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Seri. Engineering & Reeling

MANDATE:

- To carryout research projects/programmes in the area of agricultural engineering for enfusing tangible mechanisation in sericulture and to undertake innovative works/designing and development of items to support host plant and silkworm crop production disciplines through fabrication of tools/equipment/machines to achieve reduction in cost of production, drudgery, operational time and save on resources.
- To carryout research projects/ programmes/ works for developing reeling packages for newly developed hybrids, wherever required.
- To carryout evaluation studies for cocoon quality assessment of newly developed breeds/ hybrids from laboratory and field samples.
- To up keep of the machineries & equipments in the SE & Reeling sections.

SCIENTISTS:

Name	Designation
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MECHANIZATION IN SERICULTURE - NEED & SCOPE

Today, mechanization in sericulture is a felt need mainly for:

- (a) Enhancing the work efficiency and productivity of the workers
- (b) Reducing the manpower requirement for various work
- (c) Curtailing the expenditure on various activities
- (d) Increasing the profitability in sericulture
- (e) Obtaining timeliness in various sericulture activities
- (f) Minimising the drudgery in many sericultural works and
- (g) Enabling the farmers to take up sericulture at large scale level

(a) Enhancing the work efficiency and productivity of the workers:

Mechanization helps in increasing the efficiency and productivity of the workers. Following table shows the augmentation in workers efficiency and output in some of the activities of sericulture through mechanization.

Improvement in workers efficiency through mechanisation

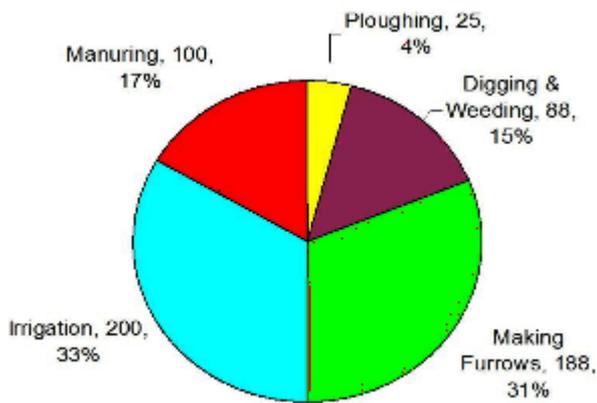
No.	Activity/ Work	Worker's Output		Gain in work through use of machine (B/A)
		Manual (A)	With Machine (B)	
1.	Land preparation	2,000 sqm/day	20,000 sqm/day	10 times
2.	Mulberry cutting preparation	300 cuttings/h	1,200 cuttings/h	4 times
3.	Shoot harvesting	200 kg/day	1200 kg/day	6 times
4.	Intercultural operations	1,000sqm/day	20,000sqm/day	20 times
5.	Leaf chopping	20 kg/h	200 kg/h	10 times
6.	Matured silkworm picking	30 dfils/day	300 dfils/	10 times

No.	Activity/ Work	Worker's Output		Gain in work through use of machine (B/A)
		Manual (A)	With Machine (B)	
7.	Cocoon harvesting	10 kg/h	50 kg/h	5 times
8.	Cocoon deflossing	5 kg/h	50 kg/h	10 times
9.	Tray washing	25 trays/h	100 trays/h	4 times
10.	Cocoon cutting in grainages	250 cocoons/h	2,000 cocoons/h	80 times



(b) Reducing the manpower requirement for various work:

Sericulture, the process of silk cocoon production, comprises of rearing silkworms which feed on mulberry leaves cultivated by the farmers. It is considered high labour requirement industry since many years. Figure 1 and 2 show the manpower requirement for various activities of mulberry cultivation and silkworm rearing.



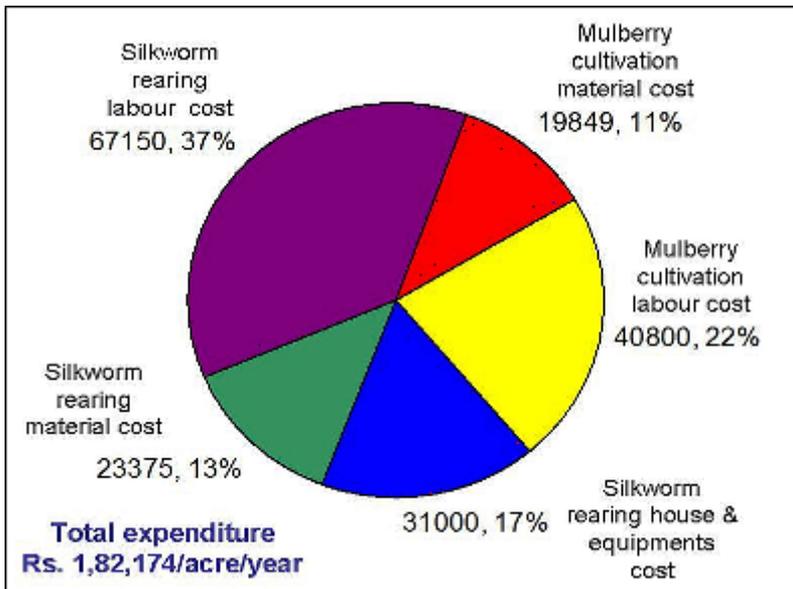
Total mandays : 601/hectare/year



From Figure 1 and 2, it can be seen that in all 1,589 mandays (240 for mulberry cultivation and 395 for silkworm rearing) are required per acre in a year. In general one can say that on an average two workers/year are required for maintenance of one acre of mulberry garden and rearing of silkworms from it. In southern states of India, the silkworm rearing is carried out through out the year. Hence, sericulture provides continuous employment to the workers. With drastic reduction in workers availability and high labour wages, the farmers will have to go for mechanization of labour intensive activities. The Table 1 shows enhancement in workers efficiency and their productivity though mechanization in various activities involving cocoon production. Hence, the farmers can overcome the labour problem by reducing the manpower and workers requirement besides curtailing expenditure for cocoon production through appropriate and needful mechanisation.



(c) Curtailing the expenditure on various activities:



The figure shows various costs

involved in silk cocoon production. Here, it can be observed that 59% total expenditure in silk cocoon production accounts for labour wages for mulberry cultivation (22%) and silkworm rearing (37%). Today, the farmers may have very little control on costs of inputs required for mulberry cultivation and silkworm rearing and creation of silkworm rearing infrastructure such as rearing house, rearing stands, mountages, etc. and hence the farmers will have to go for use of tools and machines to carry out various labour intensive activities for reducing the cost of cocoon production. Table 2 shows the savings on various sericulture activities through appropriate mechanization.

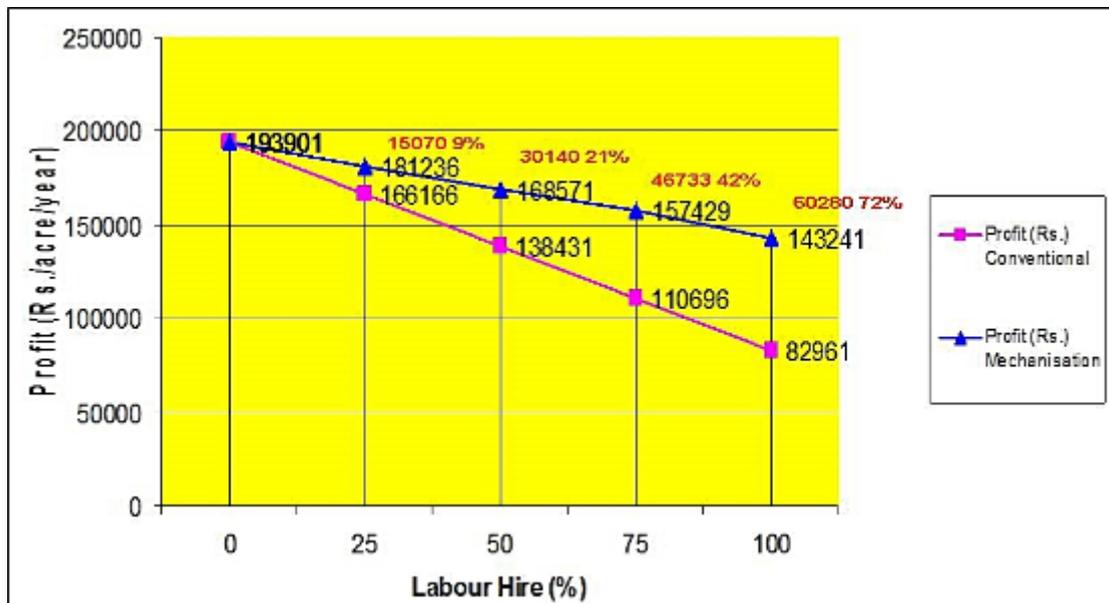
No. Activity / Unit	Cost of operation (Rs.)		Cost Saving (%) [(A-B)/A]x100
	Manual (A)	Machine (B)	
1 Land preparation (per ha)	3500	750	80
2 Cutting preparation (per 1000)	80	15	80
3 Intercultural operations (per ha)	2000	1200	40
4 Chemical application (per ha)	400	100	75
5 Shoot harvest (per MT)	500	125	75
6 Rearing house disinfection (per 300 dfls)	250	100	60
7 Leaf chopping (per day for 5000 dfls)	2000	200	90
8 Silkworm picking (per 100 dfls)	500	200	60
9 Cocoon harvesting (per 100 dfls)	600	150	75
10 Cocoon deflossing (per 100 dfls)	400	150	60
11 Tray washing (per 100 trays)	200	50	75



(d) Increasing the profitability in sericulture:

Silk cocoon production is highly remunerative. The profitability in cocoon production has been reduced during last few years due to sharp increase in cost of inputs and labour wages due

to migration of farm workers to towns and cities due to urbanisation, industrialisation and rapid growth of construction and service sectors. In present situation, the silk cocoon production is still a high return crop when compared to other farm crops. Nowadays, the shortage of labour and increasing labour wages have become a major concern for sericulture industry.



The above figure shows the annual net earnings or profits from silk cocoon production per acre by different category on farmers based of extent of hiring of the workers. Here, it can be observed that the farmers who have sufficient family members to do various works and do not hire any workers and may have profit of Rs. 1,93,901/acre/year. Normally, the farmers having mulberry plantations upto 2 acres can be kept in this category. The profits reduce with increase in extent hiring of labours. A farmer with 50% workforce as family members and hire balance 50% manpower will have net earnings of Rs. 1,38,431 per year from an acre. The farmers having mulberry plantations above 2 acres and upto 5 acres are in this category. In Figure 5, there is a very interesting thing to note that the farmers, who do not have any family labour and totally dependant on hired labours, can earn profit of around Rs. 80,000 per acre in a year. The big farmers having mulberry plantations above 5 acres are in this category. Most of these farmers are educated, employed and engaged in many works. They have sufficient finances to hire labours. This is a big strength of sericulture and for this reason why many young youths are attracted by sericulture? This is a good sign for Indian sericulture industry in coming years.

The profitability and sustainability of sericulture can be increased through appropriate and needful mechanisation. The activities which could be mechanised partially or fully are:

1. Land preparation for new mulberry plantations
2. Mulberry cutting preparation
3. Weeding and intercultural operations
4. Irrigation by adopting drip irrigation system
5. Spray of chemicals for pest and disease control
6. Mulberry shoots harvesting for late age rearing
7. Disinfection and cleaning of silkworm rearing houses
8. Leaf chopping for young age silkworms

9. Picking of matured silkworms
10. Cocoon harvesting
11. Cocoon deflossing

The above figure shows that higher profitability in sericulture can be achieved through appropriate mechanization in various activities of silk cocoon production. In Here, it can be observed that profits for a farmers having adequate family labours to carry out various works for mulberry cultivation and silkworm rearing, the profits per acre in a year remains highest at Rs. 1.93 lakhs. Other farmers who hire the workers partly or fully, the annual profits per acre can go up from Rs. 1.66 lakhs to Rs. 1.81 lakhs i.e. by 9% for farmers possessing 75% workforce and hiring 25% of workforce through mechanization of activities like land preparation and intercultural operations by tractor operated equipments, irrigation through drip irrigation, shoot harvesting with brush cutter, harvesting and deflossing of cocoons through machines. The gain for farmers hiring 50% of workforce is 21% as the profits go up from Rs. 1.38 lakhs to Rs. 1.68 lakhs. The farmers engaging 75% and 100% labour for different works; the gains are 42% and 72% , respectively. It is very interesting to note that mechanisation will greatly help the farmers hiring more labours. The large scale farmers who hire most of their workforce will be benefitted maximum through mechanization.



(e) Obtaining timeliness in various sericulture activities:

Timeliness is very important in many silk production activities. The timely intercultural operations, watering, spray of chemicals for diseases and pest control, pruning and harvesting of mulberry shoots, leaf chopping and its feeding to young age silkworms, application of bed disinfectants for resuming silkworms emerging out of moult, picking and mounting of silkworms for cocooning, harvesting and cleaning of cocoons greatly affects the silkworm cocoon crop. To carry out these works lot of manpower is required. Nowadays, farmer often face difficulty in getting adequate number of skilled workers. The mechanisation can be a feasible alternative to labour shortage to maintain timeliness in carrying out various works on a silk farm.



(f) Minimising the drudgery in many sericultural works:



Many of sericulture works are full of

drudgery. The workers have to work for long hours, most of the time in damp conditions, in dim light, with surroundings full of dust and pathogens, etc. for less money. Mechanisation will help the workers in reducing drudgery in many of the activities of silk production such as intercultural operations and shoot harvesting in mulberry gardens, disinfection of silkworm rearing houses, leaf chopping in young age silkworm rearing, picking of matured silkworms, cocoon harvesting cocoon deflossing and cleaning, etc.



(g) Enabling the farmers to take up sericulture at large scale level:



The mechanization can also make it

feasible for farmers to go for silkworm rearing at large scale. By using machines, large area of mulberry can be cultivated and more number of silkworms can be reared at a time by the farmers. The mechanised large sericulture will result in production of high quality cocoons at lesser cost.



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