of Sericulture etc.
Sericulture Department
Government of Assam.

Date of Joining as Demonstrator : _____

Date of Joining as Farm Manager / Inspector : _____

PREFACE

Assam is a leading Silk producing State. It has a virtual monopoly in Muga and the dominate share in Eri Silk.

In the backdrop of growing unemployment and slow industrialization, development strategies increasingly focusing on this traditional, income-earning cottage activity in the State. Efforts are now underway to transform Sericulture inform a household occupation into a vibrant commercial activity. The National supply gap of 7000 Metric Tones provides a golden opportunity for our rural economy.

The Central Silk Board has evolved standardized Package of Practices for increasing productivity by upgrading technology to the intermediate stage. However, this intermediate technology is yet reach all farmers and reelers.

The Sericulture Department is primarily responsible for the transfer to technology through its 1000 strong Extension staff who have direct and continuous interface with our Sericulturists. The need for a working Manual for these Extension Officers has been felt ever since the CSB Package were operationalised.

With this end in view, a small team of 3 officers was assigned the task. Shri Mrinal Kalita, assisted by Smt. M. Sharma, prepared the Draft Manual while Shri B. Nath provided essential management support. The draft was examined by experts from the Central Silk Board and their suggestions were incorporated.

The Manual is designed to fulfil three critical functions --

- * To serve as a Performance Aid for our 672 Demonstrators, 185 Supervisors, 95 Farm Manager/ Inspectors, 60 Extension Officers, 26 Superintendent/ Project Officers, 18 Assistant Directors etc.*
- * To Standardize Sericulture operations all over the State, thus ensuring uniformity and performance at the mastery level.*
- * To ensure complete transfer of current Sericulture Technology of the farmers and reelers.*

Mere publication of a Manual is not enough. It has to be operationalised effectively. For this, 10 Workshops are being conducted with assistance from the DOPT, Govt. of India and the Assam Administrative Staff College to train all grassroot level functionaries of our Department in the use of this Manual. Trainers have already been developed for this purpose.

The Department does not claim perfection. Development is a continuous process. The manual will be updated and refined periodically. Suggestions to improve this Manual into a more effective tool for performance will always be welcome from all quarters.

I sincerely hope that all concerned will find this work useful and I take this opportunity to thank all those individuals and organizations who made this happen.

S. P. Nandy
Director

Dr. (Mrs.) HEMO PRAVA SAIKIA
MINISTER.
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MESSAGE

Sericulture as an enterprise offers a tremendous opportunity for sustainable employment and economic growth in our state. But Technology and skills need to be improved and standards of performance set before this opportunity can be fully availed of in this Era of quality consciousness competitiveness and open markets.

I am happy that the Sericulture Department has compiled a Manual of Standard Operating procedures relating to all aspects of Silk production. Publication of this Manual will go a long way in helping our growers, readers, reelers, spinners etc. in achieving the standards of performance required to avail of the opportunity arising from the opening up of World Markets.

I hope that all officials of the Department irrespective of ranks will use the manual in performance of their functions and strives ton achieve even higher standard.

(DR. HEMO PROVA SAIKIA)

FORWARD

Sericulture is predominantly practised in Assam vis-a-vis in North East India by small marginal farmers. It is utmost important to motivate the farmers to adopt proven technologies for increasing the production.

Fortunately, the Department of Sericulture, Assam is having adequate infrastructural network for providing extension services, to the farmers. During the last few years it could be possible to percolate some of the package of practices developed by the Central Silk Board through extension machineries under Catalytic Development Programme, United Nation Development Programme, Sonali Suta Prakalpa etc. The overall out come of these schemes have been most encouraging and farmers are convinced that sericulture has tremendous potential to up grade their socio-economic status. Besides the financial support provided under various schemes, extension services renderedx of a good manual was a long felt need to provide support to extension workers. The department of Sericulture has taken all out efforts to publish the sericulture manual 2002 which will benefit one and all to gain knowledge or practice sericulture as a sustainable economic avocation.

Probodh Kr. Das
Joint Director
Regional Muga Research Station
Boko, Assam.

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-What is Sericulture-What is Silk-Life cycle of Silkworm-Optimum Temperature & Humidity-Requirement-Climate of Assam-Rearing schedule of Muga Silkworm, Rearing Schedule of Eri Silkworm, Rearing schedule of Mulberry Silkworm, Norms of engagement of labour-Conversion Table-Basic information.

Job Descriptions :

-Sericulture Demonstrator (circle)-Supervisor/Sericulture Demonstrator (Eri Spinning Training Centre)-Sericulture Demonstrator (Farm/Project)-Supervisor/Sericulture Demonstrator (CMG/ECC/Muga VGR)- Supervisor (Farm/Grainages) Manager of farm/

Grainages, Reeling expert/Reeling Foreman/Extension Officer (Posted in Reeling Unit) Inspector of Sericulture/Extension officer in Block level, Extension officer posted in Mulberry seed Grainage, Project officer (Sericulture), Superintendent of Sericulture, Asstt. Director of Sericulture, Planning officer, Deputy Director of Sericulture, Joint Director of Sericulture (Head quarter) Joint Director of Sericulture (Zonal), Adl. Director of Sericulture (Hills), Additional Director of Sericulture (H.Q.) Exhibition officer, Officer/l/c Research, Principal S.T.I. Titabar.

Mode of functioning in Sericultural Institutions :

Mode of functioning in Sericultural institutions :

Prohibition on rearing of domesticated animals in Govt. farms etc. - Digging of Trench and erection of green fencing.

Self Help group :

Definition- how to form SHG-Sailen features of SHG-Rules & regulation-Role of members and representative-Transparency in SHG management-Cluster of Apex bodies-Annual action plan.

List of Registers :

List of Registers to be maintained in MSDP/Farms/Centres etc. - Proforma for Inspection by Asstt. Director/Superintendent of Sericulture.

List of Govt. Institutions :

Muga Farms - Eri Seed grainage - Mulberry Farms - Muga Reeling Unit - Eri Spinning Centre - Mulberry Reeling Unit - Tasar production centre - Muga V.G.R. - Eri Concentration centre - Collective Mulberry garden - Sericulture Map of Assam.

SECTION - A

PRE - COCOON TECHNOLOGY

1.0 PACKAGE OF PRACTICES OF MULBERRY CULTIVATION :

1.1. Selection of Land :

- Select flat or slightly sloppy, fertile, porous, loamy, sandy loam or clay loam soils, (slightly acidic P^H : 6-7)
- Soil testing is to be done prior to establishment of garden.
- Rectify highly acidic or alkaline soil by application of lime and gypsum respectively.
- Acidic soil (P^H below 6.8) is to be corrected by adding liming materials like dolomite, calcitic lime stones, burnt lime, hydrated lime, lime sludge and slags depending upon the availability. Ground lime stone application is common.
- Use the following table to estimate the requirement of lime stone for reclamation for reclamation of acidic soil.

Soil texture	Quantity of lime stone required (tone/ha) to bring soil P ^H to 6.5 from	
	P ^H -4.5	PH-5.5
Sandy	5.00	2.50
Sandy loom	7.50	3.75
Loam silty loam	10.00	5.00
Clay loam	15.00	7.50
Clay	16.50	8.25

- Broadcast the dust of lime stone in two or more split doses in the field to be followed by ploughing.
- If required, repeat lime application once in every 4-5 years, based on soil P^H test results.
- For reclamation of Alkali Soil (P^H above 7.2) level the plot and divide into sub plots.
- Dig a deep tench (60 cm depth) across the slope of the plot.
- Make strong bounds (30-45 cm high) around the plot for better harvesting of rain water and leaching).
- Apply gypsum @ 2-4 tones per hectre and mix it with the top soil by light ploughing.
- Flood the plot with good quality irrigated water.
- Remove/leach out the water through the channel/tench after few days.
- In new soil, take one or two green manuring crops of 'Dhaincha' and plough down the same into the soil at the pre-flowering stage.
- Areas with atmospheric temperature of 20°C-30°C and 50 mm rainfall, once in fortnight and a sun shine hour of 9 to 13 hours a day are ideal for good growth of Mulberry plants.

1.1.1 Plantation Season :

- Plant Mulberry saplings in the month of April-May in rain fed condition.
- Plant Mulberry cuttings in the month of September-October in irrigated condition.

1.1.2 Land Preparation :

- Prepare land by deep hoeing/ploughing 2-3 times in the month of February -

March upto a depth of 30-40 cm in order to loosen the soil and make a fine tith of the soil.

- Leave the soil expose to sun shine in order to kill the weeds and soil born insects.
- Prepare pits of 1.5' x 1.5' x 1.5' Size at a spacing of 3' x 3' for low bush tree or 6' x 3' for high bush tree.
- Apply FYM @ 0.5 cft (5kgs) and 5 to 10 gms BHO/ALDRIN per pit, mix with soil and fill up the pit at least 15 days before plantation.
- Nos. of pits per acre are 4900 for 3' x 3' spacing and 2500 for 6' x 3' spacing.

1.1.3 Mulberry Varieties :

- S-1635, BC-259, TR-8, TR-10, JRH.

1.1.4 Plantation material :

- Raise Mulberry plantation by planting cutting or saplings.
- Prepare cutting of 6"-7" long with 3 or more live buds from hard wood branches of 6 to 8 months old and of pencil thickness (10-12 mm in diameter).
- The ends of the cuttings should be clean cut with an angle of 45° without split or bark peeling.

1.1.5 Raising of Mulberry Nursery :

- Plough the plot well upto a depth of 30-40 cm.
- Prepare nursery bed of 6' x 4' x 8' (1xbxh) size leaving at least 1' all-round for working space.
- Apply 1.5 cft (15.0 kgs) FYM and equal quantity of sand, mix with the soil of the nursery bed.
- Plant selected cuttings at a distance of 6" between cuttings keeping at least one bud above the ground in slightly slanting position (45° angle) in the last week of November.
- Irrigate the cuttings immediately after planting and thereafter at periodical intervals of 4-5 days.
- Moulch the nursery bed to preserve moisture after planting.
- Apply 180 gms. area/bed after 2 months of planting.
- Weeding at an interval of 15 days.
- One 24 sq. ft. nursery bed accommodate 215 cuttings.
- Vigorous saplings of 3'-4' tall will be ready by the middle of April.

1.1.6 Transplantation in the field (Rainfed Areas) :

- Transplant 3'-4' high saplings from the nursery bed in the pits (as recommended in item No. 1.1.2) during April-May.

1.1.7 Plantation of cuttings in field (Irrigated Condition) :

- Prepare cuttings as per recommendation given in Sl. 1.1.4.
- Plants 3 cuttings per pit (already prepared) in triangular at a distance of 15 cm during September-October.
- Irrigate the plantation once in 15 days interval.

1.1.8 Maintenance :

- 1st Year - 1st weeding and inter cultural operation to be done after 60 days of plantation i.e. in August under Rain fed condition and in January under irrigated condition.
- 2nd weeding and inter cultural operation to be done after 90 days of plantation

i.e. September under Rainfed condition and in February under irrigated condition.

- Apply NPK in the month of November-December and May-June @ 20.4 kgN; 10.2 kgP; 10.2 Kg K per acre (i.e. 8.16 gmN; 4.08 gm P; 4.08 gm K/ plants)
- Apply FYM @ 19 cm per acre just before application of NPK in the month of November-December and May-June.

2nd year onwards :

- Prune the plants at a height of 1.5/-2.0' in the month of June (1st pruning - middle pruning)
- Carry out hoeing and weeding just after pruning (mid June)
- Apply FYM @ 19 cm/acre and NPK @ 30.0 kg:15.3 kg: 15.3 kg per acre in the month of June.
- Carry out hoeing and weeding operation in the last week of August.
- Prune the plant at 6// height in November (IInd pruning bottom pruning)
- Carry out hoeing and weeding operation in Mid November after pruning.
- Apply FYM @ 19 cm/acre and NPK @ 30.5 kg. 15.3 kg. : 15.3 kg per acre in the month of November.
- Carry out hoeing and weeding operation in the month of January.

1.1.9 Green Manuring & Inter Cultivation :

- Sow seeds of Dhaincha, Sanhemp in the Mulberry garden in the last week of June after hoeing @ 50 kg./hectre (i.e. 20.4 kg/acre)
- After 45 days of seed sowing, cut the plants and mix with soil (last week of August)
- Sow seeds of Mug, Masur and black pea in 1st week of September in the Mulberry garden after hoeing @ 40 kg/hactre (i.e. 16.32 kg/acre)
- Harvest the crops in the month of December.
- Mulch the soil of the garden by the plants after collection of the seeds.

1.1.10 Leaf Harvest :

- Harvest leaves by picking after 10 weeks of pruning.
- Leaf yields per acre is 6000 kg. in rainfed condition and 9000 kgs in irrigated condition per year.

2.0 PACKAGE OF PRACTICES FOR RAISING BLOCK PLANTATION OF SOM PLANTS :

2.1 Raising of Nursery :

Introduction : The major host plants of Muga Silkworm i.e. Som and Soalu, grow as trees. Propagation of these trees are usually carried out through seeds. The seeds remain viable for a short period and show poor germination. Seeds sown in nursery bed with suitable cultural practices give better germination and produce quality seedlings. Plantation through seedling show better survival after transplantation and high foliage production.

2.1.1 Preparation of Seed bed :

- Select well drained high land in a shady place for seed bed preparation.
- Plough the land properly upto 30 cm depth and level it.

- Make 5x1.5 mtr bed and raise the bed upto 20 cm height.
- Maintain a gap of 30 cm between two beds for cultural operation as well as for proper drainage.
- Apply 5 cft (50 Kgs) well decomposed FYM and 200 gms of Forate per bed and mix thoroughly with the soil.

2.1.2 Seed Collection & Selection :

- Collection ripe and mature seed preferably directly from the plant before natural shedding during April-May in Lower Assam and during May-June in Upper Assam.
- Soak and wash the seeds in running water 2-3 times to remove the pulp.
- Put the seeds in water and select only those which settle at bottom for sowing.
- Dry the seeds in shade. Seeds above 0.3 gm in weight and 0.7 mm in diameter are ideal for sowing.
- Treat the seeds with cerasan or Dithane M-45 @ 2 gm/kg of seeds.

2.1.3 Seed sowing and raising of seedlings :

- The seeds remain viable only for a short period. It is desirable to sow the seeds soon after collection.
- Prior to sowing, soak the seeds for 24 hours i water.
- Sow seeds keeping a distance of 15 cm from seed to seed. Seed should be placed at just 2 cm deep in the bed, covered with soil.
- Sow 8000 seed (2 kg approx.) per bed.
- Cover the seed bed with a thin layer of hay or thatch grass i.e. mulching and wet the bed thoroughly by sprinkling water. Repeat watering at 4-5 days interval.
- Remove the mulch after 90% germination.
- Apart from the above mentioned procedure, the seed can be directly sown in polythene tube.
- Sow 2-3 selected seeds in polythene tube (15x20 cm) filled with a mixture of sand, soil and FYM (1:1:1)
- After germination (6-8 weeks from sowing) keep one seedling in each tube and transfer the others.

2.1.4 Transplantation of Seeding to Poly bags :

- For providing better spacing, transplant the seedlings after 2-3 months of sowing to 15x20 cm poly bags filled with soil, sand and FYM mixed at 1:1:1 ratio without disturbing the root system.
- Watering of seedlings at 4-5 day interval.
- Avoid stagnancy of water.
- Provide a shed over the seedlings to protect from direct sunlight and hail storm. Remove the shade after on set of monsoon.

2.1.5 Transportation of Seelings :

- To avoid high air flow or direct sun ray, protect the seedlings with wet hesian cloth for long distance transportation.

2.1.6 Protection of Seedlings from Pests :

- In case of attack of seedlings by Pests like Aphids, Thrips, Jassids, Loopers

and Bluish Black beetles, spray 0.03% DIMECRON at 15 days interval till pests are controlled.

2.1.7 Raising of Som Plantation :

2.1.8 Selection & Preparation of Land :

- The site for Muga food plantation should be high and well drainable.
- Plough the land thoroughly upto a depth of 30 cm.
- Make 45 cm×45 cm×45 cm size pits of 3 mtr×3 mtr spacing (450 pits per acre).
- Fill the pits with 5 kg (0.5 cft) well decomposed FYM, 5 gms forate after properly mixing with soil.

2.1.9 Planting season and transplantation of Seedling :

- The monsoon (April-September) is ideal for planting.
- Thranspalnt 8-12 months old seedlings to the prepare pit (1.5'-2' height).
- Before transplantation, open the polybag with a blade and remove it gently without disturbing the root system of the seedlings.

2.1.10 Application of FYM and NPK :

FYM - Make 6''-9'' deep ring around the base on the plant (at a distance of 2 feet from the plant) during the month of November-December and refill the ring with FYM @ 5.0 kg per plant (0.5 cft) during the 2nd-4th year and 10.0 kg FYM per plant from the 5th year onwards.

NPK - Apply 40 gms N, 60 gms P and 15 gms K per plant during 1st-4th year and 80 gm N, 120 gms P and 30 gms K per plant from 5th year onwards in two split doses at the interval o 6 months in the month of March and August every year.

- NPK can be applied by making rings as in the case of FYM or through holes in the ground (8''-9'' deep 5-6 oblique holes made at a distance of 2' around the plant).

- After NPK application irrigate the plot if there is no rain.

2.1.11 Inter Culture Operation :

- Carry out regular cultural operations by weeding and loosening of soil around the plant (2 times per year).
- Soil loosening allows the rain water to percolate deep into the soil and ensure better aeration in the soil.

2.1.12 Training, Pruning and pollarding.

(Prune means to cut off parts of a tree to make it grow better)

(Pollard means cut off teh tree trunk so that a thick crown of branches grows out).

The objectives of training, pruning and polarding are :

i) To increase the foliage.

ii) To remove dead or diseased parts.

iii) To maintain desirable height and shape of the plant.

iv) To establish a functional relationship between different organs of the plant.

- After transplantation of the seedling, nip the apical bud once in 6 months

which will give umbrella shaped crown and the plant will have more branches.

- Too many side branches should not be allowed and when the plants become 3 year old the main trunk upto a height of 3' above ground level are to be kept free of side branches.
- Maintain 4 to 5 branches above 3' from the ground level and 2 to 3 branches on each of these branches subsequently to grow. This method should be continued year after year so that umbrella shaped crown of the plant is obtained.
- After the first rearing in 4th year, resort to light annual pruning and defoliation.
- Resort to heavy pruning of branches in the 6th year during the month of October-November.
- Pollard the plants at a height of 1.5 mtr after 6-7 years during the month of October-November and clip off light branches after each rearing.
- Apply cow dung on the pruned/pollard surface of the branches /trunk.

PRUNING SCHEDULE

Pruning

→	Light Pruning (Clipping) (Removal of 25% Bio-Mass annually)
→	Heavy Pruning (October-November) (Removal of 50% Bio-Mass annually after 6 th years)
→	Pollaring (October-November) (Removal of Bio-Mass leaving only tree trunk after 6 th -7 th years)

PRUNING SCHEDULE (light pruning)

CROPS	PERIOD OF PRUNING	
	EARLY AGE REARING	LATE AGE REARING
a) Kotia Link		
1. Baishaki (April-May)	1 st week of December	1 st week of November
2. Aherua (June-July)	1 st week of March	1 st week of February
3. Bhodia (August-Sept.)	1 st week of May	1 st week of March
4. Kotia (Sept.-October)	1 st week of July	1 st week of June
b) Jethua Link		
1. Ahinia (Sept.-Oct.)	1 st week of June	1 st week of May
2. Aghanua (Oct.-Nov.)	1 st week of July	1 st week of June
3. Jarua (June-March)	1 st week of Sept.	1 st week of August
4. Jethua (April-May)	1 st week of Dec.	1 st week of Nov.

3.0 Package of Practices for Cultivation of Eri Food Plants :

3.1 Cultivation of Castor Plants :

3.1.1 Seasons of Plantation :

March-April and September-October are ideal seasons for castor plantation.

3.1.2 Selection and preparation of land :

- Select high, flat or slightly sloppy land to avoid water stagnation.
- Plough the land 2-3 times to a depth of 20-30 cm and level.
- Make 45 cm(L) × 45cm (B) × 45cm (D) pits at 1.5 × 1.5 mtr spacing (1722 Nos. pits per acre)
- Apply 5 kg FYM per pit and mix thoroughly with soil and level it.

3.1.3 Sowing of seeds and initial care :

- Select seed of red and green varieties of castor (preferably non bloomy)

- Sow seed @ 2-3 per pit at a depth of 3-4 cm and irrigate if there is no rain (Dry Season).
- Germination takes place within 7-10 days.
- Keep only one plant per pit after 15 days of germination.
- Carry out hoeing and weeding 3-4 times per year.
- Aooly NPK @ 30 kg:20kg:10kg per acre after 1 month of germination at the base of plant by making 6" deep ring around the base of the plant (At a distance of 2 feet from the plant).
- Apply 15 kg Nitrogen per acre (i.e. 8-9 gms/plant)+1 kg FYM/Compost per plant by making rings at the base after 2nd leaf harvest.

3.1.4 Leaf harvest :

- Make 1st leaf harvest after 3 months of plantation.
- Make 2nd , 3rd , 4th and 5th harvests after 1.5 to 2 months depending upon the growth and leaf maturity.
- Leaf yield per acre per year is 10,000 kgs.
- Leaf yield per plant per year is 6.0 kgs.

3.1.5 Cultivation of kesseru Nursery bed :

Kesseru is the second best host plant for Eri Silkworm rearing nest to castor.

3.1.6 Raising of seedling in Nursery bed :

- Kesseru seed remain viable for short period and show poor germination.
- Seedlings are to be raised in Nursery with suitable cultural operation and transplanted later to regular plantation site.

3.1.7 Season and Selection of site :

- February-March is the ideal season for raising Kesseru Seedlings.
- Select high and well drained land.

3.1.8 Preparation of Nursery bed :

- Plough the land 2-3 times upto a depth of 30 cm and level.
- Make 6 mtr (L) x mtr (B) beds and raise to 15 cm height.
- Apply 6 cft FYM (60 kgs) and equal quantity of sand to each bed, mix thoroughly with the soil and level.
- Leave the bed as such for 2 weeks.
- Apply 0.1% Endofil-m 45 @ 20 per bed before 2 days of sowing.

3.1.9 Seed Collection :

- Cover the Kesseru fruits on the plant with nylon net.
- Collect the ripe fruits during Feb-March.
- Store the collected fruits in shade for 1-2 days.

3.1.10 Seed Treatment :

- Soak the fruits in water overnight after storing for 1-2 days.
- Rub the soaked fruits with gunny cloths.
- Put the rubbed depulped fruits in water once again and collect the sunken seeds nfor sowing.
- Treat the seeds with Endofil-M 45 @ 2-3 gms per kg of seeds.

3.1.11 Seed Sowing :

- Sow 800 seed in each nursery bed maintaining a row to row distance of 20 cm and seed to seed distance in a row at 15 cm.
- Mulch the seed bed with a thin layer of straw.
- Irrigate regularly in the morning and late noon hours during dry season.
- Provide a shed over the bed to protect from direct sun light and hail storm.
- 90% germination can be obtained within 18025 days.
- Remove the mulch after 90% germination.
- Remove the shed after the on set of monsoon.

3.1.12 Cultural operation :

- Carry out weeding at an interval of 20-30 days till the seedlings attain a height of 20-25 cm.
- Spray 0.1% ROGOR along with 0.1% ENDOFIL - M45 at an interval of 15-20 days.
- Keep only 1 seedling per pit.
- For better growth spray 10% Urea Solution 3 times at an interval of 15 days from June onwards.
- Seedling grow to a height of 1.0' to 1.5' upto the month of August (4 months).

3.1.13 Raising of Regular Plantation :

3.1.14 Season and Selection of Land :

- August to middle of Sept. is the ideal season.
- Select high, flat or slightly sloppy land.

3.1.15 Land preparation

- Plough the land to a depth of 20-25 cm and level it.
- Make 45cm x 45cm x 45cm pit at 2 mtr x 2 mtr spacing.
- Apply 0.5 cft (5kg) of well decomposed FYM mixed with 19 m ENDOFIL-M 45 per pit and mix thoroughly with soil.

3.1.16 Transplantation :

- Transplant 1.5' tall healthy seedlings.
- Remove the soil surrounding the seedling at the nursery bed by making a ring of 1' depth, leaving 1' diameter at the base.
- After 10-15 days when the terminal roots appear from the cut ends of the seedlings, transplant the seedlings to each pit on a rainy day.
- Nos of Kesseru plants per acre is 1200 Nos.

3.1.17 Maintenance :

- Carry out hoeing and weeding 3-4 times a year.
- Apply 0.5 cft (5kg) FYM per plant once a year before monsoon (Feb-March).
- Apply 60:37:12 kg NPK per acre per year after 1 year of plantation in two split doses i.e. in March and September @ 25 gm N:15 gm P:5 gm K per plant by making either ring or holes as in the case of Som Plantation.
- Apply 1 gm Endofil-M 45 along with NPK for controlling termite attack and fungal diseases.

3.1.18 Pruning / Polarding :

- Pollard the eplants after 3 years of plantation at a height of 1.5 mtr in the

month of November.

- Apply fresh cowdung at the cut ends of the plant to protect the tree from drying.
- Prune the same plant after every one year in the month of Nov. at a height of 1.8 mtr or slightly higher to get maximum leaves.
- Maintain the height of Kesseru Plants 15'.

3.1.19 Leaf Harvest :

- Leaves can be harvested after 2 years of plantation.
- One Kesseru tree yields about 30 kgs leaves annually after 5 years of plantation.

3.2.1 Preparation of Compost :

- Dig 2 nos. 3 m x 1 m x 1 m size pits per acre of silk worm food plants garden.
- 2 such pits made side by side can be used alternatively to compost all the farm waste from 1 acre garden.
- One pit is adequate to accommodate the farm waste from 1 acre garden from roughly 2 crops in 4 to 5 months time.
- Collect silk worm litters, left over of food plants leaves, weeds etc. and after spreading the collected materials in thin layer in the pit sprinkled with a mixture of fresh cow dung, ashes and water each day.
- Add some quantity of single super phosphate to the compost bed.
- Repeat the same activity till the compost bed stands 30-45 cm above the ground level.
- At last plaster the compost bed with 2.5 cm layer of a mixture of mud and cowdung.
- Erect a thatched shed to protect the compost pit from rain and direct sunlight.
- Leave the filled up compost pit for 4 to 5 months.
- Compost will be ready for use in about 4-5 months. After filling up the 1st pit use the second pit for compost preparation following the same process as recommended above.

3.2.2 Preparation of Vermicompost :

- Construct a tank of 10'x5'x1.5' size with bricks and cement in a shady location.
- The bottom of the tank is to be 5 cm thick where broken bricks, chips, cement and sand are to be used.
- The area should be slightly elevated from the ground level to avoid water logging during monsoon.
- Erect a thatch roof over the tank to protect the tank from direct sunlight, heat and rain to keep cool and humid atmosphere under the earth.
- Dig a pit 8'x4'x3' size for preparation of bedding cum feed material.
- Collect silkworm litter (not contaminated with slaked lime or any other chemicals.) left over of food plants leaves, twigs etc. Leaves and twigs of any other plants, coarsely dried banana stalks, sugarcane thrash, coir of arecanut, kitchen waste free from polythene and plastic, farm waste and waste of organic origin and put the collected materials in the said pit.

- The packing of raw material in the pit is to be sprinkled in between with fresh cowdung slurry made from approx. 5kg cowdung mixed with 20 ltrs of water.
- Fill the pit till the raw material stand 1' to 1.5' above its edge.
- At last plaster the compost bed with 1" layer of a mixture of mud and cowdung.
- The compacted moist material becomes semi-decomposed within 10 days to serve as the bedding-cum-feed mixture.
- Turned the mixture few times for proper mixing of the material.
- The material is to be sufficiently moist so as to 1 or 2 drops of water comes out when squeeze.
- Collect the bedding-cum-feed mixture from the pit and fill the tank loosely with the same leaving 6" gap at the top to facilitate turning and aeration of the mixture time to time.
- Earthworms can not survive in very compact condition. An ideal temperature for their growth is 25°C to 30°C.
- Release a mixed culture of *Endrilus eugeniae*, *Isonia foetida* and *perionyx excavatus* or any one of these in the tank @ 80 worms / cft of bedding-cum-feed material.
- The bed is to be sprinkled with water once in 2-3 days to keep moist at about 45% and turned in every 10-15 days for aeration.
- Vermicompost will be ready after 7-8 week in summer and 10 months in winter.
- After preparation of compost dump it in mounds on polythene sheet or cement floor for 12 hours.
- When most of the worms settle at the bottom of the mounds, collect the vermicasting from the surface.
- Partially air dry the collected vermi casting and then sieve through a 3 mm mesh to separate cocoons and juvenile worms which are to be released along with the earthworms settled at the bottom of the mounds immediately into fresh culture bed.
- Bed following the above technique 350 cft of vermicompost can be produced from one tank per annum.
- Supply vermicompost @ 100-200 gm/tree, 2.0 tons/hectre.

4.0 PEST AND DISEASE MANAGEMENT OF FOOD PLANTS

4.1 Mulberry Food Plants :

Common Name of pest/disease	Symptoms/Identification	Control measures
A. Insect Pest		
1. Bihar hairy caterpillar	Green areas of leaves eaten away leaving dried venation.	Spray 0.2% Rogre at fortnight interval.
2. Scale insect	Dark brown or black scales studded on the shoot, yellowing of leaf blade.	Swap stem with Diesel oil & soap emulsion in 1:3 ratio.
3. Jassids, Thrips & Mites	Burning/browning of the leaves.	Spray 0.05% to 0.1% Rogor at fortnight interval.

4. Leaf hoppers	Brown patches at leaf tip or along the margin of leaf veins. Leaf become cup shaped & withers away.	Instant light traps. Spray 0.1% Rogor at fortnight interval.
5. Tukra disease	Crumpling and thickening of apical leaves and shoot.	Cut burn affected shoots. Spray 0.1% parthion at fortnight interval.
B. Disease :		
1. Leaf spot	Brown irrregular spots appear on the leaves in rainy season. Leaves become yellow & fall prematurely.	Spray 0.1% Bavistin at fortnight.
2. Powdery mildew	White powdery patches appear on the lower surface of leaves during winter. Disease leaves look dry and fall off.	Spray 0.2% Karathane or Bavistin at fortnight interval.
3. Leaf Rust	Small dark brown pin head size spots appear on the leaves during winter. Affected leaves become yellow and wither off.	Spray 0.2% Bilton or Bavistin at fortnight interval.
4. Roof knot	Stunted growth of plants yellowing of leaves and formation of knots/ galls on the roots.	Application of Neem oil cake @ 1 ton/hect/yr. in four split doses.

4.2 Muga Food Plants :

Common Name of pest/disease	Symptoms/Identification	Control measures
A. Insect Pest		
1. Jassids, Thrips & Aphids	Browning of leaves (as a result of sucking by the pests)	Spray 0.05% Demicron or 0.3-0.5% ROGOR twice at 15 days interval.
2. Stem Borer	Hole at the trunk of the tree	Plug the hole with cotton soaked in Petrol/Kerosine and plaster over it with mud.
3. Amphutukoni Muga	Hairy caterpillars defoliate the plants. Cluster of small golden colour cocoon in between two leaves.	Rogor (0.5%) spray at 500-900 ltr/hect from April-Sept. Collect the cocoon and destroy.

4. White Ant or Termites	Attack the food plants at all stages of growth.	Mix 2.5% Aldrin dust with soil @ 20 kg 1 hect.
5. Gall insect	Ugly gall forms on both sides of leaves.	Rogor (0.5%) spray at 500-900 ltr/hect. from April-Sept.
B. Diseases :		
1. Gray blight	Affected leaves become dry with dark grayish colour on the soft tender leaves.	Spray 1% Bordeaux mixture
2. Leaf spot	Brown irregular spots appear on the leaves in rainy season. Leave become yellow and fall prematurely.	Spray 0.1% Bavistin at fortnight interval.
3. Rust fungus	Tiny, pink or yellow pustules appear on the underside of leaves, followed by the development of dark coloured spots on the upper surface.	Sulphur dusting at 10-12 kg/hect, prune the effected twigs and burn.

4.3 Eri Food Plants :

Common Name of pest/disease	Symptoms/Identification	Control measures
A. Insect Pest		
1. Castor semi loopers (Achaea-janata)	Grey looping defoliator	Spray 0.1% Rogor 0.5% Demicron along with 0.1% Endofil-M 45
2. Hairy Caterpillars (Eupractismertone)	Radis defoliators	@ 1000-1200 ltr./hec 2-3 times at an interval of 10-15 days.
B. Diseases :		
1. Rust (Melamp-sora ricini)	Tiny pink pustule on the under surface of the leaves followed by development of yellow spots on the upper surface.	Sulphur dusting @ 10-12 kg/hectare.
2. Seedling blight (phytophthora parasitical)	Dull green patch on both surface of cotyledonary leaves.	Spray Bordeaux.

3. Powder mildew (Leveillula laurical)	Colourless shiny patches appear on the under surface of the leaves, turning the upper surface pale brown.	i. Sulphur dusting @ 10-12 kg/hect. ii. Spray 0.2% Bavistin at fortnight interval.
4. Leaf spot (Cercospora ricinella)	Tiny or brown spots with pale green margins on both surface of leaves turning pale brown and greyish with blackish structure at the centre with dark brown margins.	Spray 0.3% Bilton or 0.1% Bavistin at 15 days interval.

Silkworm rearing should be conducted only after 15 days of insecticide spray.

5.0 Handling of Microscope

- Clean the objective and eye-piece lenses with a clean lens cleaning tissue.
- Place the eye piece into the draw tube.
- Place the objective over the stage, grasp the upper edge of the objective between the fore and the middle finger of left hand and bring its screw in contact with the screw of the nose piece keeping the object in line with the tube and gently pressing upwards, revolve the objective with the thumb and the fore finger of the right hand by the lower edge.
- Put the slide with the mounted object on the stage and adjust the exact position on the slide to be focussed.
- Focus on the objective. The mirror of microscope is either plain or concave. Plain mirror is suitable for low power object and concave is for high power objective.
- Object on the slide will appear too faintly at the first sight. Give few slow turns to the micrometer head to get a clear appearance of the object to some extent.
- Finally use the micrometer head to get bright appearance of the object.
- Always start examination with low power objective and after ward with high power objective.
- Microscope is an instrument which magnifies to the eye. The objects so minute as it is quite unnatural to see with the naked eye without its aid.

Parts : 1) Eye piece, 2) Draw tube, 3) Body tube, 4) Nose piece, 5) Objective, 6) Stage, 7) Sub-stage, 8) Condenser, 9) Diaphragm, 10) Mirror, 11) Base, 12) Pillar, 13) Inclination joint, 14) Handle arm, 15) Micrometer head, 16) Micrometer head, 17) Rack.

6.0 SILK WORM REARING TECHNOLOGY

6.1 Prepare of Disinfectants :

6.1.1 5% Bleaching Powder Solution :

- Dissolve @ 50 gms of bleaching powder (25-30% chlorine content) in 1 litre of water to prepare a 5% solution of bleaching powder).
- Filter the solution through a layer of muslin cloth. Allow to settle.

- use the clear solution for disinfection.

6.1.2 2% formaldehyde Solution :

- Mix 1 part of formaldehyde (36% concentration) with 17 parts of water to prepare 2% formaldehyde solution.

6.1.3 Formaldehyde lime solution :

- Add finely powdered slaked lime to 2% formaldehyde solution @ 5 gms slaked lime powder to 1 litre of 2% formaldehyde solution.

Importance :

- Formaldehyde is a health hazard.
- Hence right concentration and required volume should be judiciously used.

6.1.4 Bleaching Powder slaked lime mixture :

- Mix bleaching powder (25-30%) with finely powdered slaked lime at the rate of 100 gm bleaching powder per 900 gms of lime.

6.1.5 Slaked lime powder :

- Sprinkle water on burnt rock lime (lime stone), allow to become powder. Convert the lime powder into fine powder and sieve it.

6.1.6 Formaldehyde chaff preparation :

- Collect paddy husk and char (to blacken in fire) in an iron pan.
- Prepare formaldehyde solution of required concentration as follows --

Conc. of available formaldehyde - Conc. of required formaldehyde

$\frac{\text{Conc. of available formaldehyde}}{\text{Conc. of required formaldehyde}} = \text{Parts of water to be added to 1 part of available formaldehyde.}$

- Mix formaldehyde solution of the required concentration with chaff in 1:10 ratio.

6.1.7 Dithane M-45 + Kaolin mixture :

- Mix 1 part Dithane M-45 with 99 parts of kaolin to prepare 1% mixture.
- Mix 2 parts Dithane M-45 with 98 parts of kaolin to prepare 2% mixture.

6.2 METHOD OF DISINFECTION :

6.2.1 Rearing house and appliances :

a) Spraying :

- Expose all rearing equipments to bright sunlight for 6-8 hours.
- Dip the rearing equipments in 5% bleaching powder solution in a disinfectant tank for a minimum period of 30 minutes.
- Clean the rearing room by scrubbing with 5% bleaching powder solution.
- Keep all the rearing equipments inside the rearing room/house.
- Close the doors and windows tightly except the front door.
- Seal the cracks and crevices on the walls, windows and doors.
- If the room temperature is low, raise the temperature up to 25°C by keeping a charcoal stove or electric heater.
- Wear mask, apron, hand gloves before spraying.

- Spray 2% formalin solution uniformly to thoroughly wet the roof, walls, floor, doors, windows and also the rearing appliances @ 1 litre per 2.5 sq. mtr.
- Close the door to make the room air tight for 15-20 hours and then open the doors and windows.

b) Fumigation :

- Fumigation the air tight rearing house using 10% formaldehyde and heat in a pan over a charcoal stove or heater. Close the door.

6.2.2 Calculation of total area to be disinfected :

- Area of roof & floor : $L \times B \times 2$
- Area of 2 side walls : $L \times B \times 2 =$ Total Square area
- Area of other 2 side walls : $L \times B \times 2$

6.2.3 Surface disinfections of larvae/silkworm rearing bed :

a) Resom keet Oushadh (for control of Grassarie & Muscardine)

- Remove uneaten leaves from the rearing tray.
- Dust Resom keet Oushadh by tying in a muslin cloth on the body of the silk worms in the rearing bed uniformly after every moult, before commencing feeding at the rate of 60 gms and 120 gms for 1st & 2nd moult for 100 dfls.
- Give feeding after half an hour of RKO application.

b) Formalin chaff : for control of Muscardine disease

- Sprinkle the formalin chaff mixture on the larvae in the bed after moult before resuming feeding.
- Cover the bed with a sheet of paraffin or news papers for half an hour.
- Remove the cover and feed the worms.

c) Dithane M-45 + Kaolin mixture : for control of Muscardine.

- Dust the mixture on the body of silk worms in the rearing bed after moulting and before commencement of feeding.
- Use 1% for I, II and IIIrd instar larvae.
- Use 2% for IV and Vth instar larvae.

6.2.4 Disinfections of silkworm eggs :

- Deep the eggs in 2% formaldehyde solution in a plastic basin for 10 minutes.
- Place the egg sheets in a p-erforated plastic tray and wash under running water till the removal of formalin smell.
- Dry the surface sterilized eggs in shade.
- Surface sterilization of eggs to be done every time after procurement of laying from grainage (within 48 hours of oviposition).

6.2.5 Hygiene in silkworm rearing :

To maintain hygienic condition in time of rearing do the following --

- Collect unequal, dead and disease infected larvae from the rearing tray every day and disposed into bleaching powder or 2% formaldehyde solution.
- Collect litters from the floor of the rearing room in time of bed cleaning.
- Clean the floor of the rearing room with 2% bleaching powder solution every day after bed cleaning.
- Dust bleaching powder-lime mixture at the entrance and around the rearing building, keep foot cleaning tray at the entrance of the rearing house.
- Wash hands and feet with formaldehyde solution before attending the rear-

ing work. Keep basin with 2% formaldehyde solution on stand at the entrance.

- Do not store leaves in rearing room.

6.3.0 REARING OF MULBERRY SILK WORM :

6.3.1 Chowki Rearing :

- Chowki rearing decides the success or failure of silk worms crops. Correct chowki rearing ensures healthy and robust growth of the young silk worm and also helps to overcome the adverse conditions at a later stage. It also helps in achieving the full potential in respect of cocoon yield and quality.
- Rear newly hatched larvae upto the beginning of 3rd age for a period of 8-9 days as per standard chawki rearing technique.

6.3.2 Rearing room :

- If possible have a separate chowki rearing room to facilitate optimum temperature, humidity and hygienic conditions to the silk worms.

6.3.3 Disinfections / Proper hygiene :

- Disinfect the rearing room and all the equipment as recommended in serial number 6.2.1 and 6.2.2
- Disinfect the eggs after receipt from grainage as recommended in serial number 6.2.4.

6.3.2 Rearing room :

- If possible have a separate chowki rearing room to facilitate optimum temperature, humidity and hygienic conditions to the silk worms.
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- If possible have a separate chowki rearing room to facilitate optimum temperature, humidity and hygienic conditions to the silk worms.

6.3.4 Incubation/Black boxing of DFL's :

- Incubate silk worm dfl's in the rearing room at 25°C with 80-86% humidity for uniform hatching.
- Keep 4 egg sheets, spread (single layer) in each wooden tray over paraffin paper and put wet foam pads all around the egg sheets and cover with a paraffin paper.
- On the 9th day (i.e. pin head stage) remove the paraffin paper cover from the tray and cover it with a black sheet of paper but before doing so, distribute the incubated dfl's @ 25 dfl's per tray.
- On the 10 day remove the black paper and suddenly expose the dfl's to bright light between 8 am to 9 am to ensure uniform hatching.

6.3.5 Brushing of silk worms :

- Put paraffin paper on the bottom of the rearing tray.
- Brush silk worm in early morning hours between 8 am to 10 am (use feather).
- Collect fresh, tender, succulent mulberry leaves and chop it into 0.5 to 1.0 sq. cm.
- Sprinkle the chopped leaves over the hatched larvae on the egg cards.
- After 10 minutes, transfer the worm along with the leaves into the rearing tray

with a soft feather.

- Brush 25 dfl's per tray (size 120 cm × 90c)
- Keep 4 nos. wet foam pads around the rearing bed and then cover with another paraffin paper to maintain the required humidity.
- Use 4 ant wells to keep one rearing stand to prevent ant etc. from coming to the rearing bed.

6.3.6 Quality leaf - ensure better growth :

- Use fresh, tender dark green and succulent leaves raised as per recommended package of practices.
- In the initial stage use the 2nd and 3rd full blown leaves below the glossy leaf and gradually as the worms grows, use medium leaf for feeding the worms.
- Pluck mulberry leaf during the cooler hours of the day and carry it in wet gummy bags or baskets to the rearing house.
- Store the leaf in wet leaf chambers of earthen pot kept in cool and dark place.
- During summer, sprinkle water on the leaf and cover with wet gunny cloth.
- Use the leaf plucked in the morning for afternoon and night feeding.
- Use the leaf plucked in the afternoon for morning feeding of the next day.

6.3.7 Environmental condition, Spacing and Feeding :

- Maintain optimum temperature and humidity, regulate the spacing and feeding dose for the healthy growth of the silk worms as recommended in the following table - (for rearing 100 dfl's = 40,000 larvae)

Factors	1st instar	2nd instar
1. Temperature (°C)	27-28°C	27-28°C
2. Humidity (%)	85-90%	85-90%
3. Feeds per day (No)	4	4
4. Quantity of leaf (Kg)	2.5-3.0 kgs	13-14
5. Leaf size (sq. cm)	0.5-1.5	1.5-4
6. Bed area (sq.m)	*0.36-1.35 **0.30-1.25	1.35-4 1.25-3.5
7. Rearing tray (No) (120 cm × 90 cm)	4	4

(* Bivoltine, ** Multivoltine)

- Remove the paraffin paper cover and the foam pad from the rearing tray every morning before feeding.
- After 1/2 to 1 hour, depending upon the drying up of the rearing bed, give fresh feed to the worms maintaining specific bed area and put wet foam pad & paraffin paper as before.
- Always use chopsticks while handling chowki silkworm.
- Remove the wet foam pad and even the paraffin paper if humidity becomes 90-95% during rainy season.

6.3.8 Bed Clearing :

- Use cotton net for bed cleaning.
- Clean the bed once in the 1st instar prior to 1st moult i.e. on 3rd day.
- Clean the bed twice in the 2nd instar, first after resumption of feed after 1st moult and second prior to the settling of worms for 2nd moult.

6.3.9 Moulting and Care :

- Worms settle for 1st moult on the 3-3 $\frac{1}{2}$ day and for 2nd moult on the 2 to 2 $\frac{1}{2}$ day (moulting duration 18 to 20 hours)
- Remove the top paraffin papers and the wet foam pads when the worms start settling for moult.
- Give light feeding till all the worms settle for moulting.
- Reduce bed thickness to give adequate spacing for quick drying of the left over leaf.
- Above steps enable the moulting worms to settle uniformly.
- Resume feeding when above 95% of the worms are out of moult.
- Use tender leaf for the 1st to 2nd feeds after the moult.

6.3.11 Transportation of chowki worms :

- Transfer the chowki worms after one or two feeds after 2nd moult during cooler hour of the day preferably in the evening.

6.3.12 Late age Silk worm Rearing :

- Rear the grown up worms i.e. from 3rd age to the completion of 5th age which usually needs 16-17 days.

6.3.13 Rearing House :

- Select site for rearing house to avoid water logging, damp and direct sun light.
- In Govt. Sector where rearing house is built with concrete and C.I. sheet should have adequate number of windows ensuring cross ventilation.
- At farmers level, construct rearing house with mud walls and thatch roof with well ventilated open verandah.
- Arrange wire mesh or nylon net in the rearing house to check the entry of uzi-fly.
- The optimum floor area of rearing house required to rear 100 dfl's in 150 sq. ft. in case of multi x Bi and 200 sq. ft. in case of Bi x Bi hybrids.

6.3.14 Disinfection of Rearing House :

- Disinfect the rearing house as per recommendation in serial No. 6.2.1.

6.3.15 Quality of Leaves :

- Use nutritious leaf with lesser moisture content and medium to coarse type.
- Collect 55 to 60 days old fully grown leaf.
- Follow the same procedure for leaf collection, transportation, preservation (use leaf chamber covered with wet gunny cloths instead of earthen pot) and utilise the leaf as recommended in case of Chowki rearing.
- Do not feed the worms with withered leaf as it leads to the reduction in consumption and growth of worms.
- During high humid condition increase the number of feeds/day, each feed with lesser quantity of leaf and supply the worms with chopped leaf (1 leaf cut into 4 pieces)

6.3.16 Environmental condition, spacing and feeding :

- Maintain optimum temperature and humidity in the rearing house, regulate bed spacing and feeding does as recommended in the following table. It is advisable to give a heavy feeding at night.

Factors	3 rd age	4th age	5th age
1. Temperature (°C)	26°C	25°C	24°C
2. Humidity (%)	75-80	70-75	65-70
3. Feeds per day (Nos)	4	4	4
4. Quantity of leaf	*50-*40	*150-120	*1000**800
5. Quality of leaf	Medium	Medium	Course
6. Size of leaf (sq. cm)	4-6	Entire leaf	Entire leaf
7. Spacing (sq. cm)	*4-9, **3.5-8	*9-20, **8-16	*20-20, **16-32

(*Bivoltine, **Multivoltine)

- Maintain optimum range of temperature and humidity by artificial heating (electric heater etc.) or cooling (wet sand bed may be formed in the floor during dry season.)

6.3.17 Care During Moulting :

- Silk worm take 3 to 3½ days in 3rd age and 4 to 4½ days in the 4th age to settle for moult.
- Moulting period ranges from 24 hours in 3rd and 20-36 hours in 4th moult.
- Reduce feeding quantity when the worms start to settle for moulting.
- Stop feeding when 90-95% worms settle for moults.
- Dust lime powder over the worms in the bed to reduce humidity and to dry up the left over leaf quickly.
- Resume feeding after 95% of the worms are come out from moulting with tender leaf.

6.3.18 Bed Cleaning :

- Clean the rearing bed once in every day after the 1st feeding with cotton/nylon net.

6.3.19 Crop protection measures :

- Follow crop protection measure as recommended in serial No. 6.2.3 & 6.2.5

6.3.20 Ripening of silkworms :

- On the completion of full 6-7 days after passing the 4th moult, the worms will cease feeding and become ripe for mounting.
- The mature worms is readily distinguishable by its translucent body colour.
- The body shrinks in length and there is a visible constriction at the 4th and 5th segment.
- The ripen worm moves towards the periphery of the rearing trays.
- This is the for picking ripe worms manually for mounting in 'chandrika'.

6.3.21 Simple technique for collection of matured worms :

- Put branches with green leaves over the rearing bed and when the worms crawl into them take out the branches along with the mature worms.
- Shake off the branches over a mat to dislodge the worms and collect the

worms in a basket, or,

- Spread a net on the bed after feeding, the mature worms which do not feed any more will come out and crawl on to the net.
- Take out the net and shake off over a mat to dislodge the matured worms and collect them in a basket.

6.3.22 Mounting of matured worms and harvesting of cocoons

- Use bamboo mounage (Chandrika) or plastic mountage.
- 50 matured worms need 1 sq. ft. area in the mountage for smooth spinning (i.e. 2 sq. cm per worm)
- Mount 1000 to 1100 worms in a chandrika of 1.8m × 1.2m size.
- Maintain 24° C temperature and 60-65% humidity besides providing good areation in time of spinning.
- Spinning of cocoons completes within 2-3 days, so harvest cocoons on the 5th day in case of multivoltine and 6th day in bivoltine.
- Collect good, double, flimsy and stained cocoons seperately from the mountage.
- Clean the cocoons by removing floss.
- Loosely pack the cocoons in bamboo basket for transporting to market/reel-ing units/grainage.

7.0 MUGA SILKWORM REARING

7.1 Pre-requisite for rearing :

- Select systematic plantation in elevated plot for rearing. The area of plantation facing east and south direction is good for rearing.
- Clear the weeds and brushes in the field. The green grass below the plants should not be removed completely.
- Remove dry, yellow, over mature, very tender leaves, dry twigs, ant an wasp nest and spider webs from the plants before brushing.
- Dust bleaching powder or lime in the rearing plot 1 week before brushing.
- Select 4'-6' high brushes with tender leaves for brushing.
- For rearing upto the 3rd instar, resort to light brushing/defoliation 3 months before summer and 4 months before winter rearing to ensure avaiability of suitable leaves.
- For late age rearing, select plants with mature leaves.
- Prune/defoliate the plants 4 months and 5 months prior to summer and winter rearing respectively to obtain uniform mature leaves.

7.1.1 Disinfection of rearing appliances :

- Disinfect chalai, khora, bamboo pole, spade, secature, basin, mug etc. with 2% formaldehyde solution.

7.1.2 Brushing of worms - early & late rearing :

- Incubate dfl's at 26°C +1°C and 85% relative humidity for uniform hatching.
- Put individual egg box or khora (egg cage) with new born worms between 4-8 am on twigs of the selected plants with tender leaves on the opposite direction of the sun.
- Rearing is to be started from the southern side during winter and from the

northern side during summer with a view to give sun shine according to requirement of the worms.

- Consider the worms hatched on the first three days only for rearing.
- Rear worm under nylon net upto 3rd stage on plants of 4'-6' height with tender leaves.
- Do not handle the worms til they come out from the 3rd moult.
- Transfer the 4th instar worm to high trees (i.e. 15' height) with semi matured/ matured leaves.
- Before transferring the 4th instar worms to the plants for late age rearing, tie the tree trunk with polythene sheet/banana leaf, banana bark or straw to prevent the worms from crawling fown and also from preventing the predators from climbing up.

7.1.3 Rearing Management :

- Mount the worms on a plant according to its carrying capacity (1 DFL per plant with approximately 14kg leaves)
- Avoid frequent handling of worms.
- Do not disturb or transfer the moulting worms.
- Use disinfected triangular bamboo chaloni for transferring the worms.
- Unequal worms/ irregular worms to be reared seperately.
- Collect dead/ diseased worms, conduct microscopic examination once in every stage of worms and if found infected by perbrine, burn the pebrinised lot outside the rearing plot or put in 10% formaldehyde solution and bury in a pit away from the rearing site.
- In case of outbreak of perbrine, after destroying the worms, defoliate the plants and spray 2% formaldehyde solution on the plants ands also the basal area.
- Dust bleaching powder /lime in the rearing plot regularly during high humid condition (above 80%)
- Rear worms under nylon net specially during December to March for protec-tion against attack of appanteles, Uzi fly and predators like pentatomid bugs.

7.1.4 Preparation of cocoonage (Jail) :

- Collect twigs with leaves of jackfruit, mango, singari, soalu, som, masunds etc. at least 2 days prior to maturation of the worms.
- Dry the twigs partially to a semi dry condition ina dry place.
- Tie 10-15 twigs together and prepare the cocoonage (jail).

7.1.5 Collection of ripe worms, spinning & cocoon harvest :

- The ripe worms usually crawl down the base of the tree during dusk.
- A matured worm can be distinguished by a rustling sound when put near one's ear and rubbed with finger.
- Collect the worms in bamboo basket.
- Allow the matured worms to spin cocoons on mountage (jail) hanging ina semi dark, well aerated and rat proof room.
- Mount 40 worms per sq. fit. (i.e. 3 sq. cm per worms)
- Mount Uzi infested worms on seperate jails.
- Harvest Uzi infested cocoons on the 4-6// day and stifle immediately.
- Harvest cocoons only after complete pupation. Pup[ation completes after 6

to 8 days in summer and 8 to 10 days in winter. After harvesting, sort out the good and flimsy cocoons.

- In case of seed crop, sex separation of the collected matured worms must be done to mount the male and female worms in separate jars.
- Sex separation will certainly reduce the seed cocoon to DFL's ratio from 5:1 to 3:1.

7.1.6 Post Rearing Operation :

- After completion of rearing, resort to light clipping of the plants and apply FYM/fertilizer.
- Clean the rearing plot as well as the trees and dispose off the unwanted remains in the compost pit.

8.0 ERI SILK WORM REARING

8.1 Rearing Room :

- Rear Eri Silkworm in well ventilated and fly proof rearing room with 6' all round verandah.

8.1.1 Disinfection :

- Wash rearing room and appliances with 5% bleaching powder solution.
- Keep the appliances inside the rearing room and seal the room. Fumigate 5% Formaldehyde solution under high humid condition.
- Open the room after 24 hours.
- Disinfect the rearing room at least 3 days before and soon after rearing.
- In case of perbrine incidence the rearing house must be disinfected with 2% formaldehyde.

8.1.2 Race Season :

- Rear preferably Borduar variety.
- Conduct rearing throughout the year depending upon availability of leaf.

8.1.3 Incubation of eggs, hatching and brushing :

- Incubate DFL's at 24°C-26°C and 85-90% relative humidity.
- Egg generally hatch in the morning between 6 and 9 am on the 9th - 15th day from oviposition.
- Always wash hands with 2% formaldehyde solution and then with water before starting any rearing operation.
- Keep the eri dfls in the tray over a piece of paper before hatching.
- Put a few tender castor leaves over the dfls when hatching starts.
- Transfer the leaves along with newly hatched worms to a rearing tray.
- Put the rearing stands on Ant well.
- Supply chopped tender leaves to the newly hatched worms until the first moult.
- Feed whole tender leaves to the 2nd instar worm.
- Feed 3rd & 4th instar worms on semi-mature and 5th instar worms on mature leaves.
- Give four feedings per day upto 3rd instar (i.e. 6am, 11am, 5 pm and 10pm)
- Feed the 4th and 5th instar worms 5 times a day (i.e. 6am, 10am, 2p, 6pm and 10pm)

- Rear the worms on tray upto 3rd instar.
- Rear the 4th & 5th instar worms by hanging bundle method i.e. hang a bundle of 8-10 leaves on a stick resting across the two parallel bars of stand.
- Rear Eri silkworm on Kesseru leaf from 1st to 4th instar and the 5th instar worms on Castor leaves, it gives better results.
- Requirement of leaf to rear 1 Eri dfls is, castor=10kgs; Kesseru =8kgs.
- Avoid frequent handling of worms.
- Rear irregular/unequal worms seperately.
- Collect dead/diseased worms, conduct microscopic examination once in every stage of worms and if found infected by perbrine, burn the perbrinised lot away from the rearing house and plantation or put in 10% formaldehyde solution and bury in a pit away from both rearing house and plantation.
- In case of out break of perbrine (secondary contamination) after destroying the worms, defoliate the plants and spray 2% formaldehyde solution on the plant and also the basal area.
- Dust bleaching powder / lime powder in the rearing room and the surrounding area regularly during high humid condition (above 80%).
- If fly proof rearing house is not available, cover the worms with Nylon net to prevent uzi fly etc. during December-March .

8.1.4 Bed Cleaning :

- Clean the rearing bed once in first instar just prior to preparation for 1st moult.
- Clean the bed twice in 2nd instar, first after 2 feeds after 1st moult and second before preparing for 2nd moult.
- Clean the bed thrice in both 3rd and 4th instars, after 3 feeding after 2nd moult, at the middle stage and prior preparation for 3rd moult and 4th moult.
- Clean the rearing bed after 1st feeding every day in the 5th instar till maturation.

8.1.5 Spacing for silkworm:

- Eri Silk worm must be provided adequate space to grow fully (i.e. three times the space occupied by the larval body through out the larval period.)
- To rear 10 DFLs i.e. about 3000 larvae the spacing on rearing bed is recommended as follows :
- 0.75 to 3.5 sq. ft in 1st instar (1 tray)
- 3.5 to 7.0 sq. ft. in 2nd instar (2nd tray)
- 7.0 to 16 sq. ft in 3rd instar (3rd tray)
- 16 to 40 sq. ft in 4th instar (8 tray)
- 40 to 80 sq. ft. in 5th instar (16 tray)

8.1.6 Temperature & Humidity

- For successful rearing, optimum temperature and humidity must be maintained.
- High temperature and humidity are required in the initial instars and less in the later instar.

Instar	Temperature	Humidity
1st and 2nd	26°C	85-95%
3rd	25°C	70-80%
4th & 5th	24°C	65-75%

- Maintain optimum condition by using artificial hatching (electric heater etc.) or cooling (by forming wet sand bed in the floor) during winter and dry season.

8.1.7 Care during Moulting :

- Eri silk worms shed their skin (moult) four times during entire larval period.
- When in moult, the worms takes rest without movement and occassionally moves heads and stop eating.
- Moulting stage varies from 20 to 48 hours.
- Leave the worms undisturbed at this stage.
- Keep the rearing room well ventilated and the rearing bed comparatively dry (by removing the excess leaf from the rearing bed just before attaining moulting stage).
- Resume fresh feeding when 95% larvae comes out of moulting.

8.1.8 Maturation of worms :

- Eri silk worm mature on 5th to 7th days after forth moult.
- Worms attain maturity mostly during morning hours.
- Matured larvae cease feeding and loose its mobility.
- Mature larvae can be distinguished by a rustling sound when put near one's ear and rubbed with finger.
- Most of the matured eri worms goes up from the rearing bed or bundles of leaves form 8am to 2.30 pm.
- Collect the matured worms in basket.

8.1.9 Mounting and cocoon harvest :

- Use bamboo mountage (chandrika).
- Put 25 matured worms per sq. ft. of the chandrika (i.e. 4 sq. cm per worms).
- Mount 500 to 550 worms in a chandrika of 1.8 mtr × 1.2 mt.
- Maintain 24^o-25^oC temperature and 75-80% humidity besides providing good aeration.
- Do not disturb the spinning worms.
- Eri silk worms complete spinning on the 3rd day in summer and 5th day in winter.
- harvest cocoon on 5th day in summer and 8th day in winter.

9.0 Disease/Pests Management of Silkworms

9.1 Mulberry Silkworm

Name of diseases	Symptoms/ Identification	Preventive measure/control measure
1. Gresserie (Casual agent= Borrelina virus)	Intersegmental swelling of the larval body, change in the texture of the skin (Gradually becomes shining), oozing of milky fluid from reputed skin.	<p>Preventive measures</p> <ol style="list-style-type: none"> 1. Strictly follow the recommendation given in rearing technology in respect of hygenic condition of rearing houses, optimum temp & humidigy, leaf quality, spacing etc. 2. Promptly seperate the affected larvae and bury them in a pit away from the rearing house. Before burying, put the worms in 2% formaldehyde solution. <p>Control measures</p> <ol style="list-style-type: none"> 1. Dust Resom Kit oushod just after bed cleaning @ 3 gm/sq. ft. from 1st-3rd instar once a day. 2. Spray Labex (97% lime powder + 3% bleaching powder) over the worms just after moult @ 5 gms/ sq. ft. once in each instar.
2. Flacherie (Casual agent= Streptococci, coli like bacillus and proteus like bacteria)	Infected larvae become lethargic & motionless, colour of the haemolymph turns black, chain type excreta, loss of appetite, slow growth, inelasticity of the skin and softening of larval body.	Same as in the case of Grasserie.
3. White Muscardine (Beauveria bassiana)	Infected larvae lose appetite. A lethargic larva may have diarrhoe and vomit fluid. Body becomes limp and losses its elasticity . Larva ceases to move and die after 3-5 days after infection. Dead body hardened and covered with white mycellia and conidia of the fungus.	<p>Preventive Measures</p> <ol style="list-style-type: none"> 1. As recommended in case of grasserie. 2. Strictly follow the recommendation given for silkworm eggs disinfection in seed production technology. <p>Control Measure :</p> <ol style="list-style-type: none"> 1. Promptly remove infected larvae from the bed before appearance of conidia and burn them. 2. Dust RKO over the worms just after moult from 1st-4th moult and once on the 4th day 5th stage @ 60 gms, 120 gms, 580 gms, 960 gms and 1540 gms respectively for rearing of 100 dfls.

10.0 Silk Worm Seed Production Technology :

10.1 Mulberry Seed Production

- For production of Mulberry dfls, either in Govt. Sericulture Farm or in Mulberry Grainages, strictly follow the technology as recommended in the Manual on Silk worm Egg Production by Dr. M.N. narasimhana (Chapter-VIII & IX, Pg No. 77 to 122)

10.1.1 Muga Seed Production :

- Production of muga dfls is the backbone of muga industry. Adopt the technique detailed below for production of disease free layings (DFL) in the grainage.

10.1.2 Selection of seed crops/worms :

- Never select from disease infected rearing and if the intensity of disease is enormous avoid such crop.
- For selection of healthy breeds observe the following characters :
 - i. The colour of the mature larvae is dark green.
 - ii. The head of the larvae is of copper colour.
 - iii. Presence of two excreta in the posterior abdominal segment in the 5th instar larvae.
 - iv. Uniform growth of the larvae in the entire rearing.
 - v. No symptoms of diseases.

10.1.3 Selection in the pupal stage :

Observe the following characters for selection in pupal stage --

- i. Posterior end of the Pupa is pointed.
- ii. Colour of the pupa is light chocolate.
- iii. The pupa sinks when put in water.
- iv. The haemocoel of the pupa is pink in colour.

10.1.4 Selection of seed cocoons :

Observe the following characters of cocoons --

- i. Uniform size of the cocoon.
 - ii. High percentage of silk content in the cocoon.
 - iii. Long peduncle though it is not prominent like tasar cocoon.
- Select seed cocoons from Bharpok (period of maximum maturation) 1-2 days before or after it.

10.1.5 Disinfection of Grainage Hall :

- Close the doors and windows of the grainage hall and make it air tight 5-7 days before grainage operation.
- Spray 2% formaldehyde/ 5% bleaching powder solution on the walls and larger appliances (inside the hall) for disinfection. Dip the smaller appliances in 5% bleaching powder solution.
- Use bleaching powder with 30% chlorine content.
- Spray 2% formalin + slaked lime mixture @ 1 ltr / 2.5 sq.mt. area and close the grainage hall.
- Under high humid condition, fumigate the grainage hall with 10% formaldehyde and leave the hall closed for 24 hours.

- Use disinfection mask, hand gloves etc. while disinfecting.
- Formaldehyde is more effective at a temp. of more than 20°C therefore, disinfection should preferably be done during sunny days.
- Complete the whole process of disinfection at least 3-4 days before arrival of cocoon consignment and leave the door & window open for proper aeration.

10.1.6 Transportation of Seed cocoon :

- Seed cocoons are to be transported after 6 to 9 days of spinning after attaining the brown pupal stage.
- While transporting seed cocoons, avoid direct heat, rain, jerke etc.
- Transport the seed cocoons during night or early morning hours to avoid thermal shocks.

10.1.7 Storage of seed cocoons :

- Store seed cocoons in a single layer to facilitate moth emergence.
- Maintain a temperature of 26^o-28^oC & 80-85% relative humidity inside the grainage hall.
- Moth prefer a hanging position after emergence, hence use cage with slanting roof.
- Use Antwell to keep the stands with cage.

10.1.8 Moth emergence & identification of male & female :

- Moths emerge in the evening and male emerge earlier than female.
- The antennae of the male is bigger than female and the male is more active than the female.
- The antennae of the female moth is smaller than male but abdomen and wings are bigger than male.
- Use healthy moths which exhibit vigorous activity. Reject weak, deformed, crippled and pale looking moths.

10.1.9 Coupling of moths and oviposition :

- Coupling of male and female moths may be either natural or mechanical.
- Mating usually occurs from night fall and continues till morning.
- If the moths do not couple naturally, then attached the male moth to the abdomen of the female and excite them by blowing wind from mouth or jarking.
- Allow the moths to remain in coupling for 6-7 hours.
- Use disinfected thatch Khariak (1.0 long) for tying the coupling moths.
- At night (8 to 9 PM) put the naturally coupled moths on the Kharika which are to be hanged from a string stressed across the room.
- At night (8-9 PM) find out the unpaired female moths and pair them with the male moths mechanically and put them on Kharika.
- Keep the coupling moths in cool and semi dark room with proper ventilation and facilitate air circulation.
- In the morning (4-5 AM) depairing of the coupled moths is to be done which may be either naturally or mechanically.
- Illuminate the room abruptly which results in depairing of the coupled moths.
- After depairing, tie female moth on the Kharika by a cotton thread passing round the thorax behind the fore wings.
- Keep the female moths undisturbed for oviposition.

- One female moth lays 150-250 eggs.
- Consider the eggs laid on the first 3 days only for rearing.
- One male moth can be used for 2-3 times.

10.1.10 Moth examination :

- Collect the female moths after 3 days of egg laying (oviposition) and cut the abdomen and crush it in 1% Potassium carbonate solution.
- Take drops of the thoroughly crushed samples on slide and examine under the microscope following 'V' type method of examination.
- If perbrine disease is detected, burn the moth and egg and thoroughly disinfect the Kharikas.
- Individual mother moth examination is a must for production of dfls for seed crops.
- Examine at least 20% mother moths in case of commercial seed production but individual moth testing is always preferable.

10.1.11 Egg disinfection and Drying :

- Dip the disease free eggs (DFLs) with Kharika in 2% formaldehyde solution in a plastic tray and disinfect for 5 minutes.
- Place the Kharika with disinfected eggs in a perforated plastic tray and wash under running water till the removal of formalin smell.
- Dry the surface sterilized eggs in shade.

10.1.12 Egg incubation / Preservation :

- Preserve the disinfected DFLs in a well aerated and cool place for proper hatching. Maintain $26^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ temp. and 80-85% relative humidity in the room.

10.1.13 Egg Transportation :

- Use smaller and perforated paper packets for transporting individual dfl.
- Transport eggs in muslin cloth bags (15x10cm) @ 50dfl's in each seed carrying boxes.
- Transport eggs during the cool hour of the day (either morning or evening).
- Do not keep the eggs near the engine while transporting in automobiles.

10.1.14 Important points to be followed :

- Always store seed cocoon in single layer.
- Dispose of pierced cocoons immediately.
- Burn rejected moths/pupae etc. Dump these in a soak pit prepared away from the grainage hall and spray 2% formaldehyde solution.
- Dust 1:9 mixture of Bleaching powder : Lime at the entrance and around at 1 day interval.
- Disinfect the floor regularly with 5% bleaching powder or 2% formaldehyde solution and wipe it dry.
- Remember to disinfect shoes, hands etc. with 2% formaldehyde before entering the grainage hall.
- Use ant well to prevent ant.

11.0 Eri Seed Production :

- Production of Disease free layings is the backbone of Eri Silk Industry. Adopt the following techniques for grainage operation.

11.1 Disinfection of Grainage Hall/Room :

- Follow the same procedure as in the case of Muga grainage (Sl. No. 10.15)

11.1.1 Selection of seed cocoon :

- Select regular & well formed cocoons with healthy pupae.
- Select cocoons with uniform colour (i.e. white, brick red).
- Select seed cocoons from a lot on the basis of number of green cocoon per kg (i.e. when 250-260 cocoons weight 1 kg.)

11.1.2 Transportation of Seed Cocoon :

- Follow the procedure as in the case of Muga seed cocoon transportation (Sl. No. 10.16)

11.1.3 Storage of Seed Cocoons :

- Store seed cocoons in a single layer on circular split bamboo trays on wooden racks - (date wise). or
- Store seed cocoons in a single layer (keep well spread) in Chakaripera or cage (date wise)
- Maintain 22°C -24°C temp. and 70-80% relative humidity in the room.

11.1.4 Moth emergence & Identification of male & Female :

- Moth emergence starts at 3 to 5 am and may continue upto 2-3 pm.
- Maximum moth emergence occurs between 3 to 9 am.
- Emergence takes place at natural light at room temp. and humidity (22°C-24°C temp. and 70-80% humidity)
- Distinguish sexes by observing the large abdomen of the female and the tapering abdomen of the male.
- Use healthy moths. Reject weak, deformed, crippled and pale looking moths.

11.1.5 Coupling of Moths and oviposition :

- Collect the healthy female moths in the morning and tie to Kharikas with cotton thread 8 to 10 cm long (5am to 10pm)
- Use thatch Kharika (1.0' long) for production of basic seed.
- Use small split bamboo stick (3.0' long) with 8 slant cut at 5'' aparts with hoocks for production of commercial seeds.
- Tie one female on the thatch Kharika for basic seeds production.
- Tie eight female moths on each bamboo stick for commercial seed production.
- Put one male moth near each of the female moth on the Kharika.
- Transfer the Kharikas along with the moths to the dark room.
- Hang the Kharikas from a string stressed across the dark room.
- The male moth mate with the female in the evening.
- Do not disturb the mating male and female moths till next day morning.
- Maintain room temp. at 22°C-24°C and 70-80% relative humidity and avoid light in the dark room.
- Keep the dark room well ventilated.

- 8 hours mating is sufficient for successful result.
- Unpair the male moths and keep the female moths in the dark room.
- Move flame of fire under rows of moths or illuminate high power electric light which stimulates the female moth to lay eggs.
- Consider the eggs laid on the first two days for rearing.
- A female moth lays about 250-350 eggs.
- Healthy male moth can be utilised for second time mating.

11.1.6 Moth examination :

- Follow the same procedure as in the case of Muga moth examination (Sl. No. 10.1.10).

11.1.7 Egg disinfection and drying :

- Same procedure as in the case of Muga dfls (Sl. No. 10.1.11).

11.1.8 Egg incubation and preservation :

- Preserve the eri dfls in a well aerated and cool place for proper hatching.
- Maintain room temp. at 24°C-26°C and 85-90% relative humidity.

11.1.9 Egg transportation :

- Same procedure as in Muga grainage (Sl. No. 10.1.13).

11.1.10 Important Points to be followed :

- Same as in Muga Grainage (Sl. No. 10.1.14).

SECTION - B

POST COCOON TECHNOLOGY

1.0 Definition

a) Reeling :

- The Process of unwinding of continuous filaments from cocoons in the form of yarn is known as Reeling. Mulberry, Muga & Tasar cocoons are reeled since these are composed of continuous filament.

b) Spinning :

- The process for producing single yarn out of discontinuous filament of cocoons. The process by which silkworm produce cocoons is also known as spinning. Eri cocoons are spun since they are open mouthed and not composed of continuous filament.

c) Rendita :

- The number of kgs of cocoons / nos of cocoons require to produce 1 kg silk yarn.

d) Warp :

- The threads running length wise in a loam and through which the weft threads are passed to form the cloth.

e) Weft :

- The yarn that is interwoven with the warp ends.

f) Denier :

- Denier is the size of reeled yarn. Denier (thickness) of reeled yarn is calculated as follows --

$$\frac{\text{Wt. of reeled yarn} \times 9000\text{m}}{\text{Length of reeled silk}} = \text{Denier of the reeled yarn}$$

g) Count :

- Size of spun yarn. Count is calculated as follows --

$$\frac{\text{Length of yarn in yard}}{840 \times \text{weight in pounds}} = \frac{\text{Number of hanks}}{\text{Weight in lbs}} = \text{Counts}$$

Hank = 840 yard

Yard = 0.91 mtr.

Pounds = 454 gms.

- Or count is the number of hanks (measuring 1000 meter) per $\frac{1}{2}$ kg.

h) Eri Cake :

- Dried up flattened Eri cocoon after boiling in Soda.

i) Hank :

- Hank is made by re-reeling the silk yarn in a standard drum-usually 1.50 mt in circumference. A standard hank stand contain 110 gm of yarn.

j) Skein :

- Hanks are twisted with skeining machine or by hand to make skeins.

k) Book : For disposal or storage of yarn.

- Package of skeins of raw silk weighing about 2.2 kgs (a book contain 20 skeins)

l) Floss :

- The outer covering of reeled cocoon.

2.0 Selection of Cocoons for Reeling :

2.1 Mulberry Cocoons :

- Cocoon should have well rounded and firm ends.
- Cocoon should be firm and not yield to slight pressure.
- 1000-1500 nos. Multivoltine and 600-800 nos. Uni/Bivoltine cocoons weighing 1 kgs respectively are good cocoons for reeling. Lower the number of cocoons per kg, the greater the silk content.
- Put the palm into a heap of cocoons, if feel cool and moist, be sure that the lot contains immature cocoons, so reject the cocoons.
- Shake cocoons close to the ear, if no sound is made, it is sure that the cocoon contain dead pupae sticking to the shell inside. Reject such cocoons.
- Compact and smaller cocoons are better as they contain a higher percentage of silk and the cocoon filament is smaller in denier size.
- Cocoons should not be too flossy.
- Do not select the double cocoons.
- Cocoons with thin ends.
- Double layered cocoons.
- Outside stained cocoons.
- Excessively flossy cocoons.
- Cocoons having too thin layer in their constricted or waist part.

2.1.1 Muga Cocoons :

- Select the well formed compact cocoons.
- Reject flimsy cocoons.
- Reject excessively flossy cocoons.
- Reject stained cocoons.
- Reject cocoons, pierced by the maggot of Uzi fly.
- Cocoons weighing 370 nos. per kg are good for reeling.

2.1.2 Eri Cocoons :

- Except stained cocoons all cocoons may be selected for spinning.

2.1.3 Stifling of Reeling cocoons :

- The fresh cocoons are stifled not only to prevent moth emergency by killing the pupae, but also ensure proper preservation of mulberry & Muga reeling cocoons by eliminating the moisture content.

2.1.4 Sun drying (Using black cloth) :

- Spread green cocoons in a thin layer (Not more than 2 cocoons thick) in bamboo / wooden trays.
- Keep the trays at an inclination of 20°-25° to utilise maximum solar energy.
- Cover the trays with black cotton cloths.
- Shuffle the cocoons 2 to 3 times in a day for uniform drying.
- Be sure that the cloth surface is in contact with the cocoon layer under it.
- In this process, the heat energy contained in sun light is absorbed by the black cotton cloth and radiated to the green cocoons beneath at a higher temp. A temperature as high as 70°C-80°C could develop under the black cloth when the ambient temperature is only around 30°C-33°C.
- The trays that are placed at an incline would allow maximum incidence of sun rays and air movement, facilitating removal of moisture from the cocoons.

- Continue to dry cocoons till the dry cocoon weight is around 45-50% of the green cocoon weight.

2.1.5 Sun Drying of Eri Cocoons :

- Remove the pupae from the Eri cocoons through the open end just after harvesting if the cocoons are not preserved for breeding purpose.
- Spread the empty cocoons in bamboo / wooden tray or on tarpoline in a thin layer and expose to sun for 2 to 3 days.
- Follow the same procedure for Eri cut cocoons also.
- These cocoons can be preserved for many years.
- If the cocoons are spun just after harvesting then stifling is not necessary.
- Other method of stifling is not required for Eri cocoon.

2.1.6 Hot air drying :

- Ushnakoti - a cottage hot air drying chamber is best for stifling of cocoons.
- Keep the green cocoons in aluminium trays in 1 or 2 layers and keep ready outside the chamber for loading @ 2 kg per tray.
- Set fire in the oven and test for any smoke leakage.
- The oven of the Ushnakuti is capable of burning fire wood, agro wastes such as paddy husk, ground nut husk, wood chips, dry leaves etc.
- Place the trays with the cocoons on the rack inside the chamber.
- After loading the cocoons, close the door of the Ushankuti.
- Continue fire even after closure of the chamber.
- Record the temperature inside the chamber with the help of a stem dial thermometer.
- Continue burning of fuel atleast for 4 hours to get 30 to 40% weight loss of the cocoons.
- During this 4 hours, maintain temperature at 100°C (1st hour), 90°C (2nd hour), 80°C (3rd hour), 70°C (4th hour).
- Use both the bottom & top ventilators of the chamber for expelling the moist air inside the chamber due to evaporation of pupal body fluid.
- After 4 hours of stifling, stop fire to reduce the temperature to normal.
- Finally take out the dried cocoons from the chamber for storage.

2.1.7 Preservation of cocoons and storage :

- Store the stifled cocoons in wooden or iron wire mesh cage in thin layers which are rat proof having good ventilation.
- Keep the cages in a room having double the normal ceiling height.
- Maintain 60-70% humidity in the storage room.
- Sprinkle lime dust on the floor of the storage room to reduce excess humidity.
- Disinfect the storage room periodically with 2% formaldehyde / bleaching powder solution.
- Preserve eri cut cocoons following the above recommendations.
- Put the cage on Ant well to prevent ant etc.

2.1.8 Cooking of cocoon :

- Cooking is done to soften the gummy substance of the cocoons and to loosen the compact silk filament layer for reeling. This is done by boiling of cocoons in hot alkaline water.

2.1.9 Cooking of Mulberry cocoons :

- There are two systems of cooking for two different systems of reeling namely 'Floating system' and 'Shunken system'.
- For 'Floating system' of reeling, cocoons are cooked only to the extent the silk shell becomes wet but still impenetrable to water so that they float in water when the cooked cocoons are put into the reeling basin.
- In 'Shunken system' of reeling, not only the shell is cooked but also the cocoon also gets filled with water inside to the extent of 97-98% with the result that the cocoons become heavy and sink in the reeling water.

2.1.10 Cooking for Floating system of Reeling :

a) Open Pan :

- Take ordinary open pans or vessels made of either earthenware or copper sheet with thinning inside the vessel.
- Pour water into the vessel and bring to boiling point by application of direct heat from fire below the basins.
- Put a handful of cocoons into the boiling water and keep immersed in water for a few minutes by using a perforated ladle.
- When the cocoons appear dull in colour and somewhat translucent, they feel soapy to the touch and the filament easily comes off when pulled, consider that the cocoons are cooked and ready for brushing.

b) Three Pan type :

- This method consists of simple cooking equipment.
- Having three fairly larger size porcelain basins fitted in a row on a platform or table.
- The basins are provided with water and steam connections.
- The accessory equipments consist of a long handled brass wire cage for holding the cocoons, a wire mesh disc of special design with wooden handle for keeping the cocoons immersed in the basin and a long handled perforated ladle.
- Fill the three basins with water and bring up the temperature up to 90°C-95°C in the 1st and last basins.
- Maintain 60°C-65°C temperature in the 2nd basin.
- Take required quantity of cocoon in the wire cage and after fastening the cage, immerse the cocoon in the 1st basin for about 60 seconds.
- Take out the cocoon cage from the 1st basin and immerse in the second basin for 30 or 40 seconds.
- Discharge the cocoon cage from the 2nd basin and immerse in the 3rd basin for one or two minutes depending upon the quality of the cocoons used and the degree of cooking required.
- Transfer the cocoons using a long handled perforated ladle to the cocoon receiving trough for onwards supply in small baskets to the reeling basins for brushing and reeling.

c) Cooking for shunken system of Reeling :

- Pour water into a basin (of required size) and boil up to a temperature of 83°C-93°C.
- Put cocoons into the boiling water and cover it and then continue boiling.
- Remove the cover after a short time and continue boiling for about one third

the predetermined time for boiling.

- Douche the cocoons in a cold water spray.
- Then cover the cocoon again and boil it for some time.
- Stop supply of heat to the basin and spray cold water over the cocoons.
- Transfer the cocoons into wooden cocoon carrier tube of convenient size containing water at 40^o-50^oC for brushing in reeling units.
- Cocoons cooked in this method are filled to an extent of 97% of the cavity and therefore sinks in the reeling water.

2.1.11 Brushing of Cocoons :

- Cooked cocoons either for the 'Floating' or the 'Shunken system' or reeling and to be brushed for removing the surface floss layer of cocoons.
- The floss layer of the cocoon is entangled and coarse and does not yield silk for reeling.
- This is the process of seeking the end of the cocoon filament.

2.1.12 Hand brush-brushing :

- Prepare the hand brush with paddy straw.
- The brush should be thick, flexible and not too stiff.
- This should be 15-20 cm along with a flat, circular brushing surface of about 6-8 cm in diameter.
- Tie the handle end into a close pack to afford the brushing operator a good grip.
- Gently brush the softened floss of the cooked cocoon in the basin by circular movements of the brush lightly touching the surface of the cocoons.
- The brush catches and draws off the flossy waste from the cocoons.
- When sufficient quantity of floss comes out from the cocoons and the cocoons wound round the end of the brush, lift the brush from the cocoons, draw the bave from the lamps and remove the floss.
- Pull the bave by hand to take out the remaining floss from the cocoons till getting the end of the bave suitable for reeling.
- Now the cocoons are ready for reeling.

2.1.13 Reeling Devices of Mulberry Silk :

- Country charkha -require two persons to operate - produce 1 kg silk yarn per charkha per day.
- Cottage basin - 6 to 10 ends per basin - Produce 800 gms per basin per day.
- Filature - 10 ends per basin - produce 800 gm per basin per day.

2.1.14 Cooking of Muga Cocoons :

- Cook the cocoons in a alkaline solution to soften the gummy substance present in the silk filament and to loosen the compact layers of silk filament prior to reeling.
- Depending on the shell weight of the cocoons the following cooking recipe may be used :

RECIPE :

1. Muga Cocoons	200 gms	500 gms
2. Soda	2gm/litre of water	2 gm/litre of water
3. Water	5 litre	10 ltr
4. Boiling time	15 to 20 minutes	15 to 20 minutes
5. Temperature	85 ^o to 95 ^o C	85 ^o To 95 ^o C

- Boil water in a stainless steel container.
- Add soda @ 2 gm /litre of water and mix thoroughly.
- Immerse cocoons in the water and cover it with the lead and boil the cocoons for 15 to 20 minutes.
- Maintain temperature 85° to 95°C.

2.1.15 Deflossing of cocoon :

- Deflose the cooked cocoon by hands, one at a time till the reelable end of the silk filament is traced.

2.1.16 Reeling of Muga Cocoon :

- Reeling is done in wet reeling method.
- Both traditional Bhir and improved machine like CSTR I type are used.
- After deflossing, the filament of 8-10 cocoons are put together (to produce a yarn of 36-40 denier or 45-50 denier) and feed to the ree.
- The single strand is the reeled on the bobbin.
- Reeled yarn is to transfer to re-reeling machine to make 1.5 mtr hank (circumference).

2.1.17 Comparative Reeling performance of various Muga reeling devices

Reeling devices	Combining devices	Operation	Effective spindle	Production/ 8 hr (gm)	T.P.I
1. Bhir(2person/bhir)	Arm friction	Manual	1	100	0.5
2. RMRS-VI	Croissure	Pedal	4	200	nil
3. CSTR I	Ring spindle	Pedal & Electrical	4	200	6-7
4. SILMAC	Ring spindle & Croissure	Electrical	6	160	9-12

2.1.18 Re-reeling :

- Reeled silk, inspite of all the care taken in reeling, contains certin defects such as short length of fine sizes, broken threds, entanglements, hard gum spots, short lengths of loose threads etc.
- Such defects of reeled silk are to removed by a process of re-reeling of the silk yarn on to a standard reels of a re-reeling machine.
- The silk on the reel is wetted by dipping the reel in water for some time before re-reeling.
- 1.5 mtr hank (circumference) is to prepare by re-winding the reeled yarn on the re-reeling machine.

2.1.19 Lacing and skeining :

- Clean the silk hank manually if any dirt remains after re-reeling.
- After cleaning, lace the hank. Lacing consists of pasing a thread across diving the hanks into five equal parts with the purpose of keeping the thread in place to ensures the thread being unwind easily.
- Lacing is done with soft silk or cotton threads which can be easily snapped or broken by hands.
- After lacing the hanks, it is to be skeined by a small skeining machine.
- For skeining, the laced hanks are to twist several times and fold the hank upon itself ina number of spirals.

2.1.20 Eri Spinning :

- Eri cocoons are spun since they are open ended and not composed of continuous filament.

2.1.21 Degumming of Eri cocoon :

- Deggum the Eri cocoon in the following manner :

Materials	Recipe -I	Recipe -II
1. Eri cocoon	1 kg	100 gm
2. Soda	1% (100gm)	2gm/ltr
3. Soap	-	20gm/ltr
4. Material :Liquor	1:10	1:10
5. Boiling time	1 hr.	1 hr.
6. Temperature	90-95°C	90-95°C

- Take water in a stainless steel container and put over fire. When the temp. rise to 50-60°C add soda + soap (as per requirement) and stir well to dissolve it.
- Immerse the cocoons tied in a muslin cloth and boil for 45-60 minutes 90-95°C.
- Wash the properly boiled cocoons in clear water and clean the inner dirt of the cocoons (if any) and dry.
- Make Eri cake putting 5-6 cocoons together.
- Use the cake for spinning.

2.1.22 Comparative Spinning performance of various spinning devices :

Spinning devices	Mode operation	Production/ 8 hr (gm)	Fineness of yarn (count)
1. Takli	Manual	40	25-32
2. Choudhury type charkha	Pedal	80	15-25
3. Ambar Charkha	Manual	180	20-24
4. CSRI Motorized Spinning wheel.	Electrical	200	18-25

2.1.23 Production of Ghicha Yarn :

2.1.24 Coarser Yarn :

- Muga cocoon and silk waste (cut and pierced cocoons, reeling and basin waste) can be converted to fine and coarse spun yarn.
- For producing coarse Ghicha (Matka) yarn, the cocoon and silk waste are to first clean and then boil in 10-12% sodium carbonate solution for 20 minute.
- After boiling, clean the cocoon and silk waste in hot water.
- Spun yarn of required size form the waste material by using a earthen pot.
- About 120 gm of ghichan yarn can be produced / day per worker.

2.1.25 Finer Yarn :

- For producing finer spun yarn Bhagalpur Spinning wheel may be used.
- Boil cocoons and silk waste for 1 hr. in 10% soda and 12% soap solution.
- After washing in clean hot water and partial drying, the cocoons and waste material is converted to yarn by spinning directly on Bhagalpur wheel.

2.1.26 Hanks, Laching and Skeining :

- Follow similar process as in case of Mulberry and Muga.

SECTION - C

BASIC USER INFORMATION

1.1 What is Sericulture ?

Sericulture is an agro-industry, the end product of which is "Silk".

There are four different types of silk each of which is produced by a distinct variety of silk worms feeding on different host plants as furnished below :

Sl. No.	Variety of silk	Name of Silkworm	Sl. No.	Name of host plants
1.	Muga silk	Muga Silkworm (<i>Antheraea assamensis</i>) Family : Saturniidae	i. ii.	Primary host plants a) Som (<i>Machilus bombycina</i>) b) Soalu (<i>L. polyantha</i>) Secondary host plants a) Mezankari (<i>L. Citrata Blume</i>) b) Dighloti (<i>L. Salicifolia Rexb</i>)
2.	Eri Silk	Eri Silkworm (<i>Philosamia ricini</i>) Family : Saturniidae	i. ii.	Primary host plants a) Castor (<i>Ricinus communis</i>) Secondary host plants a) Kesseru (<i>Heteropanax fragrans</i>). b) Tapioca (<i>Manihot utilissima</i>)
3.	Mulberry Silk	Mulberry Silk worm (<i>Bombyx mori</i> L.) Family : Bombycidae	i.	Mulberry (<i>Morus indica</i> , <i>Morus, alba</i>)
4.	Tassar Silk	Tassar Silkworm (<i>Antheraea mylitta</i>) Family : Satutiniidae	i. ii.	Asan (<i>Terminalia tomentosa</i>) Arjun (<i>T. Arjuna</i>)

(Till date tasar silk worm is not commercially exploited in Assam)

1.2 What is Silk ?

Silk is a protein fibre produced by silk worm for spinning cocoon. The purpose of the cocoon is to provide a protective casing to the silk worm during the most critical period of its life i.e. the pupal stage. Basically there are two proteins which form the silk fibre i.e. "fibron" which constitutes the core of the fibre and "Sericin" a waxy substance which encases the fibron. These proteins are synthesized by the silk worm from the leaf it feeds on during its larval period. Details of different cocoons are furnished below :

Particulars	Muga	Eri	Mulberry
Colours of cocoons	Golden light brown (Reelable)	White, Brick red (Unreelable)	Whites creamy, white yellow (Reelable)
Shape of cocoon	Oval (with small peduncle)	Elongated flossy spindle shaped	Oval, constricted spherical, pointed
Size of cocoon	4.5-5.5 cm (L) x 2.1-2.7 cm (B)		2.5-3.5 cm L x 1.5-2.0 cm B
Wt. of single cocoon with pupa	2.35-3.0 gms	3.5 to 4.7 gm	0.4-2.0 gms
Nos/kgs of cocoon require to produce 1 kg Silk yarn	4500-6500 nos.	1.3 kg.	Uni=6.0-7.0 kg Bi=7.0-8.0 kg Multi=15.0-16.0 kg Hybrid=11.0-12.0 kg

Single cocoon filament length	350-500 mtr.	15 mtr.	400-1500 mtr.
Thickness of single cocoon filament.	4.5-5.0		1.8-3.0 Denier

1.3 Life cycles of Muga, Eri and Mulberry silk worm :

- Life cycle of silk worms has four stages : such as egg, Larva, Pupa and moth.
- Domesticated Mulberry silk worms are univoltine, bivoltine and multivoltine. Univoltine silkworm completes one generation, Bivoltine complete two generation and multivoltine silk worm completes 5-6 generations per year.
- Semi domesticated Muga silk worms are multivoltine which completes 5-6 generations per year.
- Domesticated Eri Silk worm are multivoltine which completes 5-6 generations per year.

Stages of Silk worm

Sl.	Different stages of silk worms	Muga		Eri		Mulberry	
		Summer (Maximum days)	Winter (Maximum days)	Summer (Minimum days)	Winter (Maximum days)	Summer (Minimum days)	Winter (Maximum days)
1	Egg stage Diapuse eggs	7	14	9	18	10 4 months- 10 months	15 Bivoltine - univoltine
2	Larval stage	22	45	17	45	25	31
3	Spinning stage	3	7	3	6	4	6
4	Pupal stage	14	35	13	22	13	15
5	Moth stage	4	6	4	6	2	3
Total Days		50	107	46	97	54	70

1.4 Optimum Temperature and humidity requirement :

- Different activities require certain range of temperature and humidity to complete the life cycles of different varieties of silk worms as furnished below :

Sl.	Different stages/ activities	Muga		Eri		Mulberry	
		Summer temp. °C	Winter % humidity	Summer temp. °C	Winter % humidity	Summer temp. °C	Winter % humidity
1.	incubation of eggs	25-26	80-85	24-26	85-90	24-25	80-85
2.	Larval stage	24-26	75-80	24-26	75-85	24-27	70-80
3.	Spinning of cocoon	24-25	75-80	24-25	75-80	23-24	60-70
4.	Storage of seed cocoon/moth emergence	25-28	70-80	22-24	70-80	24-26	75-80
5.	Paining of moths	25-28	75-80	22-24	70-80	23-25	70-80

1.5 Climate of Assam :

- The climate of Assam is sub-tropical with moderate temp. Details furnished below --

Particular	Spring	Summer	Autumn	Winter
1. Temperature (Degree Celsius)	15-28	23-38	18-26	7-20
2. Relative humidity (%)	65-98	75-98	70-80	60-70
3. Rainfall / year (mm)	1000	2900	400	0
4. Sunshine hours (hr)	12-13	13-14	11-12.5	10-11

1.6 Rearing schedule for Muga Silk worms :

1.6.1 Jethua Link --

Name of Crop	Date of hatching /brushing	Date of maturing	Date of moth emergence
P-3 Ahinia	Sept-9 to 18	Oct -4to13	Oct-21to30
P-2 Aghanua	Oct-30 to Nov-8	Nov-26 to Dec-5	Dec-31 to jan-6
P-1 Jarua	Jan-20 to 26	March-12 to 18	April-4 to 10
Jathua	April-20 to 26	May-20 to 26 (Jeth 6 to 12)	

1.6.2 Kotia Link :

Name of Crop	Date of hatching /brushing	Date of maturing	Date of moth emergence
P-3 Baishakhi	April-24to30	May-18to24	June-5 to 11
P-2 Aherua	June-16to22	July-9to15	July-26to Aug-2
P-3 Bhodia	Aug-7 to 13	Aug-31 to Sept-7	Sept-17 to 24
Kotia	Sept-27 to Oct-5	Oct-21 to 29 (Kati 3-12)	

1.7 Rearing schedule for Eri Silk worm :

1.7.1 Spring Season :

Name of crop	Date of hatching /brushing	Date of maturing	Date of moth emergence
1st batch	March-16 to 18	April-8 to 10	April-21 to 23
2nd batch	May-4 to 6	May-22 to 24	June-5 to 7
3rd batch	June-16 to 18	July-4 to 6	July-17 to 19
4th batch	July-28 to 30	Aug-16 to 20	Aug-31 to Sep-5

1.7.2 Autumn Season :

5th batch	Sept-14 to 17	Oct-16 to 19	Nov-3 to 6
6th batch	Nov-18 to 20	Dec-23 to 25	Jan-15 to 17
Basic seed rearing at Govt. ESG.	Jan-27 to 28	Feb-19 to 21	March-6 to 8

N.B. For the basic seed rearing, optimum temperature & humidity must be maintained in the rearing house and suitable leaves to be fed to the silk worms.

1.8 Rearing schedule of Mulberry Silk Worm :

Name of crop	Date of hatching /brushing	Date of maturing	Date of moth emergence
Spring Season			
Commercial crop			
1st batch	March 1 to 10	March 26 to April 5	BixBi
2nd batch	April 20 to 25	May 14 to 19	C.B
Seed Crop			
P-3 crop	May 24 to 25	June 20 to 22	Sarupat
P-2 crop	May 24 to 25	June 20 to 22	'G' race
P-1 crop	March 1 to 10	March 28 to April 7	Bivoltine
Summer Season			
i. Commercial	July 1st to 5th	July 23 to 27	Multi x multi
ii. P-3 crop	July 15 to 20	Aug 7 to 12	Sarupat
Autumn Season			
Commercial			
1st batch	Sept 25 to 30	Oct 21 to 26	Cross Breed (Multi x Multi)
2nd batch	Oct 10 to 15	Nov 6 to 11	Hybrid (Bi x Bi)
Winter Season			
P-3 crop	Jan 15 to 20	Feb 15 to 20	Sarupat.

* Conduct cellular rearing to rear 30-35 dfles in case of P-3 crop.

* In case of P-2 rearing brush 2 dfles per tray (wooden 60 cm x 90 cm)

1.9 Norms for engagement of labourers :

- Number of labourers in Muga, Eri and Mulberry sector will be different considering the spacing of food plants, frequencies of intercultural operations and nos. of crops to be raised.

Particulars	Nos. of Labours	Nos. of Mandays/year
1. Muga (1.0 acre)	1	365 MD
2. Eri (1.5 acre)	1	365 MD

3. Mulberry (1.0 acre)

Hill areas	1.5	548 MD
Plain areas	1.0	365 MD

1.10 Conversion :

1.10.1 Area :

Unit area	Conversion
1. Kotha	1K=2880 sq.ft.
2. Bigha	5K=1B=14400 sq.ft.
3. Acre	3.08B=1 acre=44352 sq. ft.
4. Hectare	7.56 B=2.455 acre=1H=108900sq.ft.

1.10.2 Weight / Volume :

Unit area	Conversion
1 quintal	100 kgs
10 quintal	1000kgs=1 M tone
1 M tone	0.98420 tone
1 tone	1016 kgs
1 cft FYM	10 kg
10.8 cft	1 cm
1 cm	108 kgs

1.10.3 Basic Information (Standard) :

Particulars	Mulberry	Muga	Eri
1. Scientific name of silk worm	Bombyxmori L.	Antheraea assama	Philosamia ricini
2. Major food plants	Mulberry (Morus-indica) S01635, BC-259, TR-8, TR-10, JRH.	Som, Soalu	Castor, Kesseru
3. Spacing for plantation	3'x3' & 6'x3'	3m x 3m	Castor-1.5 x 1.5m Kesseru-2x2m
4. Nos of food plants per acre	3'x3'=4900 nos. 6'x3'=2500 nos.	450 Kesseru-1200 nos.	Castor-1722 nos.
5. Season for raising nursery	November	April-May	Kesseru-Feb-Mar
6. Season for raising plantation	April-May (Rainfed) Sept.-Oct (irrigated)	April-Sept.	Castor-March-April Kesseru-Aug-Sept.
7. Yield of leaves per acre	6000 kg (rainfed) 9000 kg (irrigated)	3600-38000kgs (approx) after 7th year of plantation	Castor-1000kgs Kesseru-36000 kgs after 5th year of plantation
8. Nos. of eggs per laying	Uni-250-300 Bi-500-600 Multi-300-400 Hybrid-400-500	150-250	200-350

9. Quantity of leave required to rear 1 DFL	Uni-7-8 kgs Bi-8-10 kgs Multi-7-8kgs Hybrid-8-9kgs	16-18 kgs	Castor-10kgs Kesseru-8kgs
10. Cocoons from 1 dfl (Nos.)	Uni-200-220 Bi-250-275 Multi-150-200 Hybrid-250-300	50-60	200-250
11. Nos. of cocoon to a kg	Uni-550 Bi-800 Multi-1200 Hybrid-750	With pupa-370; Empty cocoon-3300	With pupa-250 Empty-2500
12. Average quantity of cocoon per 100 dfls	Uni-30-40kg Bi-30-40 Multi-20-25 kgs Hybrid-50-60 kg	5000-6000 nos.	20,000-25,000 nos, with pupa-80-100 kg, Empty cocoon 8-10kg
13. Quantity of cocoon require to produce 1 kg. silk yarn	Uni-6-7 kgs Bi-9-10 kgs Multi-15-16 kgs Hybrid-11-12 kg	4500-6500 nos.	1.3 kgs
14. Denier of single cocoon filament.	1.8-3.0 D	4.5-5.0 D	Spun silk (count)
15. Average filament length of a cocoon.	400-1500 mtr.	350-500 mtr.	15 mtr.
16. Ratio for silk worm seed production.	1 dfl per 3 seed cocoons	1 dfl per 3 seed cocoons	1 dfl per 5 seed cocoons

1.11.0 Requirement of Implements for

A. 1 acre plantation of silkworm food plants (Mulb, Eri and Muga)

B. Rearing of 100 dfls / crop (Mulb, Eri and Muga)

C. Grainage to produce 5000 dfls / crop (Eri & Muga).

Sl. No.	Name of articles	Mulberry	Eri	Muga
(a)	Agricultural implements :			
1.	Spade	3 Nos	2 Nos	2 Nos
2.	Digging Fork	1 No	1 No	1 No
3.	Showels	2 Nos	2 Nos	2 Nos
4.	Crow bar	2 Nos	1 No	1 No
5.	Sickles	4 Nos	2 Nos	3 Nos
6.	Pruning saw	4 Nos	2 Nos	3 Nos
7.	Secature	1 No	1 No	1 No
8.	Water cane	3 Nos	3 Nos	3 Nos
9.	Iron pan	3 Nos	2 Nos	2 Nos
10.	Measuring tape	1 No	1 No	1 No
11.	Big dao	1 No	1 No	1 No
12.	Rain Gauze	1 No	1 No	1 No

(b)	Rearing house & Applications:	(40,000 worms)	(30,000 worms)	(20,000 worms)
1.	Fly proof rearing house (Nos) 18'Lx15'B with all side varandah (Capacity 200-225 dfls)	1 No.	1 No.	-
2.	Jali house or Mounting hall (10'x10' with corrugated roofing and 6' front side varandah) (capacity-200 dfls.)	-	-	1 No.
3.	Rearing Rack (7' L x 2' B x 6' H with 8 nos. shelves - 9' apart)	4 Nos	4 Nos	-
4.	Wooden Tray (3' Lx2' Bx3' H)	7 Nos	10 Nos	-
5.	Round Bamboo Tray (3.5' diameter)	60 Nos	40 Nos	10 Nos
6.	Chandrika (1.8m x 1.2m)	35 Nos	40 Nos	-
7.	Feeding stand (with cross legs and 0.95 cm high).	1 No	1 No	-
8.	Ant wells	16 Nos	16 Nos	
9.	Leaf chopping board (3'Lx3' B)	1 No	1 No	-
10.	Knives (I) Smaller (II) Bigger	1 No 1 No	1 No 1 No	- -
11.	Leaf Chamber (152 cm x 76cm x 76 cm)	1 No	1 No	-
12.	Bed cleaning Net	60 Nos	-	-
13.	Paraffin paper	14 Nos	20	-
14.	Foam Rubber strip (2'L)	28 Nos	40 Nos	-
15.	Chop sticks	7 Nos.	-	-
16.	Feather	14 Nos	-	-
17.	Mountage (Jali 3' x 3')	-	-	15 Nos.
18.	Nylon Net (25'Lx25'Bx8'H)	-	-	2 Nos
19.	Bamboo Posts (10' high)	-	-	20 Nos.
20.	Bamboo basket (medium size)	2 Nos	2 Nos	2 Nos
21.	Bamboo Chalani (triangular)	-	-	10 Nos
22.	Tarpoline (12'x12')	-	-	1 No
23.	Torch	1 No	1 No	1No
24.	Hurricane Lamp	1 No	1 No	1 No
25.	Wshing basin with stand	1 No	1 No	1 No
26.	Foot cleaning tray (110 cm L x50cmBx2.5cmH)	1 No	1 No	1 No
27.	Sprayer	1 No	1 No	1 No
28.	Disinfection Mask	2 Nos	2 Nos	2 Nos
29.	Hand gloves	2 pairs	2 pairs	2 pairs
30.	Hygrometer	1 No	1 No	1 No
31.	Hydrometer	1 No	1 No	1 No
32.	Weighing balance	1 No	1 No	1 No
33.	Electric Heater/ Charcoal stove	1 No	1 No	1 No
34.	Bucket	1 No	1 No	1 No

35.	Mug	1 No	1 No	1 No
(c)	Grainage operation (for 5000 DFI's			
1.	Grainage hall (18'Lx15'B with 6' all side varandah	Refer pg. no. 188-189 of Manual on Silk worm egg production by Dr. M.N. Narasimhana.	1 No	1 No
2.	Cocoon preservation stand (1.95m×0.45m×0.75mH)	-	7 Nos	8 Nos
3.	Cocoon preservation box (80 cm Lx50cmBx36cmH)	-	25 Nos	30 Nos
4.	Kharika (Thatch- 12"/L and bamboo 3/L)	-	650 Nos	2500 Nos
5.	Galvanised wire	-	1/2 kg	1/2 kg
6.	Cotton thread (20 count)	-	1/2 kg	1/2 kg
7.	Plastic basin (2'Lx1.5'Bx3'H)	-	1 No	1 NO
8.	Plastic Tray (Perforated)	-	1 No	1 No
(d)	Equipments for worms / Moth Examination etc.			
1.	Microscope	1 No	1 No	1 No
2.	Slide	1 box	1 box	1 box
3.	Slid cover	1 box	1 box	1 box
4.	Mortal & Pistles	1 set	1 set	1 set
5.	Glass Rod (9"/L)	1 No	1 No	1 No
6.	Measuring jar (plastic 100 ml)	1 No	1 No	1 No
7.	Plastic beaker (250 ml)	1 No	1 No	1 No
8.	Absorbent cotton			
9.	Examination table	1 No	1 No	1 No
10.	Stool	1 No	1 No	1 No

SECTION - D

JOB DESCRIPTIONS

1.0 Duties and Responsibilities of Technical employees :

1.1 Sericulture Demonstrator :

Sericulture Demonstrator in circle --

- Will work in the Gaon Panchayat level within a radius of eight (8) km. distance.
- Shall display a sketch map of Sericulture villages in his circle.
- To do extension work being the liasoning agency between Rearers, Reelers and the Department keeping contact with the artisans of his area in every way providing help/guidance and any technical assistance that rearers/reelers may need.
- To assess the requirement of dfls in his area, submit to the Inspector/ E.O. of the area, distribute dfls, realize sale proceeds, arrange for the remittance of the sale proceeds and all others works related to the distribution of dfls amongst the Rearers.
- Maintenance of records and registers as may be required (collection of data and other related works)
- Providing marketing assistance to the Rearers/ Reelers as per Departmental programmers.
- To submit reports/ return in prescribed format to the Inspector / Extension Officer on the fixed date/ day as decided by the superior officer.
- To maintain day to day work. Diary to be checked and verified by the immediate superior officer in time of submitting the fortnightly report.
- To identify farmers / plots and see suitability of the soil condition for plantation.
- To help farmers at the time of plantation and rearing by arranging cuttings/ seedlings / saplings and dfls/ seed cocoons.
- To arrange periodical discussions to motivate the farmers to adopt Sericulture.
- To see that the subsidies and bank finance are utilized properly and to keep Extension officer/ Inspector informed duly.
- Arrange to reside within the circle jurisdiction in a central place with intimation to district/ sub-divisional officer.
- During rearing period the Sericulture Demonstrator must visit the farmers house at least once in a week to give necessary technical guidance. Rearing chart should be maintained.
- In case any Sericulture Demonstrator fail to distribute some quantity of Mulberry dfls due to lack of time to the rearer, then he must arrange for chowki rearing of the dfls in the nearby CMG and distribute the 3rd age worms to the farmers. Farmer wise detail rearing report incorporating nos. of dfls brushed, cocoon harvested, silk yarn obtained and finally earning of the rearer from the rearing must be submitted to the concern S.I/E.O. within 30 days from the completion of the rearing.
- The reason of failure of rearing if it happen must be recorded in the remark column of the report.

1.2 Supervisor/ Sericulture Demonstrator posted in Eri spinning Training Centre :

- To maintain the building and machine etc. properly for imparting spinning

training to the entrepreneurs, each batch for a duration of 3 (three) months.

- To collect the required raw materials for the training.
- To dispose off the Eri Silk yarn after completion of the Training and remit the value of yarn to the superior officer for depositing as revenue.
- Maintain records and register as may be needed as per instruction from seniors.

1.3 Sericulture Demonstrator Posted in Farm/ Project :

- To assist the unit in-charge and to be responsible for such work of the unit as may be entrusted to him including plantation, rearing, grainage operation etc. as well as handling of stock and stores.
- To maintain day to day work Diary which must be checked and verified by the Manager / Project Officer on every Saturday.

1.4 Supervisor ? Sericulture Demonstrator as in-charge of ECC/ Muga VGR/ CMG :

- To be responsible for proper functioning of the unit to achieve the target fixed for the unit, exercising administrative and technical control over the subordinate staff and M.R. workes.
- To maintain Eri silk worm food plants properly.
- To take up Eri silk worm rearing as per action calender & supply the Eri seed cocoon to the nearest Eri Seed Grainage for seed preparation.
- To maintain Muga Silk Worm Food Plants properly.
- To arrange Muga Seed Cocoon/ DFLs for the village rearers who intends to rear Muga silk worm at Muga VGR.
- Allotment of food plants to the derserving rearers shall be made by the i/c of Muga VGR with prior approval of his immediate superior officer/ controlling officer.
- To realize 10% Muga cocoons from the Muga rearers as revenue as per departmental norms and make necessary arrangement to remit the cocoons to the nearest Muga Reeling unit.
- To realize 20% Muga cocoons if both food plants and seed cocoons or dfls are provided from the Deptt.
- To maintain Mulberry silk worm food plants properly in the CMG.
- To conduct Chowki rearing and ensure supply of chowki worms to teh commercial rearers.
- To establish nursery of Kesseru/ som in the ECC/ Muga VGR every year for distribution amongst the rearers as per fixed target.
- To supply Mulberry cuttings from each CMG to the village rearer as per target.
- To maintain all records in binding Register as may be needed as per instruction from seniors.
- To submit progress report in the departmental prescribed proforma on the fixed date as decided by superior officer.
- To supervisor the works of Sericulture Demonstrator within a radius of 8(eight) km distance surrounding the centre.
- To record daily temperature (1 PM), humidity (6 AM, 1 PM, 4 PM) and rainfall (6 AM)

1.5 Supervisor Posted in Farm/ Grainages :

- Work to maintain labourers, plantations, rearing, seed production etc. as per instruction of the in-charge.
- Work to maintain labour journal, preparation of Muster Roll bill etc.
- To attend other works allotted by the Manager from time to time.
- To record daily temp. (1 PM), Humidity (6 AM, 1 PM, 4 PM) and rainfall (6 AM).

1.6 Manager of Farm/ Grainages :

- They shall work as over all incharge of the Farm/ Grainage.
- To draw and disburse the salary of staff.
- To maintain plantation, rearing, seed production as per departmental target and all other duties concerning to the Institutions.
- To maintain all records as per departmental Norms and submit monthly/ quarterly progress report in prescribed proforma within the third working day of the following month/ quarter.
- To submit annual progress report to the Asstt. Director of Sericulture/ Supdt. of Sericulture on or before 7th day of April of the following financial year in the prescribed proforma.
- To deposit the sale proceeds within 7th day after receipt of the amount.

1.7 Reeling Expert/ Reeling Foreman/ Extension Officer (Posted in Reeling Unit) :

- To collect reeling cocoons both from the Govt. / Pvt. Sector in consultation with the Asstt. Director of Sericulture / Supdt. of Sericulture.
- To work to meet the fixed target of silk yarn production as per Departmental Norms.
- To deposit the sale proceeds of yarn/ silk waste within 7th days after receipts of the amount.
- To maintain all records regarding purchase of reeling cocoons, silk yarn, silk waste, sale proceeds, reelers journals, wages etc. in binding Registers as per Departmental Norms.
- Department will fix responsibilities for any short fall of fixed target, damage/ loss of reeling cocoon/ yarn/ silk waste on the incharge of reeling unit.

1.8 Inspector of Sericulture :

- To inspect the Sericulture activities in Seri Circle (upto 20 nos.) as per departmental plans/ programme in the sub-divisional/ block level.
- To inspect the plots identified for silk worm host plant cultivation and assess suitability of soil condition.
- To assess the eligibility of the selected farmers.
- To arrange and attend group meeting of the farmers at least once in a fortnight.
- To attend the rearer house during the period of rearing and impart necessary technical guidance.
- To see that the subsidy/ grants and Institutional finance are utilize properly and to keep the superior officer informed duly.
- To make sure that the target of each of the Sericulture Demonstrator under his control is achieved.

- To scrutinise the idents of dfls, seedlings etc. of Seri Demonstrator to ascertain that it does not deviate much from the target already fixed.
- To comply with instruction of the superior officer.
- To maintain day to day work diary which must be checked and verified by his superior officer at the time of inspection.
- To check and verify the work diary of Seri Demonstrator twice in a month.
- To submit progress report on the fixed date as decided by his superior officer.
- Arrange to supply the dfls/ cuttings/ seedlings as per target/ requirement for distribution in the circle within his jurisdiction.
- To visit the Eri Spinning Training Centre once in a week during the training period.
- To assist the rearers/ reelers for marketing of their products as per departmental plan/ programmes.
- To spend at least 3 days in a week in the field , visiting rearers and Govt. Institutions within his/ her Jurisdiction and shall record his/ her visit in work diary/ Inspection note book.

1.9 Extension Officer in Block Level :

- An Extension Officer will work in the block level.
- To Supervise the Sericultural activities of ECC/ CMG/ Muga VGR within the Block Jurisdiction
- To draw up detail programme of work of the centres and deploy the Technical staff at his disposal properly with approval of his superior officer.
- To make liason with the superior officer regarding supply of cuttings/ seedlings/ silk worm seeds etc.
- To achieve the target of the centres regarding plantation, cocoon production etc. as per norms.
- To identify prospective village and area of operation.
- To visit the farmers plot and the farmers house to be sure about the plantation and rearing etc.
- To make liason with the Sub-divisional officer/ District officer regarding supply of planting materials/ supply of silk worm seeds/ Bank finance, subsidy, organisation and registration of silk co-operative society and attend activities within the block jurisdiction.
- To arrange group meeting of farmers twice in a month and attend the same to impart technical advice and guidance.
- To keep close liason with the Gaon Panchayat and Block Development Officer to implement various Rural Development schemes.
- To scrutinise the work diary of Seri Demonstrator / Supervisor/ Inspector and forward the same to the superior officer with observation.
- To maintain day to day work diary and submit to the immediate superior officer once in a month.
- To assist in marketing of cocoon/ yarn etc.
- To be responsible for maintenance of records, submission of reports, return etc.

1.10 Extension Officer Posted in Mulberry Seed Grainage :

- To keep the grainage building/ equipments in hygienic condition as per de-

partmental norms and maintain the record of disinfection in a binding Register.

- To collect quality Mulberry seed cocoons both from Govt. as well as private sector in consultation with his superior officer.
- To work to meet the target of seed production.
- Moth examination/ seed examination must be done as per Norms.
- To deposit the sale proceed against cut cocoon within 7th days from the date of receipt of the amount.
- To maintain all records regarding seed cocoon, seed production, disinfection, moth examination, seed examination, sale proceed etc.
- To maintain day to day work diary.
- To submit report as per Norms.

1.11 Project Officer of Sericulture :

The Project Officer of Sericulture posted in the Muga Seed Development Project will be responsible for --

- To work as over all incharge of the project.
- To maintain plantation, rearing, seed production as per departmental target and all other duties concerning to the institutions.
- To maintain all records as per departmental Norms and submit monthly/ quarterly progress report in prescribed proforma within the third working day of the following month/ quarter.
- To submit Annual Progress Report to the Asstt. Director of Sericulture on or before 7th day of April of the following financial year in the prescribed proforma.
- To deposit sale proceeds etc. within 7th day after receipt of the amount.

1.12 Superintendent of Sericulture :

Superintendent of Sericulture in the Sub-Division will be responsible for --

- To manage all the works relating to development & expansion of Sericulture in the Sub-Division.
- To identify the Potential Blocks.
- To scrutinise the identified Potential Villages.
- To arrange suitable Cuttings/ Seedlings/ Saplings/ Silk Worm seeds etc. for the Sub-Division.
- To arrange for subsidy/ Institutional finance of the silk worm rearers / entrepreneurs.
- To ensure that the Bank finance and subsidy is utilize properly.
- To inspect all the Govt. Sericulture Institutions of the Sub-Division at least once in a month.
- To attend group meetings of the silk worm rearers.
- To arrange for registration of silk co- operative societies.
- To see that the target of the Farms/ Centre/ Grainage/ Reeling Unit/ Spinning Unit etc. are achieved and to asses and fix up responsibilities for failure if any.
- To examine the work Diary of all the field Staff and to approve/ disapprove the same and issue necessary instructions.
- To maintain liason with other department and look after various technical and administrative matter within the Sub-Division.

- To submit all progress report/ Diary and all reports to the concerned Asstt. Director of Sericulture.
- To submit Annual Confidential Report of Staff as per provision laid down in the Assam Services (Confidential Rolls) Rules 1990.
- To prepare and submit Plan and Non-Plan Budget proposal to the Asstt. Director of Sericulture, implementation of various departmental schemes relating to the Sub-Division, obtaining necessary sanction proposal from competent authority.
- To be responsible to the Asstt. Director of Sericulture/ Zonal Joint Director and the Directorate of Sericulture as usual for implementation of all the schemes operating in the respective Sub-Division.

1.13 Asstt. Director of Sericulture :

Asstt. Director of Sericulture in the District will be responsible --

- To manage all the works relating to the development and expansion of Sericulture in the district.
- To be the administrative as well as technical head in the district.
- To identify the potential block.
- To scrutinise the identified potential villages.
- To arrange farmer's training.
- To arrange suitable cuttings/ seedling/ saplings/ silk worm dfls etc. for the district.
- To arrange for subsidy to the rearers/ institutional finance to entrepreneurs.
- To ensure that the Bank finance and subsidy is utilized properly.
- To inspect all the Govt. Sericulture Institutions in the district at least once in a month.
- To attend group meeting of the villagers/ silk worm rearer/ reelers/ spinners etc.
- To arrange for registration of silk co-operative societies.
- To see that the target of the farms/ centres/ grainages/ reeling units/ spinning units etc. are achieved and to assess and fix up responsibility for failure if any.
- To examine the work diary of all the technical staff and to approve/ disapprove the same and issue necessary instructions.
- To maintain liaison with other department and to look after various technical and administrative matter within the District.
- To submit T.A. bill of Supdt. of Sericulture and Asstt. Director of Sericulture and reports to the Zonal Joint Director of Sericulture.
- To submit Annual Confidential Report of the subordinate staff as per provision laid down in the Assam Service (Confidential Rolls) Rule, 1990.
- To submit/ formulate district plan and non plan budget proposal in consultation with Zonal Joint Director of Sericulture and to submit the proposal to the planning board/ Director of Sericulture.
- To implement various developmental schemes/ programmes pertaining to the District and to supervise and monitor the Sericulture activities in the sub-division within his jurisdictions.
- To arrange staff meeting every month within 7th day of the following month to review the progress of Sericultural activities of the district.

1.14 Planning Officer :

- Planning officer posted in the Directorate of Sericulture will be responsible for --
- Formulation of the State plan, de-segregation of district/ sub-divisional plan in consultation with Sectoral Deputy Director, Zonal Joint Director and Addl. Directors of Sericulture (H.Q. & Hill Districts).
- Any other matter relates to preparation and submission of plan/ schemes as per Govt. prescribed guide line.

1.15 Superintendent of Sericulture :

- Deputy Director of Sericulture posted in the State Head Quarter will be responsible for the Sector allotted to the post --
 - a) Deputy Director : Eri Sector.
 - b) Deputy Director : Muga Sector.
 - c) Deputy Director : Mulberry Sector.
 - d) Deputy Director : Marketing & Post Cocoon Technology.
 - e) Deputy Director : Evaluation & Monitoring.
 - f) Deputy Director : Extension.
- To be responsible for formulation of sectoral plan/ schemes in consultation with the Zonal Joint Director/ Addl. Directors of Sericulture.
- Supervision, monitoring and evaluation of sectoral physical progress.
- To assist. Addl. Director (H. Q.) in all technical matters in their respected sector.
- g) Deputy Director (BTC) : Deputy Director of Sericulture (BTC) posted in Kokrajhar will be responsible.
 - To look in managing all the works relating to development of Sericulture in the BTC area.
 - To control over and maintain all the staff in the area.
 - To submit A.C.R. of the subordinate staff as per provision laid down in the Assam Service Rule (Confidential Rolls), 1990.
 - To supervise and monitor of various developmental plan/ schemes implemented by the district/sub-divisional office with the B.T.C. area.
 - To maintain liaison with other developments for development of Sericulture.
 - To submit tour diary/ programme of Asstt. Director of Sericulture and all other reports of the Director of Sericulture.
 - To countersigned TA bill of Asstt. Director/ Supdt. of Sericulture.
 - To responsible for formulation of plants/schemes in BTC area.
 - Technical approval of the plants/ schemes under infested fund of B.T.C. area.

1.16 Joint Director of Sericulture (H.Q.) :

The senior most Joint Director of Sericulture, posted in the Directorate of Sericulture will be responsible --

- To look after all administrative matter regarding the technical officials/ officers of the Department.
- To look after all matter related to information, publicity, records and vehicles etc.
- All matter relates to plan / project.
- Any other matter entrusted to him by the Director of Sericulture.

1.17 Joint Director of Sericulture (Zonal) :

Joint Director of Sericulture as zonal officer of the Department will be responsible-

- To work in managing all the works relating to development of Sericulture in the zone.
- To control over and maintain all the staff in the zone.
- To submit Annual Confidential Report of the subordinate staff within the jurisdiction of each zone as per provision laid down in the Assam Service Rule (Confidential Rolls), 1990.
- To supervise and monitor of various developmental plan/ schemes implemented by the district/ sub-divisional officer within the zone.
- To maintain liaison with other departments for development of sericulture.
- To submit tour diary/ programme of Joint Director Sericulture and all other reports to the Director of Sericulture. Attend Departmental/ public meeting etc.
- To countersign TA bills of Supdt. of Sericulture / Asstt. Director of Sericulture as Zonal head of the Department.

1.18 Addl. Director of Sericulture (Karbi Anglong & N.C. Hills) :

Addl. Director of Sericulture (hills) posted in Haflong & Diphu as Zonal head will be responsible --

- To work in managing all the works relating to development of Sericulture in the zone.
- To control over and maintain all the staff in the zone.
- To submit Annual Confidential Report of the subordinate staff within the jurisdiction of each zone as per provision laid down in the Assam Service Rule (Confidential Rolls), 1990.
- To supervise and monitor of various developmental plan/ schemes implemented by the district/ sub-divisional office within the zone.
- To maintain liaison with other departments for development of sericulture.
- To submit tour diary/ programme of Joint Director of Sericulture and all other reports to the Director of Sericulture. Attend departmental/ public meeting etc.
- To countersign TA bills of Supdt. of Sericulture/ Asstt. Director of Sericulture as zonal head of the department.
- To be responsible for formulation of plans/ schemes in the Hills district of Assam.
- Technical approval of the schemes / plans under entrusted fund of the District Councils.

1.19 Addl. Director of Sericulture (H.Q.) :

Addl. Director of Sericulture posted in the Directorate of Sericulture in Guwahati will be responsible --

- To finalize departmental plan/ schemes and their implementation, monitoring through sectoral Deputy Directors and Zonal Joint Director of Sericulture.
- To assist the Director of Sericulture in the administrative matter of the department.

1.20 Exhibition Officer :

The exhibition officer posted in the Directorate of Sericulture will be responsible --

- To represent the department in the State level Sericultural exhibition indepen-

dently.

- To represent the department in National/ International level exhibition in consultation with the Joint Director (H.Q.).
- To maintain the stock of exhibition materials properly.
- To collect exhibition materials from field well ahead before attending any exhibition.

1.21 Officer Incharge Research :

The officer incharge research posted in Dhakuakhana Research Sub-Station shall be responsible for --

- Conducting research work related to the Muga culture (beginning from agronomical practices to post cocoon technology).
- To work in consultation with the Deputy Director (i/e Muga Sector) and Principal, S.T.I. Titabar.
- He is to maintain all records of research activities/ findings and submit monthly reports to the Directorate with a copy to the Principal, S.T.I. Titabar.

1.22 Principal S.T.I. Titabar :

The Principal posted at the Sericulture Training Institute, Titabar will work as --

- The Head of the institution who will look after all administrative as well as academic matter of the institution.
- To work in consultation with the Directorate of Sericulture Assam.
- To utilise the service of Lecturers, Instructors, Senior Instructors, Supervisors, Junior Instructors and other staff of the Institute, in their respective field of activities (subjects) for smooth functioning of the Training Institute.

Mode of Functioning in Sericultural Institutions

1.23.1 Mode of Functioning in Sericultural Institutions :

Specific Targets are used to be set for all centres/ farms/ MSDP/ grainages/ reeling unit etc. With a view to achieve these targets, systematic measures require to be taken. It is also necessary to assign specific tasks, introduce a system of monitoring and in still a sense of responsibility and involvement amongst all concerned. Without accountability and personal involvement no tangible results can be achieved. Therefore, the following procedures are to be followed in the administration of all Sericulture units under the Directorate of Sericulture.

- The officer in-charge of the units will prepare Annual Action Plan to achieve the Target fixed for the unit and the same must be approved by the Asstt. Director/ Supdt. of Sericulture within 31st March of every financial year.
- The officer in-charge of the units will draw up quarterly working programme based on the Annual Action Plan and will submit the same to the Asstt. Director/ Supdt. of Sericulture. Thereafter, week wise, monthly work programme will be drawn up and will be displayed in the Notice Board on the proceeding Friday along with the daily requirement of Labourers.
- Regarding Regular Staff like supervisor/ Sericulture Demonstrator/ 4th Grade Staff, their duties will also be allocated as per work programme in a binding Register and this will be shown to them and their signature to be obtained.

- Available Land in the Nursery/ Centre/ Farms/ MSDP will be divided into suitable plots and a map will be maintained in the office which will be displayed prominently. A copy of the map must be submitted to the Controlling Officer. One Seri. Demonstrator or other Supervisory Staff will be put in-charge of suitable number of such plots. He will be responsible for ensuring proper cultivation and maintenance of the plots. The target fixed to the unit will be sub-divided and allotted to the Seri. Demonstrator by the in-charge as per workable convenience. While drawing up the work programme of the following week the officer in-charge will consult his subordinate technical staff.
- The 4th Grade Staff will not assigned any supervisory work.
- All subordinate technical persons of the unit will maintain a diary in a binding register to record day to day Seri. activities which will be submitted to the unit in-charge every week on the following Monday for verification.
- In-charge of the unit will records his comments in the margin and take proper action as may be considered necessary.
- The working in the Sericultural Units will be done in two shifts.

Following will be the working hours.

March to October	November to December
5 AM to 10 AM and 2 PM to 5 PM	6 AM to 11 AM and 1.30 PM to 4.30 PM

- In time of silk worm rearing the working hours should be fixed according to the Job requirement. As far as possible the rearing work should be done with regular staff and MR worker may be engaged in time of dire necessity.
- Deployment of labourers as per monthly work programme will have to be confirmed to the standards laid down in the Manual and no extra labourers shall be engaged. If due to some reasons additional labourer in excess of the "Norms" is required to be engaged, previous written approval of the Asstt. Director/ Supdt. of Sericulture will have to be obtained. In no case labourer will be engaged when there is no adequate work to justify such engagement.
- Two attendance Registers should be maintained. One for MR worker and the other for the Regular Staff. Both MR labourers and Regular Staff will have to record their arrival and departure in both the halves in the attendance register. In the rearing house/ rearing site, a long book will be maintained in which the supervisory staff and other superior officer, entering the rearing house/ rearing site every time will record the time of entry and exist with observation. Staff deployed in the rearing house will record their attendance in the long book.
- If an MR labourer fails to perform work as per prescribed Norms and as per the work programme or fails to carry out any instruction or commits any act against the interest of the unit, he/she will be served with a notice drawing his/her attention and directing the incumbent to improve his/her performance. (This will be done by the in-charge of the unit in writing and through Peon Book). If there is no satisfactory improvement after three such notices, the

unit in-charge will submit a report to the Asstt. Director of Sericulture/ Supdt. of Sericulture, who after considering the matter and after giving the incumbent an opportunity of explanation, take appropriate action in the matter including removal of the incumbent as per Govt. rules and procedure.

- As far as the regular employees are concerned their performance also will be kept under constant scrutiny and similar notice will be served for lapses. In case of persistent failure to act according to instructions disciplinary action will have to be initiated. The performance of every regular employee with reference to his/her tasks will be recorded in the Annual Confidential Report by the Recording Officer after receipt of any such report from the in-charge.
- Records and registers are to be maintained in each farms/ centre/ MSDP/ Grainages. The officer in-charge of the unit will distribute the work of maintenance of these records amongst the available personnel including Seri. Demonstrator/ Supervisor/ Ministerial Staff etc. and ensure its proper maintenance through constant checking.
- The officer in-charge of the unit will submit monthly and quarterly reports to the Asstt. Director of Sericulture / Supdt. of Sericulture within the 3rd working day following every month/ quarter as per prescribed proforma.
- The officer in-charge of each unit will keep close contact with all staff employed under his/her control, hold at least one monthly meeting where the affairs of the unit will be discussed. It is expected that it will be possible to sort out all problems by mutual discussions. In exceptional cases where intervention of higher Authorities is necessary, this should be reported to the controlling officer to take necessary action.
- Asstt. Director of Sericulture / Supdt. of Sericulture will hold meeting at least once in a month preferably within the 7th day of following every month to review the progress of Sericultural activities under his jurisdiction.
- Zonal Joint Director/ Zonal Deputy Director of Sericulture will also hold meetings atleast once in a quarter in order to review the progress of each unit and to develop motivation, involvement & congenial work environment. This will also help to sort out many problems locally.
- Additional Directors of Sericulture (both Karbi Anglong and N.C. Hills) will also hold meeting at least once in a quarter in order to review the progress of each unit and to develop motivation involvement & congenial work environment which help to sort out many problems locally.

1.23.2 Prohibition on Rearing of Domestic Animals :

- Rearing of cattle/ goat/ sheep/ pig etc. within the premises of MSDP/ farm/ centres etc. are found to be detrimental for silkworm food plants as well as for silk rearing.
- Rearing of the aforesaid animals within the campus of any MSDP/ farm/ centres under this Directorate is strictly prohibited w.e.f. 7th May'03.
- Violation of the above prohibitory measure by any occupant of Govt. quarter will be severally punished leading to pay cut, drawing-up departmental proceeding etc.

1.23.3 Digging of Trench & Green Fencing :

- Dig trench (cannal) on the boundary demarcation of MSDP/ Muga/ Farm/ Seri Farm/ Eri seed grainage etc.
- Erect green fencing (Hedge) over the inner border of the trench during rainy season.
- Erect green fencing along with the existing barbed wire/ goat proof net fencing during rainy season.

Self Help Groups

1.24.0 Development activities are successful only when they are planned, implemented and managed by people themselves. People's participation on sustained basis is possible only by building appropriate community based institutions of which Self-Help Group is an example.

Definition : A group comprises with people who have gathered together for a specific purpose on a specific place who shared common interest is called SELF HELP GROUP.

It constitutes with (10 to 20) poor people (Men or Women) of the same village / hamlets/ caste/ religion who come out voluntarily for their socio-economic development and who are willing to meet regularly for self help or mutual help.

How to Form SHG :

Initially make few visits to the village.

- For rapport building with the people.
- To see the present status of the village.
- To talk with the community, youths, village heads, for household visits etc.
- Informal meeting is to be convened on date/ time convenient to the poor people. The objectives of formation of SHG, goal needs, and reason for formation are to be explained to the people.

Formal meetings to be held with the group of people who have shown interest spontaneously on SHGs and willing to form a group.

At the beginning of the meeting, goal and objectives of SHG are to be explained.

Once group is formed, frame rules and regulations.

List out the books to be maintained by the SHG.

Homogeneous groups (not mix-sex) in terms of sex, activity and social identity are to be formed.

Salient Features of SHG

Size : 10 to 20 people.

Frequency of Meetings : Members of the SHG can decide themselves for meeting weekly/ fortnightly or monthly. But weekly meetings are the best. Initially few meetings are to be attended by the facilitator/ animator.

Meetings : Meetings to be held on date/ day / timings convenient to the poorest member of the SHG. Meeting minutes to be written regularly in the proceeding book.

Attendance : It is better to have more than 80% attendance in each meeting. Attendances of the members in each meeting are to be recorded regularly. Last two pages of the proceeding book or a separate book can be used for recording attendance of the members.

Dropouts : Members with poor/ irregular attendance can be thrown out.

Late attendants can be fined.

- Dropouts - May be due to own reasons - like marriage.
- May be migration and joining in another SHG.
- May be for death.
- May be for meeting timings not convenient etc.

Savings : SHG savings are the contribution from the group members. This constitutes the SHG fund.

Saving can be fixed or optional - Optional is better.

Saving can be weekly or monthly - Weekly is better.

Planned Savings : SHG should have a plan for saving. More income producing months of the year can be earmarked for more savings.

Target for Savings : The SHG should not fix any target of amount to be saved weekly or monthly. Rather it should have a yearly target of savings.

Books of SHG : SHG should have the following books - Attendance Register, Meeting proceeding books, Individual pass books, SHG bank pass book, Saving ledger, Loan ledger, Cash book receipt and payment voucher, general ledger.

Common fund of SHG : SHG common fund constitute of interest on loans, interest on bank deposit, fine of members, donation/ grant from NGO/ Government, Revolving funds etc.

Structure : SHG may be of following structures :

- Animator, Representative, Member.
- President, Secretary, Member.
- President, Secretary, Treasurer, Member.
- Facilitator, Representative, Member.

The option D is the best. There should not be emergence of any single leadership. Power is to be rested on the group members.

Rotation of membership : Representative is nominated for handling banks accounts, Govt. works, etc. Representative should be changed at least once in a year, less than that is better.

Collective Management : Decision should be always consensus. For each meeting different member should take responsibility of facilitation, receiving saving amounts, paying loans, recording individual pass books, recording saving ledgers, loan ledgers, prepare account reports. Or the SHG can form some sub groups for different activities within the SHG.

Composition : Preferably homogenous in respect of sex, activity, village, hamlets.

Criteria for giving loans : Loans to be granted for members who are :

- Regular in attending meetings.
- Regular in savings - no matter what amount he/she saves.
- Regular in participation.

Then analyse the need in detail using PAIR WISE RANKING. Detail analysis on the purpose for the loan applied for. After that amount can be increased or decreased and then agreed. See whether the expenditure is planned or unplanned. If planned then there should be some amount of own contribution. Unplanned expenditures may be for natural calamity, sudden sickness, accident, etc.

Decide the amount you sanctioned, rate of interest and nos. of installments to be paid.

Tips-Rate of interest may be Rs. 2/- Rs. 100/- PM, Rs. 3/- Rs.100/- PM, Rs.5/- Rs. 100PM (First is the best, second is slightly dangerous, last is dangerous).

Preferential rate of interest : Depending upon the reasons for applying for loan preferential rate of interest can be fixed, or different rate of interest for different activity can be fixed.

All to be recorded in the proceeding. Decision should be consensus. Then disburse the loan.

Recovery/ Repayment : Recovery/ repayment of loan should be cent percent. Under no circumstances any concession on recovery of installments to be granted. In case of any accident or any such incidence which needs sympathetic consideration, concession can be granted for longer repayment or less/ no interest or can be helped through SHG donations.

Rules and Regulation : SHG can frame its own bye-laws with consensus decision in which following can be included.

- To attend meetings REGULARLY.
- To save regularly by each member.
- Repayment regularly.
- Interval verification in every three months.
- Audit once in a year - in April by CA or other person.
- Fixation of fines for late attendance/ repayment.
- Absentee in three consecutive meetings - OUT.
- Fixation of interest rate.
- Books of accounts.
- Who will operate those books ?
- Structure of management.

Different members can be asked to operate different books like individual pass books, loan ledger, recovery register, saving ledger etc.

Role of Members and Representative : Member or representatives should be aware of their own role and then follow it -- practice it.

Participation : Members or representatives should participate in -- groups meetings, Training programme, Gram Sabhas, village developments activities like Com-

munity Action Plan (CAP)s, Social Action Plan (SAP)s, Social Service (SS) etc.

Audit : Internal verification of accounts to be made once in three months. Accounts to be audited by CA or some other person once in every year in the month of April-but not in initial year.

Keep following the audit report.

Rotation/ Revolving the Common Fund : To consolidate the common fund, it can be revolved, rotated as per NEED.

Banks will pay interest @ 5% PA.

Lending can fetch 24% PA. Better to lend.

Training :

Representative -- 12 modules × 2 day each = 24 days spreading over 2 years.

Members -- 10 modules × 1 day each = 10 days spreading over 2/3 years.

External facilitator -- 2 module × 6 days = 12 days (TOT)

Skill development training -- 2 module × 7 days = 14 days.

Linkages : SHG members should have good relationship, regular in attending groups activities and derive support benefit of members only. They may seek loans banks, SIDBI, NGO, and HUDCO, any other financing organization.

CAPs - Community Action Programme : The group can take up some CAPs activity in free period like construction/ improvement/ cleaning roads-cleaning facilitating drainages/ tree plantation/ work for school building & library, etc. Health care plan in village.

SAPs - Social Action Programme : The group member can work for removal of gender biasness, dowry, child abuse, castism, communalism, alcoholism, and drug addictions.

SS - Social Service : The group can initiate some social service by donating blood, donating cash/ kinds for fire victims or natural calamity, providing scholarship to poor students, providing cycle to disables.

IGP - Income Generation Programme : The group can extend support to individual member for income generation. Can take up group activities of generating income of the group.

Assets Creation : SHG can create some assets - These should be maintained properly.

Transparency in SHG Management : All affairs of SHG should be known to all group members - amounts in savings, amounts in banks, amounts given on loans, amounts recovered as interest. Individual pass books, saving books to be written properly and regularly. Works can be delegated to some/all members.

Cluster or Apex Bodies : Successful SHGs of an area can form an apex body with equal nos. of representatives to

- Monitor the activities of SHGs and co-ordination.
- Collective Marketing.

- Purchase of raw materials/ material for activities.
- Auditing accounts of SHGs.
- Conduct CAPs, SAPs, SS.

Criteria for Membership : Group should be of men or women. They can be of any age for availing SHG loans. But, should be 21-60 years old to get loans from government or banks. An SHG may have members with below 21 or above 60 years of age, but they will not be entitled to get loans from Govt. or banks. Women members should preferably be married or no hope of marriage or widow.

AAP - Annual Action Plan : SHG can formulate an annual action plan according to the activity and convenience.

Months	J	F	M	A	M	J	J	A	S	O	N	D
Activities	M	M	M	M	M	M	M	M	M	M	M	M
	S	S	S	S	S	S	S	S	S	S	S	S
	L	L	L	L	L	L	L	L	L	L	L	L
	R	R	R	R	R	R	R	R	R	R	R	R
	IV			Audit			IV			IV		
		CAPs						CAPs	CAPs			SS
	LINKAGES			TRAINING								
				ANNIVERSARY								

M - Meeting, S - Saving, L - Loan, R - Recovery IV - Internal verification.

List of Registers

1.25.0 List of Registers to be maintained in MSDP/ FARMS/ GRAINAGES CENTRES

A. Accounts

1. Cash Book (Standard)
2. Acquittance Roll (Standard)
3. Sale Receipt Book (Standard)
4. Service Stamp Register (Standard)
5. Stationary Register (Standard)
6. Forms Register (Standard)
7. Monthly statement of Expenditure and receipts.

B. Store and Assets

1. Immoval Property Register
2. Tank Register
3. Stock Book (Standard)
4. Store Book (Standard)
5. Stock Book for Dry Cocoons (May be maintained in one Register)
6. Stock Book for Pierced Cocoons do
7. Stock Book for Rejected Cocoons do
8. Account for sale Receipt Book

C. Cultivation and Rearing

1. Cultivation Register (Standard)
2. Mulberry Leaf Register
3. Distribution Register for Seasonal Labourers.
4. Distribution Register for Malies & Rearers etc.
5. Irrigation Log Book.
6. Production Register (Standard)
7. Seed Cutting Register.
8. Seed Supply Ledger.
9. Inter Departmental Supply Ledger.
10. Sale Register.
11. Disinfection Register.
12. Register for recording Temperature & Humidity for each Rearing House.
13. Temperature and humidity (In Shade) and Rainfall Register.
14. Rearing Diary (For Rearing House).
15. Microscopic Examination Register.

D. General

1. Receipt Register (Standard)
2. Issue Register (Standard)
3. Attendance Register (Standard)

4. Peon Book (Standard)
5. Leave Register (Standard)
6. Staff Diaries
7. Order Book
8. Inspection Book
9. Visitors Book

B/1 : Immovable Property Register

To record details of Immovable Property, Land and Buildings including Sanction No. Amount, etc.

Description	Date of taking possession / purchase	Value (Rs.)	Sanction	
			G.O.No. & Date	
1	2	3	4	

B/2 : Tank Register

Number of Tank

Date	Details of work done	No. of labourers engaged	Amount	C.V. No. & Dt	Remarks
1	2	3	4	5	6

B/5/6/7 : Register for stock accounts of cocoons, pierced cocoons & rejected cocoons

Date	Source	Race	Quantity	Quantity	Nature of disposal	Amount of		Closing Balance	Re-marks
			Received	sold		Book no.	Amount		
			kh./kg.	kh./kg.	kh./kg.	Receipt no.		kh./kg.	
2	3	4	5	6	7(a)	7(b)	8	9	

C/4 : Distribution register for Malies and Rearers

Sl. No.	Name of Malies/Rearers	Cultivation	Irrigation	Rearing	Disinfection	Manuring	Others
1	2	3	4	5	6	7	8
Details of plot no.		Work done area		Signature of Supervising Officer			Remarks
9		10		11			12

C/5 : Irrigation Log Book

Plot No.	Date of Work	Period of Work	Total Working hrs	Consumption of fuel		Area worked	Signature of Supervising Officer	Re-marks
				Diesel	Mobil			
1	2	3	4	5(a)	5(b)	6	7	8

C/10 : Inter departmental Supply Ledger

Name of unit supplied	Date of supply	Description of articles supplied	Source of supply	Quantity supplied	Acknowledge-ment No. & Date	Signature of receiving Officer	Remarks
1	2	3	4	5	6	7	8

C/8 : Grainage Register (Seed cutting Register)

Sl. No.	Name of Corp.	Race	Dt. of spinning	Qty. of seeds (kh.)	Date of emergences	No. of months covered	Dead	Poor
1	2	3	4	5	6	7	8	9

Hibernated	Date of Examination	No. of moths examined	Results of Examination			Uufertilised
			Pb.	Fl.	Others	
10	11	12	13(a)	13(b)	13(c)	14
No. of Good Layings	Distribution of laying			Remarks		
15	Supply	Sold	Kept			
	16(a)	16(b)	16(c)	17		

C/1 : Sale Register

Dt. of sale	Receipt No.	To whom sold	Resi- dence	Quantity sold				
				Seed of layings	Co- coons	Pierced cocoons	Rejected	Misc.
1	2	3	4	5(a)	5(b)	5(c)	5(d)	5(e)
Dt. Total		Re-						
sale pro-		marks						
6	7	8						

C/14 : Temperature and Humidity Rainfall Register (in shade)

Date	Time	Temperature		Humidity		Rainfall (mm)	Remarks
		Max.	Min.	Max.	Min.		
1	2	3(a)	3(b)	4(a)	4(b)	5	6

C/2 : Register for accounts of mulberry leaves

Date	Quantity harvested (kgs) in plots	Total Qty. harvested (kgs)	Total Qty. consumed (kgs)	Total Qty. rejected (kgs)	Remarks
1	2	3	4	5	6

Total for the month :

Quantity upto previous month :

Grand Total :

C/3 : Distribution register for labourers

Sl. No.	Name of the labourers	Rate	Culti- vation	Irriga- tion	Rear- ing	Disinfec- tion	Manur- ing	Others	Details of plot no.
1	2	3	4	5	6	7	8	9	10

Work done area	Signature of Supervising Officer	Remarks
11	12	13

C/12 : Diinfection Register

Dt.	Receipts		C.V. No. & Dt.		Issues			Purpose of use with R.H. No. or no & name of implements	
	Whence received	Quantity	No. Dt.	if purchased / forwarding no. date with	To whom supplied	Qnty.	No.		
1	2(a)	2(b)	2(c)	2(d)	3	4(a)	4(b)	4(c)	5

D/6 : Staff Diary (Standard)

Name of Officer with Designation :

Attached to the Nursery

Year

Date	Hours	Nature of works				No. of Labours
		Rear- ing	Cultiva- tion	Disinfec- tion	Misc.	
1	2	3(a)	3(b)	3(c)	3(d)	4

Materials		Amount of work		Signature of supervising officer	Remarks
Particulars	Qnty	done with	specification		
5(a)	5(b)	6		7	8

Proforma IA

No. of daily workers to be engaged in the month from to (to be fixed in the notice board every Friday)

Date	No. of workers to be engaged for				Remarks
	Cultivation	Rearing	Grainage	Misc.	
1	2	3	4	5	6

Proforma I

Name of the unit

Work programme for the week from to

1.26.0 Proforma for Inspection by the Asstt. Director/ Supdt. of Sericulture

1. Sactioned strength of Staff indicating vacancy if any :
2. Total area of the Farm (in hector) :
3. Total area under nursery (in hector) :
4. Area under plantation of Eri/ Muga/ Mulberry silk worm food plants.
5. Nos. of Mulberry (Variety wise and also irrigated and rainfall area), Trees and high Bushes / Castor/ Kesseru/ Som/ Soalu/ other Silk Worm Food Plants with year of Plantation :
6. Area laying follow :
 - a) Existing Buildings (Present condition of the existing buildings) :
 - i) Founctional :
 - ii) Residential :
7. Nos. of M.R. worker engaged during the Month :
8. Wages of M.R. worker last paid :
9. Other expenditure incurred, item, wise :
10. Nos DFLs reared during the month :
11. Nos and quality of cocoons produced during the month, if any :
12. Quality of DFLs produced :
13. Cost of production of DFLs/ Seed Cocoon :
14. Quantity DFLs / Seed Cocoons disposed if any :
15. Amount of sale proceed, if any :
16. Quantity of cutting/ saplings/ seedlings supplied :
17. Special reporting i.e. construction in progress, other infrastructure to be required etc. should be done precisely.
18. Any other item of special mention.
19. Reason for low quantity and bad quality of leaf/ cocoons/ seed production.

1.27.0 List of Govt. Institutions

1.27.1

LIST OF MUGA FARMS

Sub-division	Name of muga farms	Area under farm
1	2	3
Kokrajhar	1. Kokrajhar/ 57	12.70
Guwahati	2. Khanapara/ 54	11.27
	3. Bhaktapara/ 67	23.22
	4. Kahibama/ 57	55.20
	5. Jogduar/ 76	12.00
Jorhat	6. Barahibar/ 70	37.73
Sibsagar	7. Garpera/ 82	13.93
Dibrugarh	8. Narayanpur/ 75	20.00
N. Lakhimpur	9. Dhakuakhana/ 61	28.46
Dhemaji	10. Kharangma/ 75	10.00
Haflong	11. Longkham	
	Umransu/ 86	13.33
	12. Hamren/ 86	28.00

1.27.2

LIST OF E.S.G.

District Sub-division	Name of E.S.G. with year of Esstt.	Area under E.S.G.(Hect)
1	2	3
Kokrajhar	1) Kokrajhar	3.32
Goalpara	2) Dhenubhanga/ 54	4.50
Nalbari	3) Musalpur/ 53	5.80
Kamrup	4) Barduar/ 62	5.00
Kamrup	5) Tapatali/ 78	14.14
Rangia	6) Goreswar/ 57	4.00
Sonitpur	7) Jamuguri/ 70	8.60
Darrang	8) Demornoi/ 75	13.33
Darrang	9) Bhergaon/ 86	5.07
Hojai	10) Barbaha/ 75	7.50
Morigaon	11) Oujari/ 57	6.50
Sibsagar	12) Demow/ 71	5.05
Golaghat	13) Rongagerah/ 73	4.05
N. Lakhimpur	14) N. Lakhimpur/	7.50
Jonai	15) Jonai/ 80	14.00
Dibrugarh	16) Rangsali/ 67	4.20
Tinsukia	17) Tingrai/ 82	13.38
Chapakhowa	18) Lakhimipathar/ 80	13.33
Cachar	19) Dharmikhal/ 75	8.02
Cachar	20) Harinagar/ 80	6.40
Karimganj	21) Adarkona/ 82	6.90
Diphu	22) Dengaon/ 52	3.00
Diphu	23) Dillaji/ 75	10.70
Diphu	24) Umsoi/ 79	12.80
A.D.S. Haflong	25) Khejurband/ 75	6.67
A.D.S. Haflong	26) Haflong/ 49	2.83
	Total	196.59

1.27.3

LIST OF MULBERRY SERI. FARM

District	Name of the Farm and year of Establishment	Area under Farm (Hect.)
Goalpara	1. Agia/ 55	12.40
Barpeta	2. Howly. 52	13.50
Jorhat	3. Titabar/ 1919	9.83
Sibsagar	4. Gaurisagar/ 41	14.93
Cachar	5. Pailapool/ 55	8.11
Karbi Anglong	6. Kanduli/ 86	14.09
Lakhimpur	7. Rangati/ 78	3.65
	(P-3 Farm)	
	8. Tarani/ 75	9.00

Dibrugarh	9. Hilloibam/ 52 (P-2 Farm)	9.00
Darrang	10. Mangaldoi/ 43	23.80
Nagaon	11. Senchow/ 41 (P-2 Farm)	8.90
N.C. Hills	12. Sangbar/ 75 (P-3 Farm)	8.08
Total		135.29

1.27.4

MUGA REELING UNIT

District	Sub-Division	Reeling unit and year Establishment	Total No. of Reeling Machine
1	2	3	4
Kamrup	Guwahati	1. Khanapara/ 78	14
	Guwahati	2. Sualkuchi/ 84	5
	Guwahati	3. Sakhati/ 86	2
Goalpara	Goalpara	4. Kuchdhowa/ 85	16
	Goalpara	5. Jaldhapara/ 84	20
Golaghat	Golaghat	6. Bhogagabharu/ 86	12
	Golaghat		-
Sibsagar	Sibsagar	7. Tengapukhuri/ 84	20
	Sibsagar	8. Gaurisagar/ 84	N.R.
	Sibsagar	9. Barahibari/	20
Lakhimpur	Dhakuakhana	10. Dhakuakhana/	10
	North Lakhimpur	11. North Lakhimpur	N.R.
	North Lakhimpur	12. Gogamukh/ 84	N.R.
	North lakhimpur	13. Ghilamara/ 84	9
Dibrugarh	Dibrugarh	14. Nahazar Naharani	1
		Knowar Gaon/ 83	
Total			128

District	Sub-Division	Name of spinning centre and year of Esstt.
Dhubri	Hatsingimari	1. Fekamari/ 85
Kokrajhar	Kokrajhar	2. Dotoma/ 84
	Kokrajhar	3. Shyam thaibari/ 85
Goalpara	Goalpara	4. Dhenubhanga/ 80
	Goalpara	5. Khutabari/ 85
	Guwahati	
Kamrup	Kamrup	6. Ratanpur
	Kamrup	7. Chandrapur
	Kamrup	8. Longkena/ 89
	Kamrup	9. Barduar/ 85
Nalbari	Rangia	10. Goreswar/ 84
	Nalbari	11. Pub-Barshiral/ 81
	Nalbari	12. Barama/ 80
Nagaon	Nagaon	13. Kanduli
Morigaon	Morigaon	14. Nelli/ 82
Darrang	Udalguri	15. Takankata/ 85
Sonitpur	Tezpur	16. Jamuguri/ 82
Jorhat	Majuli	17. Rownapukhuri/ 84
Dibrugarh	Dibrugarh	18. Garpara/ 84
Tinsukia	Sadia	19. Lakhimipathar/ 85
Dhemaji	Jonai	20. Jonai/ 84
Dhemaji	Dhemaji	21. Bamgaon/ 84
Karimganj	Karimganj	22. Kholo/ 86
N.C. Hills	Haflong	23. Nablaidisa/ 85
	Haflong	24. Maibong ESTC
Sibsagar	Sibsagar	25. Dhalpukhuri

1.27.6

MULBERRY REELING UNIT

District & Sub-Division	Name of Reeling Unit & year of Esstt.	Total No. of Reeling Machines
1	2	3
Kokrajhar	1. Bessergaon/ 69	2
Kokrajhar	2. Adabari/ 84	N.R.
Kokrajhar	3. Kowabil/ 91	Nil
Goalpara	4. Agia/ 69	1
Barpeta	5. Howly/ 66	2
Nalbari	6. Mussalpur	1
Darrang	7. Mangaldoi/ 64	1
Sibsagar	8. Palengi/ 68	3
Sibsagar	9. Gaurisagar/ (NEC) 89	1
Sibsagar	10. Gaurisagar/ 84	1
Sibsagar	11. Dhalarmukh	N.R.
Sonari	12. Barchakri/ 53	1
Majuli	13. Rownapukhuri/ 54	2
Morigaon	14. Morigaon/ 76	1
Tezpur	15. Besseria/ 76	1
Tezpur	16. Charengia/ 91	1
N. Lakhimpur	17. Japikhojia/ 64	1
Dibrugarh	18. Tinthengia/ 68	1
Dibrugarh	19. Chringhola/ 76	1
Tinsukia	20. Meghta/ 72	1
Tinsukia	21. Laina	1
Tinsukia	22. Philobari	1
Karimganj	23. Dullabchera/	1
Cachar	24. Dharimikhal/ 62	Nil
Cachar	25. Pailapool/ 84	1
Karbi Anglong	26. Diphu/ 81	1
	Total	27

1.27.7

LIST OF TASSAR PRODUCTION CENTRE

District	Name of the Tassar Centre	Total area of the Farm
1	2	3
Asstt. Director Sericulture, Haflong N.C. Hills	Tassar Grainage cum Training, Sikilangso	5.36
-do-	Tassar Composite Centre Labang	6.07
-do-	Tassar Seed Station, Labang	13.35
Supdt. of Sericulture Haflong	Tassar Block rearing Centre Barolangso	13.37
Diphu	Tassar Multiplication Centre Umkherni	60.19
	Total	98.34

1.27.8.

LIST OF MUGA V.G.R.

District	Sub-Division	Name of the V.G.R. and year of Establishment	Total area under V.G.R (Hect.)
1	2	3	4
Goalpara	Goalpara	1. Chapalai / 75	40.50
	-do-	2. Piplibari / 74	38.45
	-do-	3. Mitia / 73	40.00
	-do-	4. Rangpara / 75	46.60
	-do-	5. Budlungpahar / 74	27.00
	-do-	6. Kuchdhowa / 70	20.00
	-do-	7. Baida / 92	15.33
Bongaigaon	Abhayapuri	8. Nayagaon / 73	40.30
Nalbari	Nalbari	9. Subankhata / 86	12.00
Barpeta	Barpeta	10. Noontala / 73	13.30
	-do-	11. Hahchara / 76	13.30
Kamrup	Guwahati	12. Sualkuchi / 70	25.85
Darrang	Mangaldoi	13. Punia / 74	26.50
	-do-	14. Bhuragarh / 73	26.00
	-do-	15. Langrijhar /	8.00
Sonitpur	Tezpur	16. Barsala / 71	36.14
	-do-	17. Chariduar / 72	41.40
-do-	B. Chariali	18. Malipur / 74	33.40
Marigaon	Morigaon	19. Lukakuchi / 72	17.33
		20. Panbari / 72	29.00
		21. Jajari / 63	40.00
		22. Naltali / 73	42.60

		24. Kanduli / 71	22.50
		25. Raidingia / 62	19.50
Golaghat	Golaghat	26. Tulsimukh / 69	35.70
		27. Kakodonga / 86	6.86
		28. Chewaguri / 65	20.00
		29. Bhogagabham / 73	10.10
Jorhat	Jorhat	30. Senchowa / 66	40.00
		31. Bogidhola / 70	66.00
		32. Pirakata / 76	44.00
		33. Tipomia Kukurachowa / 76	20.70
		34. Balimara / 76	20.00
Jorhat	Jorhat	35. Tamulbari / 79	13.00
Jorhat	Jorhat	36. Halangapar / 77	12.14
Sibsagar	Sibsagar	37. Luitpar / 87	8.50
		38. Tengapukhuri / 69	10.00
		39. Chengma Chapari /	12.60
		40. Kharialheta/ 91	14.30
		41. Barahibari / 71 (Mount Chapari)	3.00
Tinsukia	Tinsukia	42. Sapakhaity / 77	10.76
Dibrugarh	Dibrugarh	43. Tingrai / 74	31.00
		44. Gariabam / 71	71.67
		45. Sukani / 82	27.32
		46. Rangsali / 80	13.35
		47. Kakajanhari / 81	14.28
		48. Tinkhong / 78	28.57
Tinsukia	Sadia	49. Mahmara / 69	9.00
Dhemaji	Dhemaji	50. Hollawgaon / 63	17.30
		51. Gogamukh / 74	28.58
		52. Jalbhari / 62	21.00
		53. Perabhari / 62	3.57
		54. Gobindapur / 62	12.50
		55. Bhomokabari / 74	20.00
		56. Silapathar / 89	7.00
		57. Fatiabam / 92	6.00
Dhemaji	Jonai	58. Laimekuri / 80	15.00
N. Lakhimpur	N. Lakhimpur	59. Nowboicha / 92	7.00
		60. Naharani / 77	9.50
Cachar	Silchar	61. Thaligram / 67	5.00
		62. Dharamkhal / 63	13.53
		63. Dolaichorra / 73	26.66
Hailakandi	Hailakandi	64. Baldabaldi / 74	26.96
Karbi anglong	Diphu	65. Kohara / 86	13.33
		66. Panjan / 75	12.14
N.C. Hills	Haflong	67. Lamku / 80	13.50
		Total	1441.72

District	Sub-Division	Name of E.C.C. with year of Esstt	Area under E.C.C. (Hectc)
1	2	3	4
Dhubri	Dhubri	1. Nayakgaon/73	13.49
-do-	-do-	2. Uzanpara/76	13.49
-do-	-do-	3. Bongshijhora/74	13.40
-do-	S. Salmara	4. Hatsingimari/85	6.04
Goalpara	Goalpara	5. Rangjuli/70	5.21
-do-	-do-	6. Kuchdhua/70	6.50
-do-	-do-	7. Lambopara/72	6.00
-do-	-do-	8. Matia/72	6.69
Kokrajhar	Kokrajhar	9. Ulubari/75	14.30
Kokrajhar	Kokrajhar	10. Chithila/74	14.60
-do-	-do-	11. Ballamguri/75	14.20
-do-	-do-	12. Rainadabari/73	13.38
-do-	Gossaigaon	13. Guabari/87	6.50
-do-	-do-	14. Odlaguri/93-94	3.10
Kamrup	Guwahati	15. Ratanpur/76	14.00
-do-	-do-	16. Longkona/72	3.57
Kamrup	Rangia	17. Gurmow/86	5.33
Barpeta	Barpeta	18. Hahchara/75	6.80
-do-	-do-	19. Nimua/76	7.80
-do-	-do-	20. Bajegaon pathar/79	12.90
Nalbari	Nalbari	21. Barama/70	6.50
-do-	-do-	22. Japa/71	5.30
-do-	-do-	23. Pakhamara/74	8.00
-do-	-do-	24. Naharbari/71	8.00
-do-	-do-	25. Uzirbari/86	4.40
Darrang	Udalguri	26. Balipara/74	6.00
-do-	-do-	27. Majbat/58	2.00
-do-	-do-	28. Sapakhaty/58	1.50
-do-	-do-	29. Takenkata/58	8.00
-do-	Mangaldoi	30. Mullapara/74	6.00
-do-	-do-	31. Kabilkara/81	6.50
-do-	-do-	32. Khagrabari/87	7.00
Sonitpur	Tezpur	33. Tupla/75	12.00
-do-	-do-	34. Barsala/75	6.70
-do-	B. Chariali	35. Rangchali/71	6.60
-do-	-do-	36. Khelmati/75	13.90
-do-	-do-	37. Senaigaon/76	13.33
-do-	-do-	38. Malipur/74	3.10
-do-	-do-	39. Kamdewal/73	9.10
Dhemaji	Dhemaji	40. Gogamukh	7.14
-do-	-do-	41. Lamchuk	14.28
Morigaon	Morigaon	42. Nelli/66	7.50
-do-	-do-	43. Dhupguri/75	13.95
-do-	-do-	44. Toptala/75	13.30
-do-	-do-	45. Garmari/83	6.65
Nagaon	Hozai	46. Kathiatall/53	6.69
-do-	-do-	47. Kaki/86	7.00
-do-	Nagaon	48. Kanduli/71	3.47
Nagaon	Nagaon	49. Belguri/75	8.40
-do-	-do-	50. Jakhlabanda/87	8.70
-do-	-do-	51. Pramila/87	6.80
Tinsukia	Chopaknowa	52. Hollowgaon/67	4.28
Jorhat	Majuli	53. Rownapukhuri/54	1.50
Cachar	Silchar	54. Thaligram/67	6.00
-do-	-do-	55. Salamatpur/72	6.00
-do-	-do-	56. Joypur/75	5.20
-do-	-do-	57. Frenchnagar/80	7.50
Hailakandi	Hailakandi	58. Mohanpur/75	14.20
-do-	-do-	59. Balikandi/	14.20
-do-	-do-	60. Paklabardi/73	13.46

Karimgaonj	Karimganj	61. Kholia/76	13.00
-do-	-do-	62. Tezpur/74	15.00
K.A.	Diphu	63. Dillaji/67	6.00
-do-	-do-	64. Rongkhalam/67	3.10
-do-	-do-	65. Bakalia/69	8.00
-do-	-do-	66. Parkupahar/74	4.00
-do-	-do-	67. Dissobi/77	7.60
-do-	-do-	68. Lakhijan/77	8.00
-do-	-do-	69. Bagari/	6.00
-do-	-do-	70. Japrajan/77	6.66
-do-	-do-	71. Longsolait/79	6.00
-do-	-do-	72. Dhansiri/86	13.40
-do-	-do-	73. Hidipi/79	4.00
-do-	-do-	74. Kathargaon/79	5.00
-do-	-do-	75. Upper Deopani/77	6.66
-do-	-do-	76. Deithar/80	4.00
-do-	-do-	77. Longloksu/	7.00
-do-	Hamren	78. Panjan/77	6.50
-do-	-do-	79. Kalanga/71	6.00
-do-	-do-	80. Umkhasi/71	6.40
-do-	-do-	81. Linchika/79	6.00
-do-	-do-	82. Matikhala/77	8.00
-do-	-do-	83. Hamren/86	13.37
-do-	-do-	84. Putchari/73	5.40
N.C. Hills	Hailong	85. Hatikhali/73	6.74
-do-	-do-	86. Langting/71	5.45
-do-	-do-	87. Barosling/79	6.66
-do-	-do-	88. Lanku/80	7.01
-do-	-do-	89. Langri/79	6.67
-do-	-do-	90. Maibing/85	4.35
-do-	-do-	91. Barrowpur/85	6.87
-do-	-do-	92. Harangaju/86	4.47
-do-	-do-	93. Noblaidissa/79	6.68
-do-	-do-	94. Arnidisa/	6.00
		Total	733.49

1.27.10.

LIST OF C.M.G

District	Sub-Division	Name of C.M.G. with year of Esstt.	Area under C.M.G. (in Hect.)
1	2	3	4
Dhubri	Dhubri	1. Duligaon/72	9.96
-do-	Dhubri	2. Bangshijora/74	6.74
-do-	Dhubri	3. Bonyaguri/84	10.70
-do-	Dhubri	4. Kazigaon/88 (M.P.C.)	6.50
-do-	Hatsingimari	5. Bagharpur/92	8.70
Kokrajhar	Kokrajhar	6. Bessergaon/67	6.06
-do-	-do-	7. Kowabil/80	13.33
-do-	-do-	8. Bengtol/88 (M.P.C.)	7.10
-do-	Gossaigaon	9. Bhumka/80	14.20
-do-	-do-	10. Grahampur/89	3.00
Goalpara	Goalpara	11. Budlung Pahar/71	2.80
-do-	-do-	12. Kuchdhowa/70	4.00
-do-	-do-	13. Matia/73	6.50
-do-	-do-	14. Dhudhnoi/76	12.50
-do-	-do-	15. Dorapara/65	3.40
-do-	Abhayapuri N. Salmara	16. Ambuk/79	7.00
-do-	-do-	17. Khagrapur/70	8.80
-do-	-do-	18. Baitamari/92	9.10
Barpeta	Barpeta	19. Dubagaon	13.38
-do-	-do-	20. Noontola/72	6.60
Nalbari	Nalbari	21. Japa/71	8.00
-do-	-do-	22. Bathoipuri/86	5.50
-do-	-do-	23. Geruwa/86	4.40
Kamrup	Kamrup	24. Sakhati/77	18.00
-do-	-do-	25. Gandhinagar/76	6.50
-do-	-do-	26. Ratanpur/77	14.00
Darrang	Mangaldoi	27. Bhuragarh/73	6.60
-do-	-do-	28. Betaimari/71	7.06
-do-	-do-	29. Hirapara/81	2.77
-do-	Udalguri	30. Chinakona/82	8.08
-do-	-do-	31. Sepakhaity/81	2.12
Sonitpur	Tezpur	32. Besseria/69	1.80
-do-	-do-	33. Dhaldajuli/58	1.50
-do-	-do-	34. Baruadelni/68	3.80
-do-	B.Chariali	35. Charengia/86	7.10
-do-	-do-	36. Rangchali/72	6.60
-do-	-do-	37. Behali/67	2.50
Nagaon	Morigaon	38. Charaibaha/65	3.60
-do-	-do-	39. Morigaon/63	4.50
-do-	Nagaon	40. Deorisilabandh/70	3.37
-do-	-do-	41. De-gaon/80	3.38
-do-	-do-	42. Beloguri/75	13.50
-do-	-do-	43. Akarabari/80	14.20
-do-	-do-	44. Samdhara/70	8.75
Goalghat	Goalghat	45. Sontoli/75	5.50
-do-	-do-	46. Dulakakharia/77	6.50
-do-	-do-	47. Matikhoia/81	6.00
Sibsagar	Sibsagar	48. Deodhal/82	7.10
-do-	-do-	49. Kacharipathar/69	7.14
-do-	Charaidew	50. Mathurapur/61	7.14
-do-	-do-	51. Chatianaguri/68	2.42
Dibrugarh	Dibrugarh	52. Chiringhola/75	6.06
-do-	-do-	53. Rangali/71	6.40
-do-	-do-	54. Tinthengia/66	6.44
-do-	-do-	55. Bhandari/80	14.20
-do-	Tinsukia	56. Laina/67	6.57

-do-	-do-	57. Halakguri/80	13.20
-do-	Sadya	58. Hollowgaon/67	4.28
Jorhat	Majula	59. Sonariati/86	3.20
Lakhimpur	N. Lakhimpur	60. Dustimukh/75	7.10
-do-	-do-	61. Bachagaon/75	8.00
-do-	-do-	62. Khalaguri/80	6.00
-do-	-do-	63. Naharani/77	7.00
-do-	Dhakuakhana	64. Bhomkolabari/72	7.00
-do-	Dhemaji	65. Jiadhal/86	12.28
-do-	Jonai	66. Laimekuri/82	13.00
Cachar	Silchar	67. Jibangram/83	4.12
-do-	-do-	68. Thaligram/67	5.00
-do-	-do-	69. Dharmikhal/75	13.75
-do-	-do-	70. Jamalpur/74	14.28
-do-	-do-	71. Sonai/71	4.90
-do-	Hailakandi	72. Madaripur/62	3.20
-do-	-do-	73. Karichera/65	2.80
Karimganj	Karimganj	74. Adarkona/70	6.90
Karimganj	Karimganj	75. Dullabhehera/64	3.00
Karbi Anglong	Diphu	76. Sarumathi/82	4.13
-do-	-do-	77. Rangharah/78	5.00
-do-	-do-	78. Bokajan/71	3.50
-do-	-do-	79. Barjan/70	4.00
-do-	-do-	80. Silonigaon/77	4.00
-do-	-do-	81. Tarabasa/79	3.00
-do-	-do-	82. Tissamgaon/77	4.28
-do-	-do-	83. Samelangsa/77	4.00
-do-	-do-	84. Parkupahar/77	4.05
-do-	-do-	85. Bethiphang/77	4.50
-do-	-do-	86. Dalamara/77	4.04
-do-	-do-	87. Chutianal/77	5.80
-do-	-do-	88. Thedong/	5.00
-do-	Hamren	89. Birsinki/77	6.00
-do-	-do-	90. Rongjangphang/76	6.00
-do-	-do-	91. Punja/77	4.47
-do-	-do-	92. Umpani/77	6.05
-do-	-do-	93. Muthade/79	4.60
-do-	-do-	94. Menmeji/73	4.00
-do-	-do-	95. Cherinthepi/77	4.00
-do-	-do-	96. Kanduli/87	6.00
N.C. Hills.	Haflong	97. Laisong/75	4.13
-do-	-do-	98. Barowapu/85	6.65
-do-	-do-	99. Baigas/74	6.00
-do-	-do-	100. Bangpheri/76	4.04
-do-	-do-	101. Langliet/75	4.61
-do-	-do-	102. Songbar/76	6.00
-do-	-do-	103. Labang/71	6.06
-do-	-do-	104. Vaitang/76	4.04
-do-	-do-	105. Thuruk/76	4.01
-do-	-do-	106. Khothlir/76	4.28
-do-	-do-	107. Mauldour/76	4.01
-do-	-do-	108. Malangpa/77	4.01
-do-	-do-	109. Khobak/74	4.28

Grand Total

697.02

