International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2020; 8(1): 746-750

Received: 13-11-2019
Accepted: 15-12-2019

Vinayak Hosamani
P2 Basic Seed Farm, National Silkworm Seed Organization, Central Silk Board, Nagenahally, Kunigal, Karnataka, India

Mallikarjuna Yalagi
NAHEP Project, University of Agricultural Sciences, Raichur, Karnataka, India

Pramod Sasvihalli
SSPC, National Silkworm Seed Organization, Central Silk Board, Raiganj, West Bengal, India

Venkatesh Hosamani
Entomology, COH, Munirabad-Koppal, Karnataka, India

K Sashindran Nair
National Silkworm Seed Organization, Central Silk Board, BTM Layout, Madivala, Bangalore, Karnataka, India

VK Harlapur
National Silkworm Seed Organization, Central Silk Board, BTM Layout, Madivala, Bangalore, Karnataka, India

CR Hegde
Seed Cocoon Procurement Centre, National Silkworm Seed Organization, Central Silk Board, Kunigal, Karnataka, India

RK Mishra
National Silkworm Seed Organization, Central Silk Board, BTM Layout, Madivala, Bangalore, Karnataka, India

Corresponding Author:
Vinayak Hosamani
P2 Basic Seed Farm, National Silkworm Seed Organization, Central Silk Board, Nagenahally, Kunigal, Karnataka, India

Constraints and economics of sericulture: A review

Vinayak Hosamani, Mallikarjuna Yalagi, Pramod Sasvihalli, Venkatesh Hosamani, K Sashindran Nair, VK Harlapur, CR Hegde and RK Mishra

DOI: https://doi.org/10.22271/chemi.2020.v8.i1k.8353

Abstract
Agriculture in India is the single largest employer of rural labour. Agriculture remains the main source of income and livelihood for the rural population in India. With the advent of many technologies in agriculture be it by variety, soil and nutrient management, important resources management like irrigation water, labour etc., the sector is widening itself to gamut of different economic activities. Silk, a highly priced agricultural commodity, accounts for about 0.2% of the total world production of textile fiber. Since sericulture stands next to agriculture for rural employment in India, it becomes a matter of concern to examine the sericulture production trend over the years and reasons for slow growth. Sericulture is an important agro industry in Indian economy. India is the only country in the world which produces all varieties of silk namely tasar, muga and mulberry. Economics is an important criterion to evaluate, acceptance and wider adoption of any technology which is economically sound and that can be accepted by the sericulture farming community. Among different indicators of economic efficiency in sericulture, net returns have greater impact on the practical utility and acceptance of the production technology by the farmers. Identification of suitable reasons and management of economic problems to increase the productivity in sericulture is the key for success crop potential and hence, the review.

Keywords: Sericulture, economics, mulberry, cocoon

Introduction

Mulberry area and production of silk cocoons

Anil Kumar Yadav (2008) [3] worked out compound growth rates for area under mulberry, production and productivity of silk cocoons in Kolar and Chikkaballapur districts of Karnataka during 1996-97 to 2006-07. The results revealed that area of mulberry and production and productivity of silk cocoons declined at the compound growth rate of 5.74, 4.26 and 3.96 per cent per annum, respectively. Sharad and Shekhar (2008) studied the status of silk production in India during the period 1980-81 to 2004-05. It revealed that the pattern of growth in area under mulberry cultivation has increased with significant rate of 0.25 per cent. The production and productivity of raw silk showed high significant growth of 5.06 per cent and 4.80 per cent, respectively. The production of raw silk has increased mainly due to high yielding mulberry varieties and silk worm breed.

Benefit cost of Sericulture

Lakshmanan *et al*. (2000) compared economic benefit over investment in rearing bivoltine and crossbred cocoons in their study on economics of bivoltine versus cross breed cocoon production in K. R. Nagar taluk of Mysore district. The study revealed that bivoltine rearing earns higher net returns than crossbred production owing to climatic suitability, skilled manpower and technical guidance received from developmental agencies. Chandrappa *et al*. (2001) [6] conducted a cost-returns analysis for shoot feeding and shelf rearing methods of mulberry cocoon production in Shidlaghatta and Chintamani taluks of Kolar district, Karnataka. The total initial investment on building and equipment was Rs. 4, 06, 720 for shoot feeding and Rs. 2, 57, 600 for shelf rearing (capacity of 500 Dfls). The corresponding values were Rs. 23, 189.97 and Rs. 27, 490.77 per year and Rs. 2108.19 and Rs. 2499.15 per crop for shoot and shelf rearing methods, respectively. The recurring expenditure per crop was Rs. 15,977.42 for shoot feeding and Rs. 17,509.96 for shelf rearing, of which the expenditure

on leaf, labour and laying were maximum in both cases. For shoot feeding and shelf rearing methods, the average cocoon yields were 52.10 and 51.50 kg for 100 Dfls and the net returns were Rs. 13, 824.39 and Rs. 11, 540.89, respectively. The average cost incurred for producing a kilogram of cocoon was higher with shelf rearing (Rs. 77.71) than shoot feeding (Rs. 69.43). The returns per rupee invested was higher with shoot feeding (Rs. 1.76) than shelf rearing (Rs. 1.58). Rao *et al*. (2001) [30] in their study on comparative economics of cocoon production in coastal area and traditional areas of Andhra Pradesh showed that the cost and returns structure of cocoon production varied widely between the two areas. The cost of cocoon production was evaluated to be Rs. 24106.31 and Rs. 26810.03 in Chittoor (traditional area) and Eluru (coastal area) areas, respectively. The average yield obtained by the Chittoor farmers was higher (42.99 kg/100 dfls) than that of Eluru farmers (38.50 kg/100 dfls). The Eluru farmers realized a lower average price for cocoon (Rs. 98.75/kg) compared to Chittoor farmers (Rs. 106.50/kg) due to the non-availability of marketing facilities in that area which in turn caused deterioration of cocoon quality due to long distance transportation for marketing. The net revenue earned by Chittoor farmers was higher (Rs. 16966.51) than that of Eluru farmers (Rs. 5863.55). The cost benefit ratio was estimated at Rs. 1:1.70 and 1:1.22, respectively for Chittoor and Eluru areas. They also recommended that the extension agency should intensify its efforts and strengthen the marketing system in new areas to make the enterprise more viable. Srinivasa *et al*. (2001) [33] reported that the total cost of production of cocoons was Rs. 32786.75, Rs. 37427.46 and Rs. 34638.31 for bivoltine, multivoltine rearers and the overall category, respectively, in their study on cropping patterns and income levels of sericulturists in Mandya district, Karnataka. The net returns for the three categories were found to be Rs. 15756.86, Rs. 20051.16 and Rs. 18235.24, respectively. They also stated that the net returns were low in the case of bivoltine rearers compared to the multivoltine rearers as the bivoltine race (CSR) was reared only from September-February in which only 3 crops could be harvested as compared to 5 crops of multivoltine.

Umesh *et al*. (2001) [6] observed that under shoot feeding, the total cost of cocoon production per crop of 500 dfl's was Rs. 17794.77, of which the expenditure on silkworm rearing alone was Rs. 15865.08, whereas under shelf rearing, the total cost of cocoon production and silkworm rearing was Rs. 19687.14 and Rs. 17396.24, respectively, as indicated from their study on economic performance of mulberry cocoon production under different methods using chawki worms in Chintamani taluk of Kolar district. The costs of mulberry leaves accounted for the highest costs in both rearing methods, followed by labour and chawki worm costs. However, the cost incurred for labour in shelf rearing method was marginally higher (23.10%) over shoot feeding (19.38%). On an average, rearers have realized a net returns of Rs. 14655.23 under shoot feeding and Rs. 12342.86 under shelf rearing for every crop of 500 dfl's. To produce 1 kilogram of cocoon under shoot feeding and shelf rearing, rearers have to spend Rs. 67.15 and Rs. 75.29, to gain a net returns of Rs. 55.30 and Rs. 47.20, respectively. For every rupee invested in cocoon production, returns of Rs. 1.82 in shoot feeding and Rs. 1.63 in shelf rearing is expected. Hiriyanna *et al*. (2002) [15] evaluated the economics of CSR hybrids 'vis-à-vis' the popular multi x bi hybrid (PM x NB4D2) in their study on comparative economics of bivoltine hybrids with multi x bi hybrid cocoon production. The expenditure incurred for rearing CSR hybrids was higher than that of multi x bi hybrid rearing due to usage of more inputs but benefit cost ratio-wise, CSR hybrids were rated better than multi × bi hybrids. Reddy *et al*. (2002) [31] reported in their study on comparative economic analysis of bivoltine and multi-bivoltine silkworm rearing in Karnataka, that the total annual operational costs incurred by small, medium and large farmers for multi bivoltine cocoon rearing was Rs. 12 864, Rs. 18 339 and Rs. 22 463. The number of disease free layings and number of hired labour used annually by small, medium and large farmers for rearing multi-bivoltine cocoon ranged from 1099 to 1249 and 58 to 273 mandays, respectively.

Rane and Bagade (2006) [29] worked out cost and returns involved in cultivation of banana in Sindhurg district of Maharashtra. The primary data were collected through pretested schedule. Simple averages and tabular presentation were used for analysis. The per hectare cost of cultivation in Dodamarg tahsil and Sawantwadi tahsil were found to be Rs. 1.28 and Rs. 1.15 lakh, respectively with a net returns of Rs. 1.52 and Rs. 1.53 lakh, respectively. Gururaj *et al*. (2007) [12] reported in their study on sericulture at Kodagapura: a case study that the sericulturists who switched over to PM x CSR2 (as it was better yielder hence, more remunerative) in Kodagapura village recorded a cocoon yield of 52.22 kg/100dfls and showed an improvement of 10kg (26.3 per cent) over the bench mark cocoon yield of 41.32 kg/100dfls and earned better returns of Rs. 1800-2500/ 100 dfls after launch of Institute Village Linked Programme in 2004-05. Lakshmanan and Geetha (2007) [21] demonstrated in their study on employment opportunities in sericulture in Tamil Nadu that female labour participation is higher in particular and employment opportunities are even wider in sericulture in general as compared to other crops. They showed that mulberry sericulture generated 532 man days (of this, 319.20 man days utilised were from own family source and 212.80 man days hired) from one year period, in its activities such as garden establishment, leaf production, silkworm rearing and marketing while it was 296.15 man days for sugarcane and 133.50 man days for turmeric. They also observed that the sex ratio in labour participation was the highest in sericulture i.e. 1:1.86 while it was 1:0.93 for sugarcane and 1:1.49 for turmeric.

Anil Kumar Yadav (2008) [3] in their study on yield gaps and constraints in cocoon production in Karnataka revealed that in Kolar district, from 100 dfl, farmers produced 65.23 Kg of cocoons and 8.40 quintals of litter, the total cost was Rs. 7160.97 in which operation cost was Rs. 6710.64 and total fixed cost was Rs. 450.33. The major costs were mulberry leaf (Rs. 3616.24) and labour cost (Rs. 1636.63). While in Chikkaballapur district, using 100 dfl, farmers produced 66.04 Kg of cocoons and 7.50 quintals of litter, the total cost incurred in rearing 100 dfl was Rs. 7399.49. The total operational cost was Rs. 6959.06 in which mulberry cost (Rs. 3724.83) and labour charges (Rs. 1740.69) were the major costs. The gross returns obtained per 100 dfl in Kolar district was Rs. 9386.24. Net returns were Rs. 2225.27 and the B:C ratio was 1.31. Whereas in Chikkaballapur district, the gross returns obtained was Rs. 9395.15 per 100 dfl. The net returns were Rs. 1995.18 and the B: C ratio was 1.27. Hajare *et al*. (2008) [13] observed that the contribution from sericulture enterprise was found to be highest at 52 per cent (Rs. 82315/ha/yr) followed by paddy-sunflower (20 per cent), soybean-wheat (15 per cent) and soybean-gram (12 per cent) in paddy area, whereas it was as high as 54 per cent followed by cotton-pigeon pea (17 per cent), soybean-wheat (16 per

cent) and soybean-gram (13 per cent) in cotton area and sustained income continued up to 15-20 years. Purushothaum and Rao (2009) [28] conducted a study on Economics of sericulture in Ananthapur district of Andhra Pradesh. Cost and returns from cross breed (Pure Mysore × CSR2) silkworm rearing was estimated. The study has shown that net returns from one acre of mulberry worked out to Rs. 52,206 per year. The cost-benefit ratio of sericulture was worked out to be significantly higher (1:1.94). Detailed study of the economics revealed that the major economic factor contributing for the total cost in sericulture was labour which was 32.54 per cent for silkworm rearing and 13.95 per cent for mulberry production. Another important item was cost of equipment for silkworm rearing which is about 11.27 per cent.

Marketing of cocoons and other related crops

Murtuza Khan (1985) [27] in a study on economic analysis of seed cocoon production in Anekal taluk of Bangalore district reported that all the respondents of multivoltine cocoon production expressed the incidence of uzifly as the major problem. Infections from muscardine and flacherie diseases were reported by 64 per cent and 46 per cent farmers, respectively. On the other hand, 22 per cent and 26 per cent of the farmers expressed the problem of shortage of irrigation water, non availability of disease free layings and human labour. About 68 per cent of the respondents had no separate rearing house. In the case of marketing, 50 per cent of the respondents expressed the lack of transportation facilities. Under-weighment and poor prices of cocoons were the other major problems as opined by 34 per cent and 6 per cent of the sericulturists, respectively. Ramakrishna (1987) in his study on silk cocoon production in Karnataka, indicated that uzifly incidence was the major problem in cocoon production, which was reported by all the respondents, while 97 per cent of the respondents expressed their inability to have separate rearing house. Incidence of muscardine and grasserie were reported by 85 per cent and 81 per cent of the farmers. With regard to marketing, 93 per cent of the farmers were unhappy with weighment of cocoons and 87 per cent of the respondents suspected the existence of an illegal collusion between buyers and bidding agents. Reddy (1990) conducted a study on the characteristics and performance of farm entrepreneurs involved in sericulture in Chittoor district of Andhra Pradesh. The problems expressed by sericulturists were lack of improved mulberry variety (33 per cent), inadequate irrigation facility (60 per cent), non availability of disease free layings in time (25 per cent), lack of separate rearing houses (75 per cent), lack of timely credit (80 per cent), fluctuation in prices of cocoon (34 per cent) and inadequate transfer of technology. Kerutagi *et al*. (1994) [19] identified the constraints in silk cocoon production in their study on problems of sericulture enterprises in Bijapur district, Karnataka. The constraints identified include the incidence of pests (uzi fly) and diseases, water scarcity in the summer months, excess heat in summer. They also suggested some measures to overcome these constraints like uzi fly can be prevented using individual tray covers of nylon mesh, proper disinfection of all the materials used in the silk cocoon production and rearing of silk worm in huts and mud houses to control excess heat during summer. Jagannathan (1995) [16] identified the constraints encountered by sericulture farmers in Coimbatore district of Tamil Nadu. The study revealed that inadequate market facilities (80 per cent), lack of control measures for silkworm diseases (74 per cent), non-availability of labour for picking of leaves (70 per cent), high wage rates of labour (64 per cent), non availability of disease free layings (52 per cent), disinfection chemicals in time (48 per cent) and lack of skilled labourers for rearing silkworms (60 per cent) were the major problems.

Dodamani *et al*. (1996) [11] identified the constraints in mulberry cultivation and silk cocoon production in their study on problems of sericulture enterprises in Gulbarga district, Karnataka. They indicated that the incidence of pest and disease as well as shortage of irrigation water were the major problems in mulberry cultivation. Non availability of separate rearing rooms, shortage of rearing equipment, and mortality of layings and lack of availability of disease-free layings were the other problems faced by farmers in silk cocoon production. Prakash and Dandin (2005) [12] in their study on yield gaps and constraints in bivoltine cocoon production in Mandya District of Karnataka revealed that the major constraints for bringing down economically recoverable gaps were crucial inputs such as mulberry leaf, disinfectants, human labour and mountages. Athar and Bokhari (2006) identified, in their study on ethnobotany and production constraints of traditional and commonly used vegetables of Pakistan, that the most important constraints in summer and winter vegetables as lack of physical and social infrastructures, absence of market knowledge, use of improper seeds, high infestations of pests and diseases, post-harvest deterioration and lack of effective extension work. Lakshmanan *et al*. (2008) [22] conducted a study on economic appraisal of silk cocoon production in Southern India. The study was conducted mainly in Karnataka, Tamil Nadu and Andhra Pradesh. The marketing cost incurred in these states was found to be Rs 2166.65, Rs. 1855.75 and Rs. 1799.98 per acre per annum, respectively. Mallikarjuna *et al*. (2008) [23] conducted a study on economic analysis of sericulture vis-avis other selected agricultural crops under rainfed condition in Chamrajnagar district of Karnataka. The study on marketing cost revealed that farmer has incurred cost of Rs. 700.00 per acre per year. The contribution of marketing cost towards total cost was found to be 3.19 per cent. Anil Kumar Yadav (2008) [3] conducted study on Yield gaps and constraints in cocoon production in Karnataka. The study on marketing of cocoons in Kolar and Chikkaballapur district revealed that the farmer has incurred marketing cost of Rs. 125.12 and Rs. 159.27 per 100 Kg of cocoons, respectively. Purushothaum and Rao (2009) [28] conducted a study on Economics of sericulture in Ananthapur district of Andhra Pradesh. The study on marketing of cocoons in study area revealed that the farmer incurred marketing cost of Rs. 291 per acre per annum. The marketing cost contributed nearly 0.53 per cent to the total cost of cocoon production. Munikrishnappa *et al*. (2009) [25] studied the economics of sericulture in drought prone region of Andhra Pradesh. The farmer incurred marketing cost of Rs. 1799.98 per acre per year. It has contributed nearly 3.67 per cent towards total cost of cocoon production. 2.5 Constraints involved in sericulture and other related crops. Alimi *et al*. (2007) found in their study on economic rationale of commercial organic fertilizer technology in vegetable production in Osun State of Nigeria that major constraints to the use of commercial organic fertilizer are doubtful efficacy, offensive odour, heavy weed infestation, bulkiness and lack of funds in descending order of importance which if eliminated will boost demand for commercial organic fertilizer and improve production of vegetable for consumption.

Anil Kumar Yadav (2008) [3] in their study on yield gaps and constraints in cocoon production in Karnataka revealed that the major constraints in cocoon production were attack of pests and diseases, high wage rates of labour, inadequate

technical guidance from extension personnel, improper disinfection of rearing house and rearing equipments. Santhosh (2008) analyzed production and processing of Red gram in Gulbarga district of Karnataka. He documented that major problems faced by the processors were poor supply of power scarcity of labour as well as non availability of credit formed another problem. Dar *et al*. (2009) [8] conducted a study on constraints of silkworm rearers in Kashmir valley for adoption of rearing technologies. The study revealed that maximum rearers i.e., 83.30 per cent reported that mulberry cultivation has been traditionally public sector activity and hesitates to spare their small holdings for mulberry plantation only. So, the severe shortage of mulberry leaves was perceived as one of the major problems during the peak periods. Most of the rearers i.e., 8.00 per cent reported heavy loss due to lack of post-harvest technologies and proper marketing infrastructure in the valley conditions. About 64.44 per cent of selected farmers perceived that they harvest low yield due to lack of technical information and timely supply of inputs. Ruchira Shukla (2011) [32] was conducted a survey to know the constraints in adoption of recommended technologies in mulberry sericulture using personal interview method in two tehsils of Udaipur district of Rajasthan. It was found that among the constraints expressed by the farmers of mulberry sericulture, high input cost ranked first followed by lack of irrigation facilities whereas the constraint 'scattered field' was ranked as last according to the responses obtained from mulberry sericulturists.

In India, sericulture is one of the most important agro and forest based cottage industry, earning a foreign exchange of Rs. 400 corers / annum and providing gainful employment to over six million people. In the review it has been clearly indicated that the area under mulberry in in Karnataka was declining, which in turn affected the production of silk cocoons, this requires intensified extension activities such as trainings, demonstrations among farmers by Sericulture experts. The major problem faced by the sericulturists in mulberry cultivation was shortage of irrigation water during summer and this problem could be reduced by effective use of water by adopting drip or sprinkler irrigation systems. High pest and disease attack both during mulberry crop cultivation and silk worm rearing were considered as constraints which drastically reduced the leaf yield of mulberry and of silk cocoon. Hence, there is a need to organize various extension activities through trainings, demonstrations *etc*. to educate the sericulturists from time to time for effective control of pest and diseases and diffusion of cost effective technologies to enhance production of quality cocoons. Majority of the sericulturists in the review marketed their silk cocoons in the nearby local markets where they lacked basic infrastructural facilities as compared to the specialised silk cocoon markets. The government should arrange for development of required infrastructural facilities in these local markets. So that the sericulturists will get competitive price for their produce. In view of this, it is very much imperative to know the sericulture economics and constraints in production in order to motivate new farmers to take up sericulture and increase their income.

References

1. Ahuja UR, Shekhawat PS, Dhanpat Suthar, Saraswat PK, Jodha GS. Yield gaps and constraints in the production of mung and moth bean in arid Rajasthan. J Arid Legumes. 2005; 2(2):279-281
2. Aiyaswamy PK. Income and Employment Potentials of Sericulture in Coimbatore District. Proc. Symp. Semi. Seric, 1980, 239-243p.
3. Anil Kumar Yadav. Yield gaps and constraints in cocoon production in Karnataka : an Econometric analysis. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India, 2008.
4. Balasaraswathi SS, Lakshmanan A, Mani A, Mahima Shanthi, Qadri SMH. An economic analysis of cocoon production in Theni district of Tamil Nadu. Indian J Seric. 2010; 49(1):81-85.
5. Chandra Reddy T. Impact of sericulture industry on Income and employment in rural areas of Chittoor district, Andhra Pradesh. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka, India, 1987.
6. Chandrappa D, Umesh KB, Nageshchandra BK. Comparative economics of mulberry cocoon production - shoot vs. shelf rearing method. Mysore J Agric. Sci. 2001; 35(3):265-269.
7. Chandrashekara Reddy R. Income and employment generation in sericulture vis-à-vis alternative crops in Hosur taluk of Dharampuri district. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka, India, 1985.
8. Dar SK, Farhat Iqbal Qadri, Munshi NA, Abdul Majid Tantray, Sheikh ND. Indian J. Seric. 2009; 48(1):96-99.
9. Das KK, Sahu PK, Das NK. Problems of sericultural farmers in West Bengal - a critical appraisal. Economic Affairs, Calcutta. 1997; 42(3):172-177.
10. Datta RK, Ravikumar C. Sericulture and rural development. Nat. Bank News Rev. 1988; 4(5):25-35.
11. Dodamani MT. Economics of silk cocoon production in Gulbarga district, Karnataka. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India, 1996.
12. Gururaj R, Magadum SB, Dandin SB. Sericulture at Kodagapura: a case study. Indian Silk. 2007; 46(2):20-21.
13. Hajare TN, Jadhav AD, Jagadish Prasad, Challa O, Kalantri LB. Sericulture brings better income. Indian Silk. 2008; 46(9):27.
14. Hanumappa HG. Mulberry cultivation, cocoon production and employment generation in Karnataka. Seri. Rural Dev., Himalaya Publishing House, Bombay, 1986, 129-146p.
15. Hiriyanna, Swamy TP, Kumaresan P, Prakash NBV. Comparative economics of bivoltine hybrids with multi x bi hybrid cocoon production. Indian J. Seri. 2002; 41(1):38-41.
16. Jagannathan N. Impact of sericulture on income and employment generation. Indian Silk. 1995; 33(9):11-16.
17. Jolly MS. Economics of Sericulture Under Rainfed Conditions. Central Sericultural Research and Training Institute, Mysore, Project No. 1, 1982, 13p.
18. Kasiviswanathan K, Krishnaswamy S. Package of practices for mulberry cultivation. Seminar Report, C. S. B., Bangalore, 1972.
19. Kerutagi MG. Production and marketing of silk cocoons in Bijapur district, Karnatakaan economic analysis. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India, 1991.
20. Kumaresan P, Srinivs G, Arun Kumar KS. Optimum age of replacement of mulberry garden in Karnataka. Indian J. Seri. 1994; 33(3):56-88.
21. Lakshmanan S, Geetha Devi RG. Employment opportunities in sericulture. Indian Silk. 2007; 46(7):18-20.

22. Lakshmanan S, Munikrishnappa HM, Mallikarjuna B, Geethadevi RG. An economic appraisal of silk cocoon production in Southern India. Indian J Seri. 2008; 47(1):40-44.
23. Mallikarjuna B, Lakshmanan S, Munikrishnappa HM, Geethadevi RG. An economic analysis of sericulture vis-a-vis other selected agricultural crops under rainfed condition in Chamrajnagar district of Karnataka. Indian J Seri. 2008; 47(1):115-117.
24. Marihonniah Y. Income and employment generation in dryland sericulture and ragi mixed crop enterprise in Kunigal taluk, Tumkur district. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka, India, 1987.
25. Munikrishnappa HM, Lakshmanan S, Geethadevi RG, Mallikarjuna B. A study on economics of sericulture in drought prone region of Andhra Pradesh. Indian J. Seri. 2009; 48(2):201-203.
26. Murthy SRS. Economics of silk cocoon production with irrigated mulberry in Devanahalli taluk, Bangalore district. M.Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka, India, 1977.
27. Murtuza Khan. An economic analysis of bivoltine seed cocoon production in Anekal taluk, Bangalore District. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka, India, 1985.
28. Purushotham S, Rama Mohan Rao P. Economics of sericulture in Ananthapur district of Andra Pradesh. Agic. Sci. Digest. 2009; 29(2):120-122.
29. Rane AA, Bagade SR. Economics of production and marketing of banana in Sindhurg district of Maharashtra. Indian J Agric. Mktg. 2006; 20(1):38-45.
30. Rao MV, Kumaresan P, Prakash NBV. Comparative economics of cocoon production in coastal area and traditional area of Andhra Pradesh. Indian J Seri. 2001; 40(2):147-150.
31. Reddy TRK, Chamola SD, Mahesh N, Lalith Achoth, Comparative economic analysis of bivoltine and multi-bivoltine silkworm rearing in Karnataka. Mysore J Agric. Sci. 2002; 36(1):72-76.
32. Ruchira Shukla. Constraints in adoption of recommended technologies in mulberry sericulture in Rajasthan. Agric. Sci. Digest. 2011; 31(3):235-236.
33. Srinivasa G, Kumaresan P, Vijayaprakash NB. Economic analysis of resource use efficiency in sericulture. Indian J Seric. 2008; 47(1):29-33.
34. Suresh A, Keshava Reddy TR. Recource use efficiency of paddy cultivation in Peechi command area of Thrissur district of Kerla: An economic analysis. Agric. Econ. Res. Rev. 2006; 19(1-6):159-171.
35. Thangamuthu C, Venkataravi R. Sericulture in Tamil Nadu: assessment of the potentialities. J Rural Dev. 1989; 8(5):519-528.
36. Ullal SR, Narasimhanna MN. Handbook of Practical Sericulture, Central Silk Board, Bombay, 1978.
37. Umesh KB, Chandrappa D, Nageshchandra BK. Economic performance of mulberry cocoon production under different methods using chawki worms. Mysore J Agric. Sci. 2001; 35(2):163-167.
38. Venkataram B. Report on Financing the Crash Programme for the Development of Sericulture in Karnataka, Agricultural Credit Department, Reserve Bank of India, Bombay, 1974.