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emasculation, although the percentage of set grains thus produced may be somewhat reduced.

2. If, after emasculation of spikelets, unfavourable weather conditions or some other external disturbances do not permit of immediate cross pollination, the latter operation can be safely postponed for two or three days with full confidence of obtaining the same amount of success as can be had by pollination on the same day of emasculation.

3. Cross pollination done one or two days after emasculation is of decided advantage in hybridisation work, as the set grains obtained in this way are sure to be hybrids, as any self fertilized flowers among the emasculated spikelets can easily be detected even the next day after emasculation, from the withering condition of their stigmas and slight enlargement of their ovaries and can thus be rejected then and there.

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MULBERRY CULTIVATION IN KOLLEGAL AND THE SERICULTURAL INDUSTRY

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The cultivation of mulberry is simple and may be done in a wide range of climate and soil provided the latter is fairly fertile; the rearing of silkworms is however possible only in temperature ranging between 70° to 90° F. with a humidity of 50 to 70%. During the hot weather the rearing is as a rule stopped and the bushes pruned for a fresh flush of leaves. The above named conditions exist in the Kollegal taluq almost throughout the year and hence the rearing of silkworms is carried on all the year round giving occupation for well over 5000

families in 36 villages, the mulberry crop being raised on 10,000 acres and raw silk to the value of 10 lakhs of rupees being exported from this taluq.

Soils. Red sandy loams, black cotton soil and even sandy and gravelly soils are found suited to the growth of mulberry.

Varieties. Bush mulberry or the white mulberry (*Morus Indica*) is the only species grown in Kollegal. The varieties known locally as the *Ennairangina gaddi* and the *Buddigaddi* are popular on account of the better and more nutritious leaf they give while the variety known as the *Karigaddi* is also to be found here and there.

Propagation, planting etc. The crop is propagated by cuttings. The land is ploughed 6 to 7 times in April and May; 15 to 20 cartloads of cattle manure per acre are applied and spread before the final ploughing. The cut bits are planted with the first showers of the South West Monsoon. Furrows are opened 2½ to 3 ft. apart either way and at the junctions holes 1 foot square and 6″ deep are made and in each hole 2 to 3 cuttings are planted; 4 to 5 headloads of fresh cut bits are required to plant over 1 acre. If the weather is moist and cloudy the cut bits keep for 4 to 5 days. The bits are 8″ to 9″ long with 3 nodes in each and are laid flat like sugarcane setts. When necessary as during dry hot weather, one or two hand waterings are given. Young shoots appear in two months after planting. At this stage, weeding and intercultivation are done by working guntakas. Once a month for the next 7 or 8 months this intercultivation is carried on, every time after the picking of the leaves.

List of implements with a cultivator whose holding is 5 acres in Kamakarai Village:—

1 plough	1—0—0	1 *Ujjari*	0—4—0
1 *Balguntai*	1—2—0	1 Kalkat	0-10—0
1 *Tadiguntai*	1—2—0	Barkani 1 pair	0—2—0
1 *Kiriguntai*	1-12—0	Murrels	0—2—0
1 *Machu*	0-10—0	Yoke and rope	1—8—0
		Total...	7—4—0

Initial cost of planting 1 acre of mulberry.

4 ploughings at 12 annas each	Rs.	3—0—0
15 cartloads cattle manure		7—8—0
Carting		3-12—0
Spreading		0—8—0
Opening furrows for planting		0—8—0
Setts 4 bundles for planting		1—0—0
Cutting setts and carrying		0—8—0
and preparing		0—8—0
Planting setts—10 women		1—4—0
2 Weedings—6 women each time		1—8—0
Hoeings—twice a month for 8 months		4—0—0
Total.		24—0—0

Recurring charges including assessment.		
Assessment varying from 0—12—0 to 1—5—0.	Average	1—0—0
Two ploughings at 0—8—0 each	„	1—0—0
24 hoeings a month at 0—8—0 a pair doing 2 acres a day	„	6—0—0
Pruning—2 men	„	0—8—0
Manure—7 cartloads at 0—8—0	„	3—8—0
Carting	„	1—8—0
Weeding—6 women	„	0-12—0
Applying manure to the pits	„	0—8—0
	Total.	14-12—0

The mulberry leaves are easily browsed by sheep, goats and cattle and the fields should therefore be carefully fenced. Plantations ordinarily keep going for 12 years after which the bushes are pulled out and sown to annual crops like ragi or cholam for 1 year and again planted to mulberry. From 6 to 8 cuttings may be had of an acre of mulberry, 30 headloads or 3000 lbs. of leaves being obtained from each cutting.

Life history of silkworms:—The Kollegal silkworm belongs to the multivoltine or polyvoltine class that pass through a number of generations in a year. Polyvoltine worms feed on all bush mulberry leaves and it is perhaps difficult to rear them on tree mulberry leaves because of over-nutrition. The silkworm lays on an average 250 to 350 eggs which are oval in shape and very minute measuring about 1¼ m. m. by 1 m. m. They are cream-coloured to yellowish white when freshly laid but turn bluish black just before hatching. At Kollegal the eggs hatch out in 10 days; this period may be shorter or longer according to the temperature of the locality. In the hot months (April and May) hatching takes place in 8 days. The new hatched out worms are minute in size 2 m. m. long with a slender more or less elongated cylindrical shape. The worm is at this stage fringed with tufts of fine hairs; its color is dark brown, the head being black. The body is composed of 12 segments or rings. Behind the head there are 3 segments wherein are the front legs and the thorax. The remaining 6 segments constitute the abdomen and here are 5 pairs of legs. The head is composed of 2 scaly parts and is fairly uniform. There are 6 small single eyes. In the middle of the upper lip is a little elongated tubular organ with a microscopic orifice called the 'spinnaret'. The body contains 2 silk glands which open out into this orifice. When the larva approaches maturity these glands are filled with a clear viscous fluid which is thrown out through the orifice. When this fluid comes in contact with air it solidifies and forms the lustrous fibre called 'silk.' The thread thus formed really consists of 2 filaments one from each gland which have become agglutinated. The color of the legs generally indicates the color of the cocoons and the silk thread. The length of fibre that each vomits is from 300 to 1000 yards. The moths that emerge out of the cocoons are creamy white in colour. The male moth

is smaller than the female. Both have the wings developed but they never fly. The male moth is smaller and more lively. Its antennae are long and blackish in color, while those of the female are only slightly developed.

Rearing of silkworms. The main object in rearing silkworms is to get good cocoons yielding good quantity and proper quality of silk. To produce 2½ maunds (1 maund = 25 lbs.) of cocoons or 10 trays, the following appliances were used by Basava Chetty at Kamakarai.

1 Stand	2—0—0	1 lamt	0—0—6
10 Trays	2—8—0	Litter baskets	0—1—6
1 Sickle	0—6—0	4 Ant-wells	2—0—0
2 Baskets	0—2—0	Chopping Board	0—2—0
2 Bags for bringing leaves	1–12—0	10 Chandrikes bamboo trays	5—0—0
			14—0—0

Rearers usually buy seed-cocoons from vendors at Kunigal or Bidadi in Mysore State at Re. 1 per 1000 cocoons when paid in cash or Rs. 2 per 1000 on credit. One maund of cocoons count about 14,000 and cost Rs. 7. These cocoons or seeds are placed in bamboo trays and kept safely on a bamboo stand in a ventilated room. The moths coming out of these cocoons are usually half male and half female in number. As soon as they emerge, each male moth pairs off with a female. After 8 hours of mating the female moth is separated from the male and kept in separate bamboo trays for laying eggs. The newly laid eggs (250 to 350 per moth) are covered with a viscous fluid and so stick on to the surface where they were laid usually a piece of newspaper. Within three days, the eggs are all laid and the female moths are all thrown away—the same fate which the male moths suffered earlier in their career, i. e. after their separation from the females.

The eggs are kept in the same trays over the stands with great care. They hatch out in 10 days. The young larvae are usually brushed on to a fresh tray with a fine feather, and are fed with tender finely chopped mulberry leaves. For each feeding fresh leaves are picked from the plantation.

Feeding and moulting. The life of the worm from hatching time to spinning of the cocoon is 30 days in summer but slightly longer during the cold months. These worms in common with many others moult periodically as they feed and grow. Since they moult four times during this period of 30 days the periods of activity may be said to be five.

The table below shows the interval of each period, number of feeds, quality of leaves etc.

Period.	Number of days.	Number of feeds in 24 hours.	Moulting period.	Quality of leaves supplied for feeding.
1st	7	8	36 hours	Tender leaves finely chopped.
2nd	4	7	24 ,,	Half mature leaves chopped a bit coarser.
3rd	5	6	24 ,,	Half mature leaves chopped much coarser.
4th	6	5	36 ,,	Three quarter mature leaves, each leaf chopped into 3 or 4 parts.
5th	8	4	Spinning.	Fully mature leaves fed entire.

Moultings are periods of inactivity when the worms lie inactive nd eat nothing. With every moulting the old skin is shed off. The worms should not be disturbed during this period. When the worms get out of their moults their stomachs are delicate and so fairly tender leaves should be given for at least 2 feeds to allow of easy digestion.

Cleaning the litter. The worms do not eat all the leaves that are given to them. They should be removed at least once a day to new trays and the litter collected and thrown away in the manure pit.

Spacing of worms. The worms grow bigger in size day by day and hence greater space is necessary for them. The eggs laid by 500 mother moths when hatched occupy only quarter of a tray but during the spinning stage the adult worms occupy 25 trays i.e. they require 100 fold space. When the worms mature which is recognised by their transparent yellow colour they are collected and sprinkled over in *chandrikas* or spinning trays. Each tray of worms is given space in 1 *chandrika* for spinning. This tray is kept in the open exposed to the morning sun. They are left thus in the trays for 2 days when the cocoons are gathered and sold away in the green state and reeled off into silk.

Rearing room. Generally the courtyard, verandah, sleeping room and even the cattle yard is used as a rearing house, here the bamboo stand is placed and trays arranged on them. The eggs, worms and cocoons are safely guarded against ravages from rats, lizards, birds and ants.

Diseases of silkworms. The chief disease is the "*Pebrine*" an infectious disease. The disease is characterised by the black spots which appear on all parts of the body especially tail, legs and back. The attacked worms remain small, languid, eat little and succumb between second and third moult. There is no cure for the disease; the affected worms must be burnt to prevent infection.

Flacherie. This is a bacterial disease caused by indigestion. The worms become lean and thin and sometimes vomit green fluid matter

from their mouths and void semi-fluid faeces. The disease is contagious and is virulent in summer. The worms spin cocoons if the disease is not acute, but they die and decompose within the cocoons.

Grasseric. This is mostly due to careless feeding first with mature leaves and then with tender or succulent leaves after a rain. This may also be due to exposure of the worms to damp and cold air or sudden change of temperature. The disease is not infectious. Wet leaf and damp air should be avoided. This disease is not of common occurrence in Kollegal.

Muscardine. This is a parasitic disease caused by a fungus. The infected worms are quite stiff after death. The dead worms should be burnt immediately. Good ventilation and light should be maintained in the rearing rooms. This is rarely seen in Kollegal tract.

Economics of mulberry cultivator. About 80% of the cultivators rear their own worms. Others sell the plantation as a standing crop to other rearers. A plantation is usually kept for 12 years with an initial expenditure of Rs. 24 and a recurring charge of Rs. 14—12—0 per acre every year. The average cultivation charges per year come to Rs. 15—8—0. The yield of leaves on an average is 3,000 lbs which at 12 annas per headload of 100 lbs works to Rs. 22—8—0. The net gain per acre is thus Rs. 7—8—0. The interest on the value of the land which varies from Rs. 20 to Rs. 150 per acre has been ignored in the above calculation.

A ryot rearing the worms himself out of the leaves from 1 acre may raise 6 crops.

The table below shows the quantity of leaves from pruning, to pruning, the number of seed cocoons, the number of trays of worms, wages of labour employed etc.

Crop.	Headloads. of 100 lbs.	Seed cocoons.	Trays.	Labour.
1	10	700	8	2—8—0.
2	5	250	4	1—2—0.
3	5	250	4	1—2—0.
4	3	200	2	Nil.
5	2	100	1	"
6	8	500	6¼	2—4—0.
		Oil		2—4—0.
		Seed cocoons		2—8—0.
	33	2000	25½	11-12--0

Twenty five trays of worms will yield 6¼ maunds of cocoons which at the present rate of Rs. 6 to 7 per maund works out to an average of Rs. 40. Since the leaves and the labour are the ryot's own he realises about Rs. 40 when he sells the cocoons. If the leaves are valued and the labour as well, he makes only Rs. 5 or even less; the industry is not therefore in a very good condition. If the price of cocoons would

go up to Rs. 10 per maund the ryot may hope to get about Rs. 65 and there will be a net profit of Rs. 30 per acre. The fall in the price of cocoons is in the opinion of the writer, due to the dumping in of silk from China where the cost of production is far lower on account of the existence of tree mulberry there and other natural facilities. If the Government could give protection to the silk rearers of India by prohibiting the import of foreign silk into India there is some hope for the survival of the old indigenous industry which is the source of livelihood for about 5,000 families in this taluq.

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Notes & Comments.

The New Year 1934. The year 1934 would have come into existence by the time this issue of the Journal reaches our readers. For the Journal another year of service will begin. The present period is one of unusual depression and the stars aspect the agriculturist with a malignity. The produce of his labour sells very low. The unending jugglery in monetary values continues. Meanwhile population increases and the need for food and other commodities behind all industry, continues the more insistent. The agriculturist has to continue in his calling. He needs help and will continue to need it. May this little Journal serve to further the cause of the noble calling of agriculture!—is the prayer with which we appeal to our members to continue and enlarge their support to this Journal.

Agrarian Relief. The United Provinces Agricultural Relief Bill is a sound measure calculated to alleviate some of the many ills which an agriculturist is heir to. The chronic indebtedness of the Indian agriculturist is a well known fact and his social setting and traditions are such that there is no near prospect of his mending his ways. Preventive measures are thus remote and the only sympahy that can be shown to him is to enact measures likely to cure his economic diseases. The present economic depression has all the world over hit the agriculturist most. The wide agrarian unrest, rumblings of which are heard even in Madras needs sound and sympathetic handling and we hope and pray that this passing phase may prove a blessing in disguise.

Development of Silk Industry The world produces about 150 million lbs. of silk. Of this Japan monopolizes well over half. China and Italy come next. India produces about 2¼ millions and of this, Mysore produces half. Next to agriculture sericultune is the most important industry and the Mysore Assembly is to have a member representing the silk industry. In Mysore more than 5 lakhs of persons