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A Study on Adoption Pattern and Mulberry Production in Hunsur Taluk of Mysuru District

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A B S T R A C T

Silk is the outcome of various activities of sericulture, it can be defined as the cultivation or production of silk by rearing silkworms on large scale. Small, medium and large land-holders and even landless farmers under rain-fed and irrigated patterns practice silkworm rearing. The present study is the outcome of 60 respondents who rear commercial and seed cocoons and trade them in respective markets; the primary data was collected using a model questionnaire by personal interview. Totally 13 important parameters of mulberry cultivation viz. land area, mulberry varieties cultivated, manure and fertilizers used for mulberry cultivation along with the composting details. The farmers are actively involved in extension activities and utilizing the latest knowledge, technologies and innovations in the lab as per the data collected from 60 respondents. The primary data collected was analyzed and the results are presented in tabular forms and are herein discussed.

***Key words*:** Sericulture, Farmers, Mulberry, Adoption hunsur, Mysuru

The reduction of rural poverty continues to be a paramount goal of the developing countries like India as the majority of the poor population still resides in the countryside. The establishment of rural based industries like sericulture in particular can be very effective in creating new job opportunities and providing supplemental income. Being a rural agro-based labor-intensive industry, this sector can also play a vibrant role in checking migration from rural to urban areas [1]. Sericulture is an important means for the socio-economic development of the rural sector. A highly labour intensive, profit oriented with low input demands gives frequent periodicity of economic returns and also it is also well suited for the women folk of rural sector involving family labour. In India, sericulture is essentially a village-based industry due to certain inherent advantages like low gestation period and expenditure, maximum employment potentiality and quick turnover of investment [2]. As it is employment and income generating industry, it is rightly called as the "Kalpavriksha" or "Kamadhenu" of the poor farmers. India has the unique distinction of commercially producing all four types of natural silks yielded by sericigenous insects such as mulberry silkworm (*Bombyx mori* Linnaeus), Tasar silkworm (*Antheraea mylitta* Drury), Muga silkworm (*Antheraea assama* Helfer) and Eri silkworm (*Samia cynthia ricini* Drury) of which mulberry silk is the best known and commercially exploited for maximum productivity [3].

Sericulture industry concerned with the production of silk is divided into seven phases viz., cultivation of mulberry, silkworm seed production, rearing of silkworm, reeling of raw silk, twisting, dyeing and weaving of silk [4]. The very nature of this industry with its rural based on-farm and off-farm activities and enormous employment generation potential has attracted the attention of the planners and policy makers to recognize the industry among one of the most appropriate avenues for socio-economic development of a largely agrarian dependent economy like India [5]. Sericulture industry provides employment to approximately 8 million persons in rural and semi-urban areas in India. One hectare of mulberry garden provides continuous employment for 13 persons annually [6]. India is the second largest producer of silk in the world, during 2019-20, 239967 ha of mulberry plantation, 208896 MT of cocoons and 35820 MT of raw silk was produced with employment to 94.30 Lakh persons and export earnings of Rs. 1745.65 crores [7]. To promote sericulture industry, Government of India has launched many schemes in recent times like Central Sector Scheme (CSS), ISDSI-CSS-Silk Samagra, MKSP projects for Tasar, MGNREGA with CDP and NER textile promotion. In the last three decades, many improved and new technologies developed in order to overcome the constraints and increase the production of cocoon per unit area at farmers' level [8]. The present study was conducted to understand adoption of new technologies and methodologies by the farmers, mulberry variety

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popularly cultivated, silkworm race/breed reared in the study area and whether the farmers are using any extension tools and government aids/subsidies to solve field related problems in practicing sericulture.

MATERIALS AND METHODS

In the process of achieving the objectives of the study, it is very important to follow a systematic and scientific approach to present and interpret the results of the study or investigation conducted. The methodology outlines the features of the study area, the method of sampling and collection of data, the analytical frame work employed and the concepts are defined and explained to facilitate a clear understanding of the issues related to the present study. The primary data was subjected appropriate statistical procedure to understand for different objectives of the study are presented under the specific objectives.

Description of the study area

The geographical area of Karnataka is 191,791 Kms^2. Among the Karnataka's popular products includes raw silk, which has the highest production range among all other states in India. Karnataka state occupies first place in both mulberry cultivated area as well as in mulberry silk production. Hunsur is a town located in the Mysore district of Karnataka state, India. Hunsur town is situated on the western side of Mysore city Hunsur is also well known for timber trade, especially teak. Hunsur Teak is noted for its quality and durability. Hunsur is located at 12.31°N 76.29°E. It has an average elevation of 792 metres (2598 feet). Hunsur Taluka of Mysore district has total population of 282,963 as per the population census of 2011. As per census data, 18% people reside in urban areas while 82% lives in the rural areas.

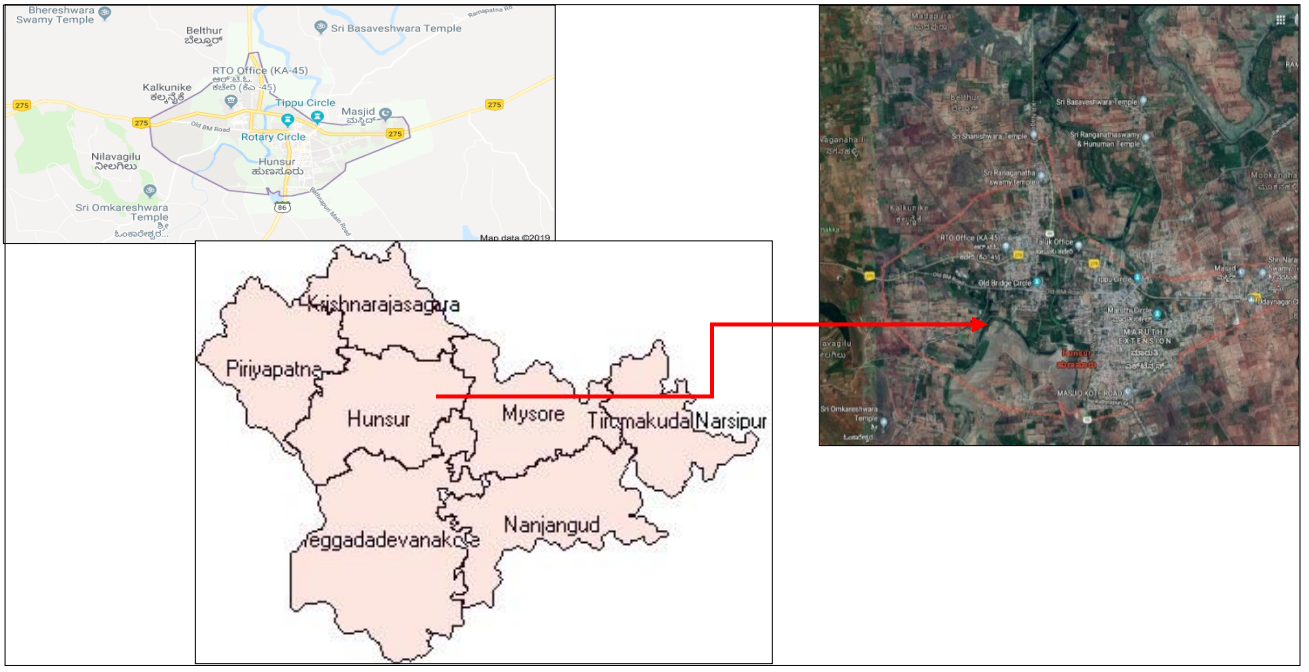

Fig 1 Location map of study rea

Sampling procedure and source of data

For the present study Hunsur taluk were selected, where a good number of households are practicing sericulture. Sixty progressive farmers were selected for the study, the primary data was collected by direct and personal interview method using pre-defined questions. The pre structured questionnaire covering all activities of mulberry cultivation, land holdings, irrigation, pests, extension, government schemes, etc. was used to collect the data.

Analytical tools and techniques employed

The data collected from 60 respondent farmers were subjected to statistical analysis. The analysis including the computation of means and percentages etc., were employed to present the data in respect to demographic feature, socio-economic profile and cropping pattern adopted by sericulture farmers. The different parameters were calculated using following formula:

$$\text{Total percentage of respondents} = \frac{\text{Number of respondents}}{\text{Total number of respondents}} \times 100$$

RESULTS AND DISCUSSION

The data was statistically analyzed to draw informative conclusions and the results of the study are presented under the following sub-headings:

1. Mulberry cultivated land area
2. Type of mulberry plantation
3. Mulberry planting system
4. Sources of irrigation
5. Methods of irrigation
6. Pests affecting the crop
7. Pesticides used
8. Methods of harvesting of leaves
9. Composting
10. Method of composting
11. Materials used for composting
12. Awareness about extension programme
13. Extension methods

Mulberry cultivated land area

Mulberry is a fast-growing deciduous woody perennial plant. Mulberry cultivation is practiced in various soil types and climatic conditions, the major area is the tropical zone covering Karnataka.

Table 1 Mulberry cultivated land area

Mulberry land area	No. of respondents	Percentage (%)
Below 1 acre	6	10
1 – 2 acres	7	11.6
2 acre and above	47	78.3
Total	60	100

A total 60 respondents of sericulture farmers shows that maximum of the respondents i.e., 47 (78.3%) have mulberry cultivated land area of 2 acre and above, 7 (11.6%) respondents own mulberry cultivated area of 1-2 acres and 6 (10%) respondents own mulberry cultivated area of less than 1 acre is presented in (Table 1).

Types of mulberry plantation

The success of mulberry leaf production depends on three factors namely mulberry variety, cultivation practices (agronomical inputs) and plant protection methods. The variety selected for cultivation must respond well to optimum agronomic inputs and plant protection measures. Mulberry can raised as dwarf, bush or tree type [9].

Table 2 Types of mulberry plantation

Types of mulberry plantation	No. of respondents	Percentage (%)
Dwarf type	18	30
Bush type	42	70
Tree type	0	0
Total	60	100

Data depicted in (Table 2) shows that, out of 60 farmers, majority of respondents 42 (70%) practicing bush type plantation and 18 (30%) respondents practicing dwarf type of mulberry plantation and none of the farmer is following tree type of cultivation [10].

Mulberry planting system

The cultivation of crops in row system are generally grown on irrigated land, during the growing season the inter-row spaces are hoed two to four times and the rows are weeded to conserve moisture and improve aeration. In the paired row system, two rows are brought together followed by a wide gap before the next set of two rows is helpful in mechanization of the inter-cultivation practices [11].

Table 3 Mulberry-planting system

Mulberry planting system	No. of respondents	Percentage (%)
Paired row system	15	25
Row system	45	75
Total	60	100

Results in (Table 3) shows that out of 60 respondents i.e., 45 (75%) follows row system of planting while as 15 (25%) respondents follows paired row system of cultivation.

Sources of irrigation

Irrigation essentially means the watering of land to make it ready for agricultural purposes. An irrigation system is supplying of water via artificial canals and channels to growing plants and crops in a field as water is vital for the growth of plants. The source of water for this irrigation comes from various means such as wells, ponds, rivers, dams, reservoirs, rainfall, etc.

Table 4 Sources of irrigation

Sources of irrigation	No. of respondents	Percentage (%)
Bore well	38	63.3
Canal	16	26.6
Lake	6	10
Total	60	100

Data reflected in (Table 4) shows the source of irrigation of sericulture farmers in mulberry cultivation. Out of 60 farmers, majority of the farmers i.e., 38 (63.3%) utilize bore well as source of irrigation, 16 (26.6%) use canal as source of irrigation and six (10%) depend on lake as a source of irrigation. These results show that bore well is the main source of irrigation as majority of the farmers are using bore well as source of irrigation for mulberry garden [12].

Methods of irrigation

Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps to grow agricultural crops during periods of less than average rainfall. Irrigation also has other uses in crop production, including frost protection, suppressing weed growth in grain fields and preventing soil erosion.

Table 5 Methods of irrigation

Method of irrigation	No. of respondents	Percentage (%)
Furrow method	30	50
Drip method	18	30
Sprinkler method	12	20
Total	60	100

Data related to methods of irrigation of the 60 farmers depicted in (Table 5), i.e. 30 (50%) majority of the farmers irrigated their land by using furrow method of irrigation, 18 (30%) of the farmers irrigated their land by drip method and 12 (20%) irrigated their land by sprinkler method.

Pests affecting the crop

In the plant's world, pests refer to harmful organisms that latch on to plants, rendering them unsuitable for harvest. Every garden is prone to attacks by pests while some organisms are harmless but the majority are detrimental to a plant's overall health. Pests lead to stunting of the plant's growth and drastically reduce the overall quality of crop, when left untreated, pests often result in the plant's death.

Table 6 Pests affecting the crop

Pests affecting the crop	No. of respondents	Percentage (%)
Bihar hairy caterpillar	32	53.3
Leaf roller	17	28.3
Leaf hopper	11	18.3
Total	60	100

Data reflected in (Table 6) shows that out of the 60 farmers, majority i.e. 32 (53.3%) farmers say their crop is affected by Bihar hairy caterpillar, 17 (28.3%) of farmers

opined their crop is affected by leaf roller and 11 (18.3%) of the farmers said the crop was affected by leaf hoppers [13].

Pesticides used

Pesticides are substances that are meant to control pests. The term pesticide includes different forms like insecticides, insect repellents, animal repellent, antimicrobial, and fungicide. Most pesticides are intended to serve as plant protection products which in general protect plants from insect/pests. However, the use of pesticides is inevitable in mulberry ecosystem for successful harvest of the crop [14].

Table 7 Pesticides used

Pesticides used	No. of respondents	Percentage (%)
DDVP	39	65
Nuvan	18	30
Neem Cake	3	5
Total	60	100

Table 7 shows that out of the 60 farmers, most of the farmers i.e., 39 (65%) are using DDVP for controlling pests, 18 (30%) of farmers are using Nuvan and 3 (5%) are using Neem Cake for controlling pests in the garden.

Method of harvesting mulberry leaves

Silkworms feed on mulberry leaves and the success of silkworm rearing depends on the quality of leaf that is consumed by the silkworms. Harvesting of mulberry leaves from the mulberry garden mainly is of two types, one leaf picking and another is shoot-harvest type. Leaf harvest depends on the type of rearing method adopted [15].

Table 8 Methods of harvesting mulberry leaves

Harvesting methods	No. of respondents	Percentage (%)
Leaf harvesting	5	8.3
Shoot harvesting	55	91.6
Total	60	100

Table 8 shows the methods of leaf harvest, out of 60 farmers i.e., 55 (91.6) farmers harvest their mulberry leaves by shoot harvesting method and 5 (8.3%) farmers follow for leaf harvesting method. Most of the farmers harvest their leaves by shoot harvesting method, which is the most common method of harvesting [16].

Composting

Compost is organic matter that has decomposed by a process called composting. This process recycles various organic materials otherwise regarded as waste products and produces a soil conditioner. Compost is rich in nutrients and is beneficial for the land in many ways, including as a soil conditioner and as fertilizer. Table 9 shows composting process, out of 60 farmers 36 (60%) farmers are practice composting and 24 (40%) farmers are not practicing composting at all [17].

Table 9 Composting

Composting	No. of respondents	Percentage (%)
Farmers practicing composting	36	60
Not practicing composting	24	40
Total	60	100

Method of composting

The secret to successful composting is to select an approach and technique that suits your needs and lifestyle. The choice will depend on a number of factors such as space availability, raw materials used and the plan to produce the compost along with how much of time the farmer can spend in the process of composting.

Table 10 Methods of composting

Methods	No. of respondents	Percentage (%)
Compost bin	11	30.5
Compost heap	25	69.5
Total	60	100

Table 10 shows that out of 36 farmers who are practicing composting, majority i.e., 25 (69.5%) of the farmers follows compost heap method and 11 (30.5%) of the farmers follow compost-bin method [18].

Materials used for composting

Almost any organic material is suitable for composting. The composter or compost pile needs a proper ratio of carbon-rich materials and nitrogen-rich materials, or among the carbon-rich materials are dried leaves, straw, and wood chips.

Table 11 Materials used for composting

Materials	No. of respondents	Percentage (%)
Cow dung	24	66.6
Mulberry waste	26	72.2
Kitchen waste	5	13.8
Total	60	100

Out of 36 farmers 24 (66.6%) farmers use cow dung as material for composting, 26 (72.2%) farmers use mulberry waste as composting material and about 5 farmers are using kitchen waste as composting material (Table 11). Based on these results, we can see that most of the farmers use mulberry waste as composting material [19].

Awareness about extension programme

Extension is the application of scientific research and knowledge of sericulture practices through farmer education. The role of extension services is invaluable in teaching farmers how to improve their productivity. Extension is also critical to move research findings and innovations from the lab to the field and to ensure a return on investment in research by translating new knowledge into innovative practices.

Table 12 Awareness about extension programme

Extension awareness	No. of respondents	Percentage (%)
Aware farmers	55	91.6
Unaware farmers	5	8.3
Total	60	100

Out of 60 farmers, 55 (91.6%) farmers are aware about extension programmes and 5 (8.3%) farmers are those, which are unaware about extension programmes as depicted in (Table 12).

Extension methods

Extension education is an applied behavioural science, the knowledge of which is applied to bring about desirable changes in the behavioural complex of human beings. Extension education has now developed as a full-fledged discipline having its own philosophy, objectives, principles, methods and techniques which must be understood by every extension worker and others connected with the rural development.

Table 13 Extension methods

Methods	No. of respondents	Percentage (%)
Group contact method	36	65.4
Individual contact method	11	20
Mass contact method	8	14.5
Total	60	100

Data illustrated in (Table 13) shows that out of the 60 farmers, majority 36 (65.5%) of farmers take part in group contact method, 11 (20%) of farmers take part in individual contact method and 8 (14.5%) farmers take part in mass contact extension method.

As shown in (Table 1), most of farmers have mulberry cultivated area of more than 2 acres followed by 1-2 acres. Mulberry can be raised as dwarf, bush, or tree type, (Table 2) shows that majority of respondents are practicing bush type plantation and dwarf type of mulberry plantation, none of the farmers are practicing tree type of plantation. (Table 3) shows that most of the farmers are following row system of planting and are generally grown on irrigated land. During the growing season, the inter-row spaces are ploughed two to four times and the rows are weeded to conserve moisture and improve aeration. The source of irrigation is important for higher yield mulberry leaves yield. (Table 4) shows that majority of the respondents have bore well as their source of irrigation followed by canal and lake water as their source of irrigation for their established mulberry garden [20].

As seen in (Table 5) that most of the farmers irrigated their land by furrow method followed by drip and sprinkler method. Irrigation and methods of irrigation helps to grow crops, maintain landscapes and re-vegetate disturbed soils in dry areas and during periods of less than average rainfall. Pests can affect a plant's growth, especially smaller ones, disturb the soil, harm the foliage's appearance, and drastically reduce the overall quality of crop. (Table 6) shows that majority of the crop loss of mulberry garden is due to Bihar hairy caterpillar followed by leaf roller. Pesticides used is seen in (Table 7) most of the farmers are using DDVP and Nuvan for controlling pests, and some of the farmers are using Neem cake for controlling pests in the mulberry garden. The most common type of leaf harvest practices followed by farmers is shoot harvest, which is followed by leaf harvest as shown in (Table 8).

Data in (Table 9) shows composting details and most of the farmers are practicing composting in sericulture farming which is one of the important step as compost itself is beneficial for the land in many ways, including as a soil conditioner and fertilizer; addition of vital humus or humic acids and as a natural pesticide for soil. The process of composting followed is shown in (Table 10), where farmers are practicing composting, majority of the farmers follow compost heap method and few are practicing the compost bin method. As shown in (Table 11), most of the farmers use mulberry waste and cow dung as composting materials, few farmers use the kitchen waste. The (Table 12) shows that maximum farmers are aware about extension programmes, which is a good sign for the development of sericulture industry. (Table 13) shows that majority of farmers involve themselves in group contact method followed by individual contact and mass contact method as part of extension activities.

CONCLUSION

Based on the above study it can be concluded that single factor of education level or experience of the farmer or extension methods cannot bring in the desired level of technology adoption and realization of the better income by the farmers. Hence, a bi model approach combining different extension strategies needs to be developed. Farmers need more intensive technology awareness, infrastructure facilities and other incentives. Whereas. most of the villages in Hunsur taluk needs programmes for change of mind set of the farmers towards new technological changes, higher education level etc. For rapid growth of sericulture ensuring better income to the farmers, different approaches with group/community farming, farmers' field schools, demonstrations and better access to the markets etc. needs to be considered. As women are also involved in several sericulture practices, techno-economic empowerment of women is also of vital importance. Considering the acreage of mulberry in Karnataka, it appears to be depressing compared to the established norms prevailing in China and Japan. Hence, concerted efforts must be made by the extension personnel to enhance the knowledge level of farmers on sericulture technologies towards greater adoption of recommended sericulture practices for higher cocoon production. In view of the static conditions of the above components, adoption of new technologies has become a matter of debate among the scientists and the administrators.

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