CHAPTER - IX
RESEARCH FINDINGS AND SUGGESTIONS

9.1. Summary

Sericulture assumes vital importance due to its capacity in alleviating the poverty and providing year round employment. It is highly suitable in the context of diversification of farm enterprises and integration with the farming system with other enterprises and has the capacity to generate attractive income. These features have attracted the policy makers to propagate the sericulture enterprise throughout the country as a suitable answer to rural unemployment and low per capita income.

Although India is the second largest producer of mulberry raw silk in the world, the productivity and quality level is less when compared to China. With the bulk of the silk being produced is lower in quality and grade, the production of superior quality silk, is still a challenge. Chinese silk, which comprises only of graded bivoltine silk, is more preferred by the power loom sector of India, as its offer price is much cheaper than the domestic silk prices. It is, therefore, imperative for domestic sericulture sector to switch on to the production of qualitatively superior bivoltine silk in the country. India can face the challenges successfully only by enhancing the quality and reduce the production costs by increasing the productivity. Karnataka is the principal silk producing state in the country with the production of 8.12 thousand tones during 1999-2000, which accounts for about 58 per cent of the total mulberry raw silk production in the country.

Efforts on adoption of technological innovations in sericulture received a considerable note in recent times which played a major role in increasing the income and employment of the farmers. Research activities performed at various R & D organizations have been responsible for the improvement of productivity of sericulture in the field. The improved technologies developed for mulberry production and silkworm rearing has been very cost effective, besides they have been aiming at higher productivity levels.
The earlier phase of development of sericulture in India had to target upon replacing low yielding mulberry variety with that of the improved robust yielding mulberry varieties followed by the replacement of the traditional multivoltine silkworm races with that of the bivoltine races. The conditions prevailed in rearing silkworm were primitive and unhygienic, which led to outbreak of diseases resulting in low productivity level.

With the introduction of the World Bank and Swiss Development Cooperation assisted National Sericulture Project (NSP) major thrust was given to the provision of adequate infrastructure facilities for sericulture development. Government of India also launched the JICA (Japan International Cooperation Agency) in collaboration with Japan for the bivoltine sericulture development in India. With this there was a great momentum in the sericultural industry due to the introduction of productive bivoltine (CSR) hybrids. There was a clear emergence of developmental linkages between the pre cocoon and post cocoon sectors. In spite of these developments, the potential of sericulture remained unexplored due to the void created in terms of acceptance of technologies by the farmers.

Many of the technologies which were evolved in sericulture during the period have contributed to the productivity level significantly. The level of productivity increased considerably mainly due to the evolution of superior silkworm hybrids and development of robust mulberry varieties along with improved mulberry cultivation and silkworm rearing practices. Due to the advent of these technologies, the sericulture enterprise could gradually get into many of the non-traditional sericultural states of the country. The research and development and training efforts of the Central Silk Board, and the initiatives and support systems of some states have enabled the increase in production and productivity (Arun Ramanathan, 2004). Due to the R & D contributions alone, there is an overwhelming increase in the production of silk of the country up to 18475 MT during 2006-07.

9.2. Major Findings
9.2.1. Technological Change in Sericulture

To identify the structural break if any in the production relations with the introduction of new technology in silk cocoon production, output elasticities were
estimated by Ordinary Least Square (OLS) method by fitting log linear regression separately for old technology farms and new technology farms.

In the case of old technology farms, the variation in the silk cocoon production could be explained up to 90 per cent (adjusted R^2) by the variables used in the model such as farm yard manure, chemical fertilizers, human labour, Disease Free Layings (DFLs) or the silkworm eggs and disinfectants and materials.

It was found that the elasticity coefficients for chemical fertilizers (0.139) and number of DFLs (0.843) were found to be positive and significant. The elasticity coefficient for farm yard manure (0.031) and disinfectants and materials (0.026) though were positive, but not significant. However the elasticity coefficient for labour (-0.004) was found to be negative and non significant. The calculated ‘F’ value (191.60) of the function was found to be statistically significant.

The analysis of the structural break through in silk cocoon production revealed that the contribution from the new technology was significant.

Further, the per acre output gain in silk cocoon production due to the shift in the new technology of production was decomposed using production function parameters and geometric mean inputs with the help of the decomposition function.

The results of the decomposition analysis indicated a slight discrepancy between observed and estimated gains in productivity between old technology farms and new technology farms. This may be attributed to the random term, which among others accounts for variable, management input which could not be included in the model.

The total gain in production due to the shift from old technology to new technology was found to be 28.58 per cent, which was mainly contributed due to the difference in the levels of input use. The contribution of technological change to the yield gain was 7.02 per cent, which implies that the output of the cocoon production could not be increased with the same level of inputs used under the old technology.
Among the components of technological change, the contribution of neutral technological change in total productivity was estimated to be 142.67 per cent. This indicates that mere adoption of modern sericultural technologies in place of traditional practices would bring an upward shift in the silk cocoon yield. But this gain was offset by the negative contribution (-135.65 per cent) of the non-neutral technologies to the yield gains.

The negative non-neutral technologies implied that there was decrease in efficiency of inputs used with the adoption of new technology, as the farmers were not able to adjust to the requirements of new methods of mulberry cultivation and silkworm rearing techniques. It was observed in the study that most of the farmers did not continuously rear the bivoltine hybrids. As the farmers rear bivoltine hybrids and crossbreeds interchangeably, they were not in the habit of adjusting to the new requirements of bivoltine hybrids.

With regard to the difference in the level of input use, number of disease free layings contributed to 12.20 per cent gain in the silk cocoon production of the total 21.56 per cent of gain due to input use. The increase in number of disease free layings is the result of the productivity gain through the production of quality mulberry leaves in the field. With the introduction of new technologies, it was possible with the new breeds of mulberry to produce the quality mulberry leaf to the extent of nearly two folds.

Hence with the increase in the productivity level of mulberry (especially V1 variety of mulberry), the food plant of silkworm, and the rearing capacity also got increased, which reflected in terms of increase in number of disease free layings.

The contribution of chemical fertilizers to the productivity gain was up to 5.82 per cent followed by farm yard manure (2.59 per cent) and labour (1.15 per cent). The productivity gain from the use of disinfectants and materials used in silkworm rearing was found to be negative (-0.20 per cent), indicating the over use of this input mainly due to free available nature through the extension agencies.
The total contribution of the differences in levels of input use to the productivity gain was 21.56 per cent, which indicated that the productivity of the old technology practices can be increased to an extent of 21.56 per cent, if the input use levels on these farms could be increased to the same level of ‘new technology farms’.

It revealed that the value of additional inputs required per acre to produce the ‘new technology’ level of output by the ‘old technology’ was estimated as, Rs. 7110.94 per acre per year. It indicates that to produce ‘new technology’ level of output (691.21 kg/acre/year) by adopting ‘old technology, farmers needed about Rs. 62124.10 per acre per year, as against Rs. 55013.15 per acre per year with new production technology. So there was a saving of Rs. 7110.94 per acre per year with the introduction of ‘new technology’ of silk cocoon production in the field.

9.2.2. Technical efficiency in Sericulture farming

The producers in an economy are not always efficient. Given the resources (inputs), a producer is said to be technically inefficient if he fails to produce the maximum possible output. A production frontier describes the technical relationship between the input and output of a production process. It defines the maximum output attainable from a given set of input. An analysis of technical efficiency among the sericulturists using frontier production functions (both deterministic and stochastic) was made in the present study.

Based on the COLS estimates, the efficiency of production was measured in terms of the physical maximum attainable by each farmer, based on the Timmer’s measure of technical efficiency. It revealed that, the level of output technical efficiency was higher in case of bivoltine (CSR hybrid) silkworm rearers with 87.67 per cent, while the same was 56.35 per cent in case of crossbreed silkworm rearers.

Based on the deciles classification the rate of participants who had efficiency at the rate of 40 – 50 percent was about 16.18 per cent, and similarly the rate of efficiency was 50 – 60 per cent in case of 55.88 per cent, 60 – 70 per cent in case of 19.85 per cent and 70 – 80 per cent in case of only 1.47 per cent, among the crossbreed silkworm rearers.
Among the bivoltine (CSR hybrid) silkworm rearers, the rate of efficiency was in the range of 70 – 80 per cent in case of 2.88 per cent, while it was in the range of 80 – 90 per cent in case of 76.92 per cent and 90 – 100 per cent in case of 20.19 per cent of the farmers.

Similarly the Kopp’s measure of input technical efficiency based on the COLS estimates, was worked out for both the categories of crossbreed and bivoltine (CSR) hybrid rearers in the study area. The average rate of input technical efficiency was highest at the rate of 88.93 per cent in case of bivoltine (CSR hybrid) rearers followed by 51.33 per cent in case of crossbreed rearers.

Based on the decile classification, it was seen that in case of crossbreed silkworm rearers, rate of input efficiency was 30 – 40 per cent in case of 5.15 per cent farmers, 40 – 50 per cent in case of 37.50 per cent farmers, 50 – 60 per cent in case of 44.85 per cent farmers, 60 – 70 per cent in case of 6.62 per cent farmers and 70 – 80 per cent in case of only 2.21 per cent farmers.

The rate of input technical efficiency among the bivoltine (CSR) hybrids was highest at the rate of 80 – 90 per cent among 71.15 per cent of the farmers followed by 90 – 100 per cent among 28.85 per cent of the farmers.

In the analysis of technical efficiency using the deterministic frontier production function, using both the Timmer’s and Kopp’s methodologies, it revealed that, the bivoltine (CSR) hybrid silkworm rearers were highly efficient than the crossbreed silkworm rearers in terms of output production and input usage respectively.

With the analysis of Kopp’s measure of input use technical efficiency, the excessive usage of inputs in production was also worked out. In case of crossbreed silkworm rearers, the quantum of excess inputs used was to the extent of Rs. 2083.73 per acre per year of Farm Yard Manure, Rs.1597.41 per acre per year of chemical fertilizer, 192 Man days of human labour, Rs. 3981.58 per acre per year of depreciation on equipments and buildings and 532 number of dfls per acre per year and Rs. 1348.95 per acre per year of disinfectants used in silk worm crop care. This
evidences that, the crossbreed silkworm rearers in the study area were comparatively inefficient in handling their resources, due to which the cost of production tended to be high, making the profit margins very marginal.

In case bivoltine silkworm rearers, the quantum of excess inputs used was to the extent of Rs. 448.20 per acre per year of Farm Yard Manure, Rs.534.99 per acre per year of chemical fertilizer, 41 Man days of human labour, Rs. 834.29 per acre per year of depreciation on equipments and buildings and 108 number of dfIs per acre per year and Rs. 303.89 per acre per year of disinfectants used in silk worm crop care. However the extent of wastage of inputs was minimum in case of bivoltine (CSR hybrid) silkworm rearers.

The maximum likelihood estimates of the Stochastic Frontier Production Function (SFPF) model for both Crossbreed Silkworm Rearer and Bivoltine (CSR hybrid) Silkworm Rearer were also worked out in the present study to assess the technical efficiency among the sericulturists, as a comparative analysis with that of the deterministic frontier functions. The average rate of Technical Efficiency was found to be 66 per cent and 89 per cent respectively in case of crossbreed and bivoltine (CSR hybrid) silkworm rearers.

A comparison of the distributions of TE estimates from both the COLS and SFPF models shows that the distribution is relatively symmetric in the COLS model, while it is skewed in the SFPF model, in both the categories of the farmers. However with the very high rate of technical efficiency among the bivoltine (CSR hybrid) rearers, it was found that again the observations were again skewed.

The overall analysis of technical efficiency revealed that with the introduction of new technologies in the field particularly the new silkworm races, the wastage in the input usage was systematically reduced in the study area. This clearly indicates that, the new technologies of sericulture are mainly cost effective, thus improving the efficiency of the farmers in the region.
9.2.3. Economic Importance of Sericulture

9.2.3.1. Cost of cultivation of mulberry

On these farms, the average cost of production of mulberry leaf is worked out to Rs. 21,467.06 per acre per year. However, the cost of production of mulberry leaf was the least in Bangalore (Rural) at Rs. 17,504.60 per acre per year followed by Mandya (Rs. 19,084.43), Hassan (Rs. 23,519.20) and Kolar (Rs. 26,104.89) districts.

Among the cost components, labour was the major item amounting to Rs. 5997.14 per acre per year, which accounted for nearly 28 per cent of production cost of mulberry. The expenditure incurred on Farm Yard Manure was the next highest cost in production of mulberry. The average input cost of FYM was found to be Rs. 4992.23 per acre per year which accounted for nearly 23 per cent of total production cost of mulberry. The cost of fertilizers in mulberry leaf production (Rs. 4375.78 per acre per year) accounted for nearly 20 per cent of the production cost of mulberry.

Mulberry being a perennial crop, the costs incurred on establishment of mulberry garden was apportioned to the economic life span of mulberry garden, which was considered as 15 years, and accounted as fixed costs in working out the cost of mulberry. The fixed cost incurred was thus worked out to Rs. 738.59 per acre per year, which accounted for 3.44 per cent of the total cost.

9.2.3.2. Cost of Silkworm Rearing

The costs incurred on rearing silkworm and the revenue generated thereby in the selected districts are discussed. The total silk worm rearing cost was highest in case of Kolar district (Rs. 37,002.10 per acre per year), followed by Hassan district (Rs. 33,485.00 per acre per year), Mandya district (Rs. 32,787.60 per acre per year) and Bangalore (Rural) district (Rs. 29,837.90 per acre per year).

The average cost of labour was found to be the most prominent and a major component in the cost of silkworm rearing too. The average cost of human labor in silkworm rearing was found to be Rs. 13795.70 per acre per year, which is equivalent to 41 per cent of total silkworm rearing cost. The second highest cost contribution was from depreciation cost. The average cost of depreciation on rearing building and
equipments was found to be Rs. 7691.99 per acre per year, which accounted for nearly 23 per cent of the silkworm rearing cost.

The total cost of silk cocoon production was found to be on an average Rs. 54,745.20 per acre per year. The total cost of silk cocoon production was highest in case of Kolar district (Rs. 63,107.00 per acre per year) followed by Hassan district (Rs. 57,004.20 per acre per year), Mandya district (Rs. 51,872.10 per acre per year).

Finally the total income derived was found to be on an average Rs. 94,361.80 per acre per year. The income derived from sericulture was highest in Kolar district (Rs. 112077.00 per acre per year), followed by Hassan district (Rs. 103769.00 per acre per year), Mandya district (Rs. 82,477.50 per acre per year) and Bangalore (Rural) district (Rs. 79,124.00 per acre per year).

The average yield of silk cocoon was found to be 62.28 kg/100 dfls. However, among the districts, the productivity of silk cocoon was highest in case of Kolar district (70.43 kg/100 dfls) followed by Hassan district (66.94 kg/100 dfls), Bangalore (Rural) district (56.81 kg/100 dfls) and Mandya district (54.93 kg/100 dfls).

### 9.2.3.3. Cost Concepts and Income Earnings

The cost $A_1$ which comprises all cash and kind expenses showed a wide variation between the districts. The cost $A_1$ per cropped area was found to be Rs. 42,713.66 per acre per year. There was a clear distinction between each of the costs considered in the study. Further, a higher rate of costs per acre per year was noticed in the districts of Kolar (Cost $C_2$ at Rs. 63,106.97 per acre per year) and Hassan (Cost $C_2$ at Rs. 57,004.24 per acre per year) than in the districts of Mandya (Cost $C_2$ at Rs. 51,872.06 per acre per year) and Bangalore (Rural) at Rs. 47,342.54 per acre per year.

Further the estimates of gross income per acre per year from sericulture in the selected districts are worked out. It is estimated that the gross income from sericulture was Rs. 94,361.81 per acre per year. However the estimated gross income in the selected districts were in the order of Rs.1,12,077.01 (Kolar district), Rs.1,037,68.78 (Hassan district), Rs.82,477.48 (Mandya district) and Rs.79,123.95 (Bangalore (Rural) district).
The net farm income was highest at Rs. 48,970 per acre per year in case of Kolar district followed by Rs. 46,764 per acre per year, Rs. 31,781 per acre per year and Rs. 30,605.42 per acre per year in case of Hassan, Bangalore (Rural) and Mandya districts respectively.

The family labour income which refers to the return to family labour and management, was highest in case of Kolar district (Rs. 60,055.09 per acre per year) followed by Hassan district (Rs. 53,932.69 per acre per year), Bangalore (Rural) district (Rs. 40,927.96 per acre per year) and Mandya district (Rs. 38,696.90 per acre per year).

9.2.3.4. Employment Potential

The employment potential of sericulture indicated engagement of nearly 363 mandays of labour per acre per year. It was found that the engagement of labour in mulberry cultivation was to the tune of 84 man days, while that of silkworm rearing, it was 279 mandays.

The major activities included in mulberry cultivation included intercultural operations, weeding, spraying chemicals etc., while the activities in silkworm rearing included mulberry leaf/ shoot harvest, feeding silkworm, disinfection of rearing house, cleaning, spraying bed disinfectants, mounting ripened larvae, harvesting silk cocoon etc. Due to the continuous changes taking place in terms of biological and mechanical innovations in sericulture, it is expected to have an impact on productivity, cropping intensity, gross income and employment. Hence, the enterprise has a potential to absorb the labour force significantly.

An attempt was made to estimate the number of hired labour employed in sericulture and it was found that nearly 55 per cent (200 man days per acre per year) of the total labour was hired for engaging in various activities of sericulture. The district wise engagement of labour in sericulture was estimated and the number of man days engaged in sericulture was found to be highest in case of Mandya district (416 mandays), followed by Bangalore (Rural) district (401 mandays), Hassan district (331 mandays) and Kolar district (306 mandays).
9.2.4. Adoption of Technologies in Sericulture

The level of adoption of different technological practices by all the respondent farmers was analysed. Twenty individual practices in sericulture, seven of the mulberry cultivation technology practices and thirteen of the silkworm rearing technology practices were considered important in the production of silk cocoon. Accordingly, these technological practices were delineated with respect to their corresponding level of adoption at the farmers’ level.

The farmers were found to adopt the technologies at different levels, which were delineated as, no adoption; a situation where the farmer never adopted the technology, partial adoption; where the adoption of technology was found to be partial or on a limited basis and in another situation, where the farmers were found to adopt the technology in full, as recommended.

The rate of adoption, which is a measure of level of adoption by the farmers, revealed that the important technologies such as irrigation (74.17 per cent), shoot rearing of silkworm (66.67 per cent), harvesting silk cocoon (60.42 per cent) and silkworm bed spacing (60.17 per cent) were some of the technologies found to be adopted by majority of the farmers. Whereas, the technologies such as mounting of silkworm (9.58 per cent), maintenance of temperature and humidity (22.92 per cent), plant protection measures (23.33 per cent) and IPM of uzi fly (28.03 per cent) were found to be the least popular technologies among the farmers for adoption in sericulture.

As an important effort of R & D organizations, the bivoltine programmes were popularized, in majority of the areas, where sericulture was newly introduced. Due to this, the important technologies of production of bivoltine silk cocoon were disseminated to the field, leading to improvement in unit productivity. The adoption of technologies among the bivoltine and crossbreed silk cocoon producers varied greatly. In this respect a classification of silkworm rearers in to bivoltine (CSR hybrid) silkworm rearers and crossbreed silkworm rearers, was done in order to study the effective rate of adoption of technologies in sericulture.
The adoption pattern of selected sericulture technologies with respect to both bivoltine (CSR hybrid) silkworm rearers and crossbreed silkworm rearers is presented as below.

9.2.4.1. Adoption Pattern of Bivoltine (CSR hybrid) Silkworm Rearers

It was found that the majority of the bivoltine (CSR hybrid) silkworm rearers, who adopted important practices in full, included technologies such as leaf harvesting (100 per cent), improved mulberry variety (89 per cent), spacing in mulberry garden (89 per cent), shoot rearing of silkworm (87 per cent), disinfection of rearing house (83 per cent), silkworm bed spacing (82 per cent), bed disinfection (80 per cent), harvesting of silk cocoon (79 per cent), Farm Yard Manure (79 per cent), chemical fertilizer (73 per cent), moulting care (73 per cent), irrigation (71 per cent),

Further, there existed a sect of respondents who adopted the technologies partly or nil, who under the study, were treated as partial/ non-adopters of the said technologies. The rate of partial/non-adoption of the technologies which was reflected in terms of the technology gap index, was normally high in the case of adoption of mounting and cocoon harvest (89.42 per cent), plant protection measures (64.42 per cent), maintenance of temperature and humidity (50.96 per cent), and silkworm pest and disease management (50.00 per cent).

9.2.4.2. Adoption Pattern of Crossbreed Silkworm Rearers

Further, it was noted that the majority of the crossbreed silkworm rearers, who adopted important practices in full, included technologies such as irrigation (77.94 per cent), leaf harvesting (67.65 per cent), rearing house (55.15 per cent), silkworm shoot rearing (53.68 per cent) and harvesting silk cocoon (49.26 per cent).

Further, the respondents who adopted the technologies partly or nil also referred as partial/ non-adopters of the said technologies, included improved mulberry variety (60.29 per cent), Spacing in mulberry garden (66.91 per cent) chemical fertilizer (72.79 per cent), plant protection measures (86.03 per cent), Chawki rearing (69.85 per cent), Disinfection of Rearing House (63.97 per cent), mounting, and cocoon harvest (90.44 per cent) and silkworm pest & disease management (50.00 per
cent), Maintenance of hygiene (69.85 per cent), Temperature and humidity (97.06 per cent), mounting of silkworm (90.44 per cent) and IPM against uzifly (88.97 per cent).

9.2.4.3. Constraints for Non-Adoption

An analysis of constraints existing in the sericulturists in the study area was done and it was found few of the constraints as perceived by these farmers as important in the adoption of technologies in sericulture.

The major constraints for the technology adoption were found to be non-availability of inputs in time (47.04 per cent) followed by, fluctuations in cocoon price (46.11 per cent), high cost of inputs (38.06 per cent), non-availability of labour (35.83 per cent), separate rearing house (22.31 per cent), lack of awareness (19.44 per cent) and lack of investment (12.41 per cent).

In case of crossbreed silkworm rearers the constraints faced were in the order of non-availability of inputs in time (72.22 per cent) followed by, fluctuations in cocoon price (55.56 per cent), separate rearing house (33.33 per cent), high cost of inputs (33.33 per cent), non-availability of labour (30.77 per cent), lack of investment (25.00 per cent) and lack of awareness (19.44 per cent).

The constraints expressed by the bivoltine (CSR hybrid) silkworm rearers for the adoption of bivoltine sericultural technologies included factors like high cost of inputs (41.67 per cent), non-availability of labour (39.71 per cent), fluctuations in cocoon price (38.89 per cent), non-availability of inputs on time (27.78 per cent), Lack of awareness (19.44 per cent), separate rearing house (13.89 per cent) and lack of investment (2.78 per cent).

Based on the findings it was found that rate of constraints were comparatively higher in case of crossbreed silkworm rearers than bivoltine (CSR hybrid) silkworm rearers. The study also revealed that the socio-economic variables of farmers were found important in deciding about the adoption of bivoltine silkworm rearing. Hence, for the introduction of new technologies in sericulture, the farmers’ socio-economic status and the constraints existing therein must be considered.
9.2.5. Discriminating the Technology Users

The Linear Discriminant Function Analysis was used in the current study to evolve the strong determinants for the condition of categories such as ‘low adopters’ and ‘high adopters’ of technological practices in sericulture.

It revealed that ten out of fourteen variables such as organisation participation (28.80 per cent), silkworm race adopted in rearing (20.91 per cent), mulberry variety (12.99 per cent), mass media participation (10.45 per cent), knowledge about the sericulture practices (6.94 per cent), type of rearing house for silkworm rearing (6.43 per cent), extension programme participation (5.61 per cent), extension contact (3.48 per cent), educational status (3.40 per cent), average yield per 100 DFLs (1.39 per cent) emerged as the strong determinants of adoption of technologies in sericulture. These variables in the linear discriminant function, effectively discriminated between ‘low adopter’ and ‘high adopter’ categories of farmers.

9.2.6. Socio-Economic Determinants of Bivoltine Sericulture

An attempt was made to reveal the impact of the socio-economic determinants of adoption of bivoltine sericulture technologies. Socio-economic characteristics like age, education, average price per kg of silk cocoon, average DFLs brushed per crop, experience in sericulture, extension participation, mass media participation, mass media participation, organization participation, knowledge level of the farmers, mulberry area, total holding size, cocoon yield etc., were used in the stepwise regression analysis followed by the application of logistic regression function.

The logit regression was used to predict the adoption of bivoltine (CSR) hybrids from the independent variables. It was brought out from the analysis that the average price per kg of cocoon, awareness about bivotine races, skills in rearing bivoltine race and mulberry variety were found to be the significant predictors of adoption of bivoltine silk worm races in production.

On the basis of the t-test, the variables such as average price per kg of cocoon, awareness about bivoltine races, skills in rearing bivoltine race, attitude about the bivoltine technologies and mulberry variety were found to be significantly influencing the adoption of bivoltine sericulture technologies. Hence the bivoltine adopters tended
to be more concerned about the available market price for their commodity, followed
by acquiring necessary skills along with good awareness and a favourable attitude
towards the technologies in bivoltine sericulture.

9.3. Conclusion and Policy Implications

This study analyzed impact of improved technologies on productivity, income,
employment, efficiency of sericulture farms in Karnataka state. The analysis revealed
that the contribution from the new technology was significant. The level of
productivity increased considerably mainly due to the evolution of superior silkworm
hybrids and development of robust mulberry varieties along with improved mulberry
cultivation and silkworm rearing practices. Through the technical efficiency analysis
of the farms, it revealed that with the introduction of new technologies in the field, the
wastage in the input usage was systematically reduced. Sericulture also stands to be
the forerunner in all aspects concerned to productivity, income and employment
generation, compared to other important crops being cultivated. Though technologies
in sericulture hastened development, adoption of the same is affected by various
factors which are biological, technical and socio-economic in nature. There was an
existing considerable gap between the adopter and non-adopter categories of farmers
in the study area. Awareness about the technology, attitude and skills were the
important determinants of bivoltine sericulture, in addition to existing price of silk
cocoon. These findings suggest that the new technologies of sericulture are mainly
productive, cost effective, thus improving the efficiency of the farmers in the region.

Based on the findings of the study following few suggestions are made in the
present study for policy formulation and developing strategies for the future
sericulture development.

1. Development of a policy framework to develop technologies and organize
measures to accelerate the technology adoption should be the priority. The end
user of the technology consists of different categories of farmers, who require
different ways or methods of extension strategies to get convinced about the
technologies.

2. The development of technology should aim at increasing production and low
unit cost of inputs. Attempts should be made to develop technology for the
environments where such objectives are expected to be achieved to a greatest possible extent.

3. Technologies developed at the research stations should aim at minimizing production risks. This is mainly because the introduction of new technology requires additional requirement of capital to purchase inputs. The low adopter category farmers are more of risk averters, for whom the technologies should look competitive.

4. Growth in productivity and efficient use of resources are the primary means of improving the benefits to the farmers. Increase in the productivity assures more output from available resources. A strong support to augment the present research in the field of sericulture is essential, to maintain and balance the present.

5. The farmers should cope up with the declining supplies and rising costs of fixed supply resources like fertilizer and petroleum products. This can be done by choosing alternative sources of these inputs developed through conservative methods.

6. For effective use of manpower, devising technologies that reduce the drudgery are essential. Research in this regard is required.

7. The benefits of the technology should be distributed evenly to all the participants of the social system. The benefits of research generated should be easily accessible to farmers.

8. Without ongoing investment in science and education, continued productivity growth can not be assured. Hence, it is preferable to educate the rural folk engaged in sericulture, so that they make right choice of decision to adopt technologies.

9. The extension agencies should make efforts to train the farmers about the new technological practices of sericulture very effectively. Hence, various training methods should be adopted to effectively disseminate the popular sericultural technologies in the field by the extension experts.

10. Efforts to develop number of other intermediary products of sericulture can make it more attractive. Such developments provide new opportunities for the farmers. Research in developing new products is essential to make the sector more attractive.
11. Providing strong marketing potential for the diversified products will ensure the production system to be demand driven.

12. Development of strong backward and forward linkages will in certain way help in achieving higher levels of efficiency in production.

9.4. Scope for Further Research

There is further scope for conducting research on the entrepreneurial ability of the sericulture farmers in the study area. The efficiency of production can be viewed from the point of view of managerial efficiency and decision making capacity of the farmers. Measurement of risks in production and working out alternative models consisting of various combinations of enterprises along with sericulture for optimum benefits is another proposition that can be looked into.