Sericulture is an important avocation for the economic development of rural areas because of the high employment generation, low capital investment and remunerative production. Tamil Nadu is one among the traditional silk producing states with an annual production of 1368 MT of raw silk, out of which 321.8 MT is bivoltine silk. Though Tamil Nadu is not gifted with natural congenial environment on par with that of Karnataka, due to its geographical and topographical influences, proper planning and adoption of new technologies had resulted in a quantum jump in bivoltine cocoon production. The present study was conducted in Erode district of Tamil Nadu which is a potential bivoltine cluster. Improved bivoltine sericulture technologies were introduced to selected farmers of Erode district through three major projects viz., PPPBST, PEBS of JICA and IVLP of CSR&TI, Mysore. The stability and sustainability of these technologies depends on their economic viability. Hence, the present study was undertaken to find out the impact of adoption of bivoltine sericulture technologies with the objective of:

- Studying the extent of knowledge and adoption of bivoltine technologies by different categories of farmers.
- Studying the impact of bivoltine sericulture technologies on cocoon yield, income and employment with different categories of farmers.
- Identifying the constraints in adoption of bivoltine sericulture technology.
- Suggesting suitable policy guidelines for improving the adoption of bivoltine sericulture technologies.

The study was conducted at Sathyamangalam, Gobichettipalayam, Talawadi and Bhavani TSCs of Erode district, Tamil Nadu. Primary data were collected from 100 farmers adopting and 100 farmers not adopting the improved bivoltine sericulture technologies through personal interview method using a structured schedule. Post classification of farmers was done based on their mulberry holding size and four categories were made. Knowledge and
adoption indices were calculated. Karl Pearson’s correlation technique and simple linear regression analysis were performed to find out the factors influencing the knowledge and adoption level of sericulturists.

The study has come out with the followings findings:

- The adopters were more literate and owned more mulberry acreage than the non adopters.

- Most of the adopters had V1 mulberry garden with paired row spacing and independent rearing house, the pre requisites for bivoltine rearing.

- The adopters participated actively in extension & training programmes and contacted the extension staff regularly.

- Knowledge and adoption index of the adopters on improved bivoltine sericultural technologies was 88.98% and 75.38% respectively as against 78.50% and 58.62% in non adopters. Both the indices revealed a direct relationship with the holding size.

- Knowledge and adoption level of adopters was comparatively better than that of non adopters with regard to mulberry variety, plantation spacing, application of farm yard manure, fertilizer and seriboost.

- Adopters had adequate knowledge about separate rearing house, silkworm race, disinfection, hygiene maintenance, shoot rearing, rearing bed spacing, bed cleaning, use of bed disinfectants and mountages and majority of them adopted the technologies fully. Partial adoption was found high in non adopters.

- Majority of the farmers in the study area were adopting any one of the control measures to control Tukra and uzi fly but the integrated package was not adopted.

- Though the farmers had knowledge on incubation and black boxing methods, the adoption rate was very less as they were purchasing chawki reared worms from CRCs.
The knowledge and adoption level exhibited a direct relationship with the holding size and most of the farmers of holding size I showed partial/non adoption.

High cost of inputs was the main constraint in adoption of recommended mulberry cultivation technologies by adopters. Non adopters perceived lack of awareness about the new technologies and high cost as the major constraint in adoption of mulberry cultivation technologies.

Lack of finance and fluctuations in cocoon price were reported as the major constraint in adoption of silkworm rearing technologies by adopters. Lack of awareness about the new technologies, lack of finance and strong belief in traditional practices were the constraints cited by non adopters in adoption of silkworm rearing technologies.

Age, extension participation, extension contact and price of cocoon per kg had a positive significant association with the knowledge index of the adopters. Except age and family size all the other variables studied were significantly related to the knowledge level of non adopters.

All the socio economic variables studied showed a positive correlation with the adoption index of adopters. However, total land holding and extension contact proved to be significant. Among the non adopters, except family size all socio economic variables studied, exhibited a positive association with the adoption index.

Irrespective of the holding size significant correlation between cocoon yield and variables such as mulberry acreage, dfls brushed, price of cocoons and income realized per acre was observed in both categories of farmers.

Income realized per annum per acre was significantly related to mulberry acreage, social participation, dfls brushed, cocoon price and yield realized per acre at 1% level in both categories of farmers.

The regression analysis revealed that age, education and mass media participation had a highly significant influence on the knowledge level of
adopters of holding size IV. Knowledge level of non adopters (pooled farms) was not significantly influenced by the variables studied, but they expressed a positive coefficient except for age and family size.

- The total land holding, extension and social participation, dfls brushed and price of cocoons had significantly influenced the adoption of technologies.

- The total cost of cocoon production was Rs. 73084.19 and Rs. 63773.69 in adopters and non adopters respectively. The cost of cocoon production exhibited a positive and direct relationship with the holding size.

- The cost of establishment of one acre of mulberry garden was high in adopters (Rs.15125.05) compared to non adopters (Rs.13656.32). The holding size and the establishment cost exhibited a direct relationship in non adopters category and an inverse relationship in adopters category. Among the different cost components, irrespective of the holding sizes, major cost was incurred on farm yard manure followed by human labour in both categories of farmers.

- The cost of leaf production was high in adopters and it decreased with the increase in holding size. The average annual cost of production of mulberry leaf per acre was worked out to Rs.35526.44 in adopters and Rs.31127.56 in non adopters. The cost of leaf production increased with the increase in holding size in non adopters. Major share of leaf production cost was incurred on labour wages in all holding sizes.

- The cost of one kg of mulberry leaf was less in adopters (Rs.1.91) than non adopters (Rs.1.94). The leaf yield was directly related to the farm size and the cost per kg of mulberry leaf was inversely related to farm size in both categories of farmers.

- The fixed cost (recurring) incurred on silkworm rearing was comparatively high in adopters and the cost increased with the increase in farm size. The cost incurred on rearing house was the major investment followed by mountages and shoot racks in both categories of farmers.
The adopters incurred more on variable cost (non recurring) and it decreased as the holding size increased. Of all the costs items, cost of mulberry leaf ranked first, followed by human labour in all holding sizes.

Adopters brushed more number of dfls (1280) than non adopters (1053) and the brushing capacity increased with the holding size.

The cocoon yield obtained/acre/year was high in adopters (833.98 kg) compared to non adopters (651.07 kg).

The adopters obtained an average yield of 64.99 kg/100 dfls and fetched an average price of Rs.144.50/kg of cocoons as against 61.51 kg/100 dfls and Rs.130.63/kg of cocoons in non adopters. The cost of production of one kg of cocoon was high in non adopters (Rs.97.95) than adopters (Rs.87.63).

The cocoon yield increased and the cost of producing one kg of cocoons decreased as the holding size increased in both the categories of farmers.

The gross return realized per acre per year from sericulture was Rs.124851.84 and Rs.94376.83 in adopters and non adopters respectively. The net return realized was Rs.51767.65 in adopters and Rs.30603.14 in non adopters.

The cost benefit ratio was 1:1.71 in adopters and 1:1.48 in non adopters.

A total of 542.80 and 483.37 man days were employed in sericulture in adopters and non adopters respectively.

An average of 68.32 man days of labour were engaged in establishment of one acre of mulberry garden in adopters and it was 60.43 in non adopters. Weeding consumed more labour, followed by irrigation and plantation.

Production of mulberry leaf had generated employment opportunities to 264.58 man days and 228.48 man days of labour in adopters and non adopters respectively. Shoot harvesting had consumed maximum labour followed by weeding.
- Adopters employed 209.70 man days of labour in cocoon production as against 190.46 man days in non adopters. Maximum man days were used for rearing of silkworms, followed by harvesting of cocoons and mounting of ripened worms.

- Holding size I had utilized more labour than other holding sizes for all activities in both categories of farmers.

- Involvement of family labour was high in smaller holdings and the hired labour involvement was high in larger holdings.

- Gender wise comparison showed that more female labour was employed than male in all activities.

**Conclusion and policy implications**

The study clearly revealed that the higher literacy rate found in adopters had helped them in acquiring more knowledge on improved bivoltine technologies and adopt them successfully. This had enabled the adopters to achieve high cocoon yield and income, thereby improving their socio economic status in the society. The reasons cited for non adoption were lack of awareness, non availability and high cost of inputs. Measures to supply the inputs at subsidized cost, establishment of bio control agent’s production units, and establishment of farmers’ field school to educate and train the farmers on the recent developments in technologies will encourage the farmers to adopt the new technologies.

The high cost of production observed in holding size I was due to the excess use of inputs and family labour, hence they should be educated on the rational use of resources. Most of the respondents in the study region complained about the high labour cost and shortage of labour during peak period of rearing. Popularization of labour saving techniques and innovation of low cost machines to reduce drudgery in sericulture should be thought of seriously by the R&D institutes.
The net profit realized by adopters by implementing bivoltine sericulture technologies was higher than that of non adopters. The important reasons are the higher cocoon productivity and the higher cocoon price fetched/kg of cocoons in adopters. However, many farmers reported during the survey that rearing bivoltine silkworms is risky and required more capital and the cocoon price is very unstable. To solve these problems, the Government has to formulate sound cocoon price policies and decide a Minimum Support Price (MSP) for bivoltine cocoons. Implementation of comprehensive insurance policy programme and extending CDP assistance to farmers with small holdings will encourage them to take up bivoltine rearing.