Production and Marketing of Silk Cocoons in Kolar District of Karnataka – An Econometric Analysis

THESIS

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Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

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By

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2018

CERTIFICATE – I

This is to certify that the thesis entitled ***"Production and Marketing of Silk Cocoons in Kolar District of Karnataka – An Econometric Analysis"*** *submitted in partial fulfilment of the requirement for the degree of* ***MASTER OF SCIENCE (Agriculture) in Agricultural Economics and Farm Management*** *of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, is a record of the bonafide research work carried out by* ***Ms. Bindu C S,*** *I.D. No. 160109034, under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instruction.*

All the assistance and help received during the course of investigation has been acknowledged by her.

Place: Jabalpur

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Chairman of the Advisory Committee

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This is to certify that the thesis entitled ***"Production and Marketing of Silk Cocoons in Kolar District of Karnataka – An Econometric Analysis"*** *submitted by* ***Ms. Bindu C S*** *to the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, in partial fulfilment of the requirements for the degree of* ***MASTER OF SCIENCE (Agriculture)*** *in the Department of* ***Agricultural Economics and Farm Management,*** *has been, after evaluation, approved by the External Examiner and by the Student's Advisory Committee after an oral examination on the same.*

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I, Bindu C S, D/o Srinivasa Gowda C V, Certify the work embodied in thesis entitled “Production and Marketing of Silk Cocoons in Kolar District of Karnataka – An Econometric Analysis” is my own hand bonafide work carried out by me under the guidance of Dr. P.K. Awasthi at Department of Agricultural Economics and Farm Management, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during 2018.

The matter embodied in the thesis has not been submitted for the award of any other degree/diploma. Due credit has been made to all the assistance and help.

I, undertake the complete responsibility that any act of misinterpretation, mistakes, and errors of fact are entirely of my own.

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Place: Jabalpur

Date: …./…./2018 (BINDU C S)

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CHAPTER – 1

INTRODUCTION

Sericulture is both an art and science of raising silkworms for silk production. Silk as a weavable fiber was first discovered by the Chinese empress Xi Ling Shi during 2,640 B.C. and its culture and weaving was a guarded secret for more than 2,500 years by the Chinese. Being a rural based industry, the production and weaving of silk are largely carried out by relatively poor sections of the society and this aspect of sericulture has made it popular and sustainable in countries like China and India.

India is the second largest producer of raw silk after China and the biggest consumer of raw silk and silk fabrics. An analysis of trends in international silk production suggests that sericulture has better prospects for growth in the developing countries rather than in the advanced countries. Silk production in temperate countries like Japan, South Korea, USSR etc., is declining steadily not only because of the high cost of labour and heavy industrialization in these countries, but also due to climatic restrictions imposed on mulberry leaf availability that allows only two cocoon crops per annum. Thus, India has a distinct advantage of practicing sericulture all through the year, yielding a stream of about 4-6 crops as a result of its tropical climate.

Over the last six decades Indian silk industry has registered an impressive growth, both horizontally and vertically. Plans and schemes implemented by central and state agencies and relentless efforts of thousands of dedicated persons in the fields of research and extension have helped in this context. For instance, the age old multivoltine hybrids have been replaced by multivoltine × bivoltine and bivoltine hybrids. The sericulture industry has witnessed a quantum jump in raw silk productivity. The average yield of 25 kg of cocoons/100 DFLs in the recent past has increased and currently the average yields are in the range of 60-65 kg/100 DFLs. The new technology, besides doubling yields has also led to qualitative improvements in cocoon production with considerably reduced renditta and has also helped break the climate barrier.

The Indian Silk Industry has crossed 30,000 MT mark in terms of total raw silk production in 2016-17 and recorded a production of 30,348 MT as compared to 28,523 MT in 2015-16 indicating an annual increase of 6.4 percent. Out of the total raw silk production, mulberry sector contributed a total of 21,273 MT (Bivoltine (BV) - 5,266 MT and Cross Breed (CB) - 16,007 MT) as compared to 20,478 MT (BV - 4,613 MT and CB - 15,865 MT) in 2015-16. The production of import-substitute bivoltine mulberry silk recorded an impressive jump of 14.2 percent due to the joint efforts of CSB and state sericulture departments and keen involvement of farmers in growing bivoltine silk both in captive (seri-clusters) and non-captive areas. The Vanya sector, comprising Tasar, Eri and Muga silks, recorded a higher production of silk - 3268 MT (Tasar), 5637 MT (Eri) and 170 MT (Muga), producing a total of 9075 MT and recording a growth of 15.6 percent, 11.3 percent and 3.2 percent, respectively as compared to the last year. Fabrics, made-ups and readymade garments are the major items of India's silk exports, which account for about 91.5 percent of the total silk goods exports of the country. The industry, despite the global recession, managed an export earnings of Rs.2093.42 crore from silk and silk-goods. A total of 3795 MT of raw silk worth Rs.1092.26 crore was imported mainly from PR China, to supplement the domestic production for meeting the increasing demand (Source: www.csb.gov.in).

Sericulture in Karnataka has 200 years history. It was introduced by King Tippu Sultan who needed high value, low volume commodities to trade with Europe in exchange for arms and ammunitions. Sericulture took its roots in Karnataka due to the meticulous care taken in its propagation by him. The rulers succeeding him in Mysore also continued the royal patronage to this activity. Subsequently, the British encouraged the production of mulberry silk in Mysore and Kollegal areas which were then in the Madras province. Though Kashmir and West Bengal were the leading sericultural states in India in the past, later Karnataka became the leading producer of silk and currently accounting for 44.09 percent of the mulberry silk production in the country. This was possible because of a conducive climate, institutional support and planning and the traditional skills of the farmers.

Since sericulture is a state subject, Government of Karnataka launched intensive programmes like, Karnataka Sericulture Project with the assistance from the World Bank to develop sericulture industry in the state. The idea was to expand the production base and to provide a sound infrastructure to the industry.

Mulberry silk is produced from silkworm (*Bombyx mori L*.) which feeds on mulberry leaves. Silkworm rearing is location specific, requires temperature ranging from 70^0 F to 85^0 F, humidity in the range of 60 to 80 percent and the annual rainfall of about 600 mm found suitable for cultivation. Silkworms produce the cocoon in about 25-30 days, after which worms spin cocoons. These cocoons are sold to the reelers at the regulated cocoon markets. The reelers convert them into silk yarn. In the major silk producing states, there are well established cocoon markets for the sale of cocoons. The reeled silk is bought by weavers and this transaction takes place through the silk exchanges.

Sericulture has been practiced since several decades, the dynamic changes in the field of sericulture research and development have been brought during the last three decades, mainly due to introduction of better mulberry varieties and silkworm races and improved cultural and rearing practices. Though extension network has been established at national and state level to educate sericulturists, a wide gap exists between the recommended technology and actual adoption by sericulturists. To plans a suitable intervention strategy, to bridge this gap, it is necessary to understand present knowledge level for improved production technologies and socio-economic profile of the farmers. It is; therefore, present study was conducted to know the extent of knowledge of improved sericulture production technologies and profile analysis of farmers of Kolar district of Karnataka state.

The study relates to Kolar district of Karnataka state which represent 2.08 percent of the total geographical area of the state. The nature of the study is both positive and normative and it is sought to diagnose the sericulture activities regarding the existing level of technology adoption, cost and returns, and constraints in silk cocoon production and marketing etc.

Such study is essential to assess the profitability from sericulture so that the hidden barriers could be focused in some definite terms and some suggestion could be given.

With a broad agricultural base, Sericulture is seen as an effective tool for rural development and reconstruction. The present study seeks to answer the questions like, a) Cost incurred and returns obtained from silk cocoons, b) Extent of profit from Sericulture in different scale of production and marketing pattern followed by sericulturists and c) The probable constraints pertaining to silk cocoon production and marketing. Looking into the importance of Sericulture in rural economy the present study was undertaken with the following objectives.

1.1 OBJECTIVES

1. To study cost structure and profitability from silk cocoon production on sample farms.
2. To study marketing of silk cocoons in the study area.
3. To identify production and marketing constraints faced by silkworm rearers and to suggest the solutions to overcome the constraints.

1.2 HYPOTHESES

1. Production of silk cocoons is not profitable to the farmers.
2. Cost of marketing of cocoons is same in all groups of farmers.
3. Farmers do not have constraints in production of cocoons and cocoon marketing.

1.3 Limitations of the study

The present study mainly relied upon the data collected through personal interview using a pre-tested schedule for the agriculture season which was already completed. Therefore, some amount of recall bias is bound to be associated with the data since the farmers did not maintain any record about the cultivation expenses, application of inputs and returns especially for crop production.

However, efforts were made to minimize them through cross checks at the time of data collection. The degree of discrepancy if any would be negligible as the estimates presented are in averages. The year to year wide variations in yield is a common phenomenon observed in silk cocoon production. The major factors influencing this phenomenon includes: climatic variations, occurrence of pest and diseases, variations in inputs used and the quality of mulberry leaf grown and fed to the silkworms.

The average yield of only one crop was considered in the study and the study has not taken into account the extent of variations caused by these factors on the productivity levels. The average prices realized by sericulturists for cultivation of one crop was calculated and used in converting production figures from quantities to value term, although the prices realized would be different from farmer to farmer in each crop.

1.4 Presentation of the study

This study is undertaken in Kolar block of Kolar district, Karnataka. This thesis is organized into five chapters. The first chapter provides a brief introduction along with the specific objectives. In chapter second, some pertinent reviews are presented in consonance with the study objectives. Chapter three describes the main features of the study area, sampling framework, database and analytical tools employed in the analysis of the data. The empirical results pertaining to study are presented in chapter four along with critical discussion of results. Finally, chapter five summarizes the major findings of the study with suggestions.

CHAPTER – 2

REVIEW OF LITERATURE

The review of past studies helps us in framing objectives, developing research design, variable selection, interpreting the results and in drawing meaningful conclusions. In accordance with the objectives of the study, a brief review of literature is presented under the following headings.

2.1 Cost structure and profitability from silk cocoon production

2.2 Marketing of silk cocoons

2.3 Production and marketing constraints in sericulture

2.1 Cost structure and profitability from silk cocoon production

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) conducted a cost-returns analysis for shoot feeding and shelf rearing methods of mulberry cocoon production in Sidlaghatta 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 layings were maximum in both cases. For shoot feeding and shelf rearing methods, the average cocoon yields were 52.10 kg 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) 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 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.

Srinivasa *et al.* (2001) 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) observed that under shoot feeding, the total cost of cocoon production per crop of 500 DFLs 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 Chikkaballapura 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 DFLs. To produce 1 kg 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) 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) 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 respectively.

Lakshmanan and Mallikarjuna (2006) reported that the cost of cocoon production per kg of cocoon increased from Rs. 70.43 during 1993-94 to 79.29 in 1995 - 96, which is due to the escalation of input prices.

Gururaj *et al.* (2007) 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/100 DFLs and showed an improvement of 10kg (26.3%) over the bench mark cocoon yield of 41.32 kg/100 DFLs and earned better returns of Rs. 1800-2500/ 100 DFLs after launch of Institute Village Linked Programme in 2004-05.

Lakshmanan and Geetha (2007) 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 mandays (of this, 319.20 mandays utilised were from own family source and 212.80 mandays hired) from one-year period, in its activities such as garden establishment, leaf production, silkworm rearing and marketing while it was 296.15 mandays for sugarcane and 133.50 mandays 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 (2008) in their study on yield gaps and constraints in cocoon production in Karnataka revealed that in Kolar district, from 100 DFLs, 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 DFLs, farmers produced 66.04 Kg of cocoons and 7.50 quintals of litter, the total cost incurred in rearing 100 DFLs 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 DFLs 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 DFLs. The net returns were Rs. 1995.18 and the B: C ratio was 1.27.

Dandin *et al.* (2008) reported that large scale farmers possessing more than 5 acres of mulberry incurred a total expenditure 64,167.90/acre/year and in case of small / medium scale farmers it was Rs. 64,537.58/acre/year for the cocoon production in Tamil Nadu. The cost of cocoon production per kg was worked out to Rs. 100.28 for large and Rs. 93.48 for small scale farmers in Tamil Nadu.

Hajare *et al.* (2008) observed that the contribution from sericulture enterprise was found to be highest at 52% (Rs. 82315/ha/yr) followed by paddy-sunflower (20%), soybean-wheat (15%) and soybean-gram (12%) in paddy area, whereas it was as high as 54% followed by cotton-pigeon pea (17%), soybean-wheat (16%) and soybean-gram (13%) in cotton area and sustained income continued up to 15-20 years.

Krishnamoorthy *et al.* (2008) reported that farmers of Manu patty cluster adopted exclusively bivoltine DFLs, consuming Rs. 2,44,675 during 2006-07 as against 2850 DFLs during 2003-04. The average yield of bivoltine improved from 53.4 to 62 kg/100 DFLs. A total of 15,51,359 DFLs were reared during 2003-04 to 2006-07 of which 6,43,803 DFLs were CSR bivoltine hybrids. Obviously, it had a significant impact on their net income that increased by about 70% *i.e.*, from Rs. 34,364 to Rs. 58,781 acre/year. The farmers of Dasampalayam achieved the maximum net return of Rs. 72,010/acre/year. The variable cost worked out was Rs. 40,481.00 and the fixed cost was Rs. 8,781.40 and the total cost was Rs. 49,262.40. The total gross return was Rs. 108043.00. The net return was Rs. 58,781.00/acre/year with the cost benefit ratio of 1:2.10.

Kumaresan *et al.* (2008) observed that the study was carried out in Udumalpet area of Coimbatore district during 2005-2006. The cost of production of cocoon per kilogram for the large farmers was Rs. 100.61/- and in the case of small farmers it was Rs. 93.48 /-. The expenditure incurred on labour by the small farmers was more than the large farmers which was Rs. 17,122.71/acre/year and Rs. 13,990.65 for small and large farmers respectively. The gross income obtained by small farmers was Rs. 1,04,665.52 / acre / year and Rs. 94,732.22 / acre / year by large farmers.

The net income earned by the small farmers was Rs. 40,127.94 / acre / year and Rs. 30,564.32 / acre / year by large farmers. The cost benefit ratio was 1:1.61 for small scale farmers and 1:1.48 for large farmers. Though the large farmers did not obtain the revenue comparable to the level of small farmers, their profit levels were high with the cost benefit ratio of 1:1.48 which was comparable with many other cash crops such as sugarcane, turmeric, cotton, banana, etc.

Srinivasa *et al.* (2008) carried out a study in Chamajanagar and Kolar districts or Karnataka during 2002-2003 revealed that the production cost of mulberry leaf was Rs. 6,528.00 acre/year in Chamarajanagar district and Rs. 31,929.00 / acre / year in Kolar district. The total cost of silkworm cocoon production was Rs. 16,520.00 and Rs. 77,780.00 / acre / year in the case of Chamarajanagar and Kolar districts respectively. The total return was Rs. 11,566.00 / acre / year and Rs. 1,25,954.00 / acre / year and the net return was Rs. 4,684.00 and Rs. 48,168.00 acre / year in the case of Chamarajanagar and Kolar districts respectively.

Hiriyanna *et al.* (2009) reported that the cost of cocoon production increased to Rs. 32,777.73/acre/year from Rs. 24,997.64 after implementation of the extension programmes. The gross revenue has increased from Rs. 43,649.55 / acre/year to Rs. 84,839.69. The net revenue was Rs. 18,651.90 and Rs. 52,061.96 before and after implementation of the programmes. The cost benefit ratio worked out was 1:1.75 before and 1:2.59 after implementation of the programmes.

Murtuza Khan *et al.* (2009) reported that the comparative economic analysis of cocoon production in Kolar district revealed that the total variable cost for bivoltine and crossbreed were Rs. 55,821.54 and Rs. 48,726.15/acre/year which accounted for 87.12% and 86.31% respectively and the net return were Rs. 51,723.32 and Rs. 33,510.73. The total quantity of mulberry leaf used per acre per year for both was 23,653.53 kg and 20,780.45 kg respectively. The total cost of leaf production per acre per year was found to be Rs. 32,540.64 and Rs. 27,745.72. The total cost of Rs. 37,994.00 the silkworm rearing cost was Rs.53740.00 and the total cost was worked out to Rs. 91,734.00.

The number of DFLs reared was 1136/acre/year and the cocoon yield was 838 kg/acre/year. The average yield obtained was 73.8 kg/100 DFLs. The average cocoon rate was Rs. 219.00. The total returns was Rs. 1,83,522.00 and the net return was Rs. 91,788.00. The cost of cocoon production worked out was Rs. 109.46/kg. The cost benefit ratio was 1:2.00.

Purushothaum and Rao (2009) 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% for silkworm rearing and 13.95% for mulberry production. Another important item was cost of equipment for silkworm rearing which is about 11.27%.

Balasarswathi *et al.* (2010) revealed the costs incurred towards establishment of mulberry garden in Theni district of Tamil Nadu. It worked out to an average of Rs. 8069.50 for establishment of one acre of mulberry garden. The different costs associated with garden establishment indicated that the highest share (28.20%) was incurred for FYM followed by Rs. 4020.00 for human labour which accounts to 22.20% of the total cost of establishment. Out of the total establishment cost, human, animal labour and tractor power formed the major share (28.60%). Among the inputs, FYM and chemical fertilizers formed the major share (30.40%). The different costs associated with the mulberry garden maintenance indicated that the highest share was incurred for human labour (42.0%) due to scarcity of man power in Theni district of Tamil Nadu. The cost of labour, FYM and fertilizer, all put together accounted for 72.90% of the total production cost in the study area. The unit cost of leaf production (per kg) was estimated to Rs. 1.39.

Thirunavukarasu and Balakrishna (2011) stated that the analysis of the rearing date of farmers of two groups (CRC supported and Director brushing) for two years 2008-09 and 2009-10 revealed that the group of farmers who reared silkworm received from the CRC harvested an average yield of 72

kg/100 DFLs and got a net income of Rs. 84,496/acre/year whereas the farmers who reared silkworm right from brushing by themselves harvested an average yield of 60 kg/100 DFLs and got a net income of Rs. 62,500 / acre / year.

Jayaram *et al.* (2012) reported that in Karnataka state the area under mulberry cultivation was Rs. 97,647 ha during 2006 – 2007. The mulberry silk cocoon production was Rs. 58,697 MT and had a Compound Growth Rate of 2.77%. Similarly, the raw silk produced during the year was 7,993 MT with a Compound Growth Rate of 4.93%.

Chandrama and Manisha (2013) conducted a study on contribution of sericulture to women's income in Goalpara district of Assam, India. The contribution of sericulture for their income is about 23.24% and the returns from sericulture are very high with a low investment. An income of Rs. 1,40,000/- or Rs. 4,20,000/- can be generated by an investment as low as Rs. 40,750/- in case of muga cultivation. In case of Eri silk, the returns are as high as Rs. 29,400/- from an investment of Rs. 13,100/- in one hectare of land.

Prakasam and Ravi (2014) studied Sericulture as an ideal enterprise for sustainable income in Erode district of Tamil Nadu. The sample farmers of Tamil Nadu in Erode area attained an average cocoon yield of 74.55 kg / 100 DFLs and their cocoon fetched an average price of Rs. 224.47/kg. Thus, the total income from cocoon has been arrived at of Rs.1,80,613.05 from 804.62 kg. of cocoon production.

Roopa and Murthy (2015) conducted a study to analyze the cost of mulberry and cocoon production in Haveri district of Karnataka state. The cost of mulberry cultivation was found to be Rs. 23,278.54 per acre in case of marginal farmers, Rs. 25,116.18 per acre in case of small farmer and Rs. 26,358.52 per acre in medium farmers. The cost of cocoon production was high for medium farmers Rs. 50,046.54 per acre, followed by small farmers Rs. 55,036.06 per acre and marginal farmers Rs. 59,187.20 per acre.

2.2 Marketing of silk cocoons

Anil Kumar (2008) 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.

Lakshmanan *et al.* (2008) 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) conducted a study on economic analysis of sericulture vis-a-vis 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%.

Munikrishnappa *et al.* (2009) 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% towards total cost of cocoon production.

Purushothaum and Rao (2009) 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% to the total cost of cocoon production.

2.3 Production and marketing constraints in sericulture

Harinath (2001) examined problems encountered by farmers in production and marketing of cocoon in Ramanagaram and Siddlaghatta market. He reported that incidence of pest and disease problem was major problem faced by the farmers in production which is expressed by 85% of the farmers, followed by shortage of rearing equipment and inadequate finance for investment which is expressed by 76.66% and 70% of farmers respectively.

In marketing of cocoon price fluctuation is the major problem expressed by 86.66% of the farmers followed by the problem of unremunerative prices and non-availability of market information was expressed by 75% and 56.66% of the farmers.

Rajan (2002) reported that the major problems in adoption of bivoltine sericulture technologies were timely supply of quality silkworm eggs in required quantity, organizing large number of chawki rearing centers, providing hygienic condition and supply of required equipments.

Munikrishnappa *et al.* (2002) observed that lack of finance was the major constraint (42%), faced by the small farmers (up to 2.5 acres) and fluctuation in cocoon price was the major constraints faced by the medium (2.6 to 5.0) and large farmers (more than 5.0 acres) respectively in Mysore district in adopting improved sericultural practices.

Dhane and Dhane (2004) reported that farmers expressed constraints in mulberry cultivation such as high labour wages (94%) inadequate labour (98%) inadequate irrigation facilities (78%), high cost of manures and fertilizers (73%), lack of guidance and lack of knowledge about mulberry diseases and pest (67%).

Mallikarjuna *et al.* (2004) indicated that high cost was the major constraint for non-application of recommended dose of fertilizers. Availability of excess water (47%), lack of initial investment (24%) and delay in sanction of loan (22%) were the major constraints for non-adoption of drip irrigation technology. Lack of awareness (97%) was the major constraint for non-adoption of biological control for uzi fly management.

Deepa *et al.* (2005) observed that the main reasons for partial and non-adoption of recommended sericulture technologies by farmers of Mulakalacheruvu mandal of Chittoor district were lack of knowledge, strong belief to own ideas, reluctance on advanced practices, lack of extension participation and contact and financial constraints.

Vijay Prakash and Dandin (2005a) conducted a study on yield gaps and constraints in bivoltine cocoon production in Mandya district of Karnataka which revealed that the constraints faced by the small farmers (Non-availability of inputs 65%, rearing house 68%, DFLs 39%, disinfectants 39% and mountages 39%) were more when compared with the large farmers (Non-availability of inputs 54%, separate rearing house 40% and disinfectant 32%). The reasons for poor adoption of new technologies were attributed to poor performance of the technology at field, lack of adequate information, defective approaches and one-way traffic method of technology transfer (Dandin *et al.*, 2005a).

Vijay Prakash and Dandin (2005b) reported that major constraints for the technology adoption were non- availability of inputs in time (72.22%). Followed by Fluctuations in cocoon price (56.56%), requirement of separate rearing house (33.32%) and high cost of inputs (12.00%) for the small farmers, the constraints expressed by the large farmers for the adoption of bivoltine sericulture technologies include high cost of inputs (41.67%), fluctuation in cocoon price (38.89%) and non-availability of inputs in time (27.78%). Further, they have also reported that the response of respondent's farmers regarding the constraints for getting higher field in case of small farmers were non- availability of inputs (68%), rearing house (65%), DFLs (39%), similarly it was observed in the case of large farmers that non-availability of inputs (54%), separate rearing house (40%) and disinfectants (32%) were the most serious constraints. further, the small farmers expressed other constraints, like shortage of human labour (16.78%) rearing materials (23%) and transport and marketing (26%), likewise the DFLs (24%), human labour (27%), material (21%), mountages (13%), and transport and marketing (24%) were the constraints of large farmers.

Madhu Prasad (2006) reported that major constraints faced in adoption of silkworm rearing technologies were difficulty in picking of worms, requirement of more inputs for chawki garden, tukra infestation, high cost and pungent smell of Vijetha, availability of duplicate disinfectants in the market with synonymous names, non- availability (100%) and complicated application procedure (77.08%) were the major constraints in adoption of bio fertilizer among the farmers of Kolar district.

Jadhav *et al.* (2007) studied on the constraints faced by the farmer in mulberry cultivation and silk worm cultivation and they found that four types of constraints faced by the silk worm rearing farmer (1) non- availability of rearing equipment, (2) high cost of manure fertilizer, (3) fast deterioration in quality of cocoon, (4) temperature and humidity.

Anil Kumar (2008) 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.

Dar *et al.* (2009) 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% reported that mulberry cultivation has been traditionally public-sector activity and hesitate 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% reported heavy loss due to lack of post-harvest technologies and proper marketing infrastructure in the valley conditions. About 64.44% of selected farmers perceived that they harvest low yield due to lack of technical information and timely supply of inputs.

Qadri *et al.* (2010) were found that the adoption level of the improved package of practices of mulberry cultivation and silkworm rearing were at very low rate. Expensive and cumbersome technologies, lack of awareness, and non- availability of technology were attributed as the major reasons for non-

adoption. Creating awareness and interest among farmers 27 about latest technologies and development of farmer-friendly and cost-effective technologies are needed. Hence, it has been suggested that intensified extension efforts would bear fruitful results in popularizing the improved sericulture.

Shukla (2011) investigated problems faced by sericulturists were conducted during 2007-08 in district Udaipur of south Rajasthan. Seventy sericulturists (35 each adopters and non- adopters) from two Tehsils viz Mavli and Jhadol were selected purposively for the study. The results revealed that majority of the respondents (95.71%) face the problem of irrigation during summer among them 10% sericulturists face the problems during marketing of cocoons. Problems like problems of family labor (8.85%), housing for silk worm (7.14%), serious silk worm diseases (5.71%) and monetary problems (5.71%) were least expressed by the sericulturists of the study area.

CHAPTER – 3

METHODOLOGY

This chapter outlines the features of the study area, the method of sampling adapted, nature and sources of data collection and different tools and techniques employed in analyzing the collected data. The concepts used in the study are defined and explained to facilitate a clear understanding of the issues related to the present study.

The methodology is explained in 3 sub chapters

3.1 Profile of study area

3.2 Selection of respondents

3.3 Analytical tools and techniques employed.

3.1 Profile of the study area

Karnataka state is selected for the study at the state level. Karnataka is the eighth largest state in India with a geographical area of 190 lakh ha. It is located between 11° 50' and 19° 00' N latitude and between 74° and 78° E longitude in the southern plateau. The state receives an average annual rainfall of about 1139 mm, both from south-west and north-east monsoons. The important crops grown in the state are paddy, jowar, ragi, maize, bajra and wheat among cereals; red gram, green gram, tur and bengal gram among pulses; groundnut, sunflower and safflower among oilseed crops and cotton, sugarcane and tobacco among commercial crops; tomato, onion, brinjal, cabbage and potato among vegetables; grape, guava, pineapple, sapota, banana, mango, pomegranate, citrus and papaya among fruits. Karnataka comprises 30 districts of which 12 districts are located in northern part of the state and rest in southern part of the state.

Sericulture is a prime commercial crop of Karnataka; it creates lots of employment and also highly profitable. During 2012 – 2013, Karnataka state had 74,128.1 ha (1,85,320.25 Acre) mulberry plantation in 10,542 villages involving 1,30,522 people involving in Sericulture. Adopting modern technologies Karnataka state has produced 898.35 lakhs of Chawki (58.99 lakhs of Bivoltine and 838.36 lakhs Multivoltine DFLs) and produced 49,441.003 MT. (3,548.625 MT Bivoltine and 45,892.378 Mt

Multivoltine) cocoons and from this 7,063 MT raw silk has been produced (Bivoltine 572.4 MT and 6,490.6 MT Multivoltine). As per statistics per acre 266.80 kg cocoon has been produced and from this 38.112 kg raw silk been obtained. (http://e-krishiuasb.karnataka.gov.in)

3.1.1 Geographical description of Kolar district

Kolar district falls under the Eastern dry zone (Zone 5) of Karnataka state. It geographically lies within the interior of deccan peninsula between 77° 21' to 78° 35' East longitude and 12° 46' to 13° 58' North latitude. Elevation from the mean sea level is 800-900m in major areas and in remaining areas it is 900-1500m. The geographical area of the district is 396900 hectares *i.e.* 3979 sq.km and it is bounded on the north by Chikkaballapur district, on the south Dharmapuri district of Tamil Nadu, on the East by Chittoor District of Andhra Pradesh and on the west by Bangalore Rural district of Karnataka. The District headquarters, Kolar town is located 65 km, north-east of Bangalore. The major sources of employment are agricultural: dairy farming, sericulture and floriculture. The district is popularly known as the land of "silk, milk and gold" and it is traditional district of sericulture. Farmers in Kolar depend on borewell water for irrigation and drinking.

3.1.2 Population and demography

The geographical area of Kolar district is 396900 hectares spread in five blocks, 156 panchayats and 1599 villages. The district has five taluks *viz.*, Bangarpet, Kolar, Malur, Mulbagal and Srinivaspur. In 2011, Kolar had population of 1,536,401 of which male and female were 776,396 (50.53%) and 760,005 (49.47%) respectively. The overall population density of the district was 386 per Sq.km. the population density is 386 persons per sq.km. Sex ratio is 979 females per 1000 male and literacy rate is 74.39%.

Table 3.1: General features of Kolar district, Karnataka

S. No	Particulars	Kolar District
1	Geographical Area (ha)	3,96,900
2	Taluks (No.)	5
3	Hoblies (No.)	27
4	Villages (No.)	1798
4 a	Inhabited	1599 (88.93%)
4 b	Un-inhabited	199 (11.07%)
5	Population (No.) (2011 census)	15,36,401
5 a	Male	776396 (50.53 %)
5 b	Female	760005 (49.47%)
6	Density of population (per sq. km)	386
7	Decadal growth of population (%)	10.77
8	Annual average rainfall (mm)	724
9	Number of rainy days per year (days)	46.2
10	Temperature (° C)	
10a	Minimum	15
10b	Maximum	37

Source: Kolar District at a Glance 2014-15, District Statistical Office, Kolar.

3.1.3 Climate, rainfall and soil type

There are three distinguishable agricultural seasons in the district *viz.*, Kharif (June- September), Rabi (October-December) and summer (January-May). The South West monsoon commences by about end of the May or early June and it continues intermittently till the end of September.

The average rainfall in the district was 724.00 mm with a major portion of the same being received from South West monsoon only. The average number of rainy days during the same period was 46.2 days. The temperature prevailed in the district ranges from a minimum of 15° C to a maximum of 37° C. The soil type is mainly red loamy fertile which is very useful for dry land cultivation.

3.1.4 Land utilization

The total geographical area of Kolar district was 396900 ha during 2014-15 and out of this 167666 ha was under net sown area. The gross irrigated area was 26144 ha and net irrigated area was 17135 ha. Tube wells are the major source of irrigation. Nearly 74547 ha was not available for cultivation, about 59259 ha is classified as fallow land. The forest area in the district is about 20,620 ha.

Table 3.2: Land use pattern in Kolar district, Karnataka

S. No	Particulars	Area (ha)
1	Geographical Area	396900
2	Forest	20,620
3	Not available for cultivation	74547
4	Other uncultivable land	52,825
5	Fallow land	59259
6	Net sown area	167666
7	Gross irrigated area	26144
8	Net Irrigated area	17135

Source: Kolar District at a Glance 2014-15, District Statistical Office, Kolar.

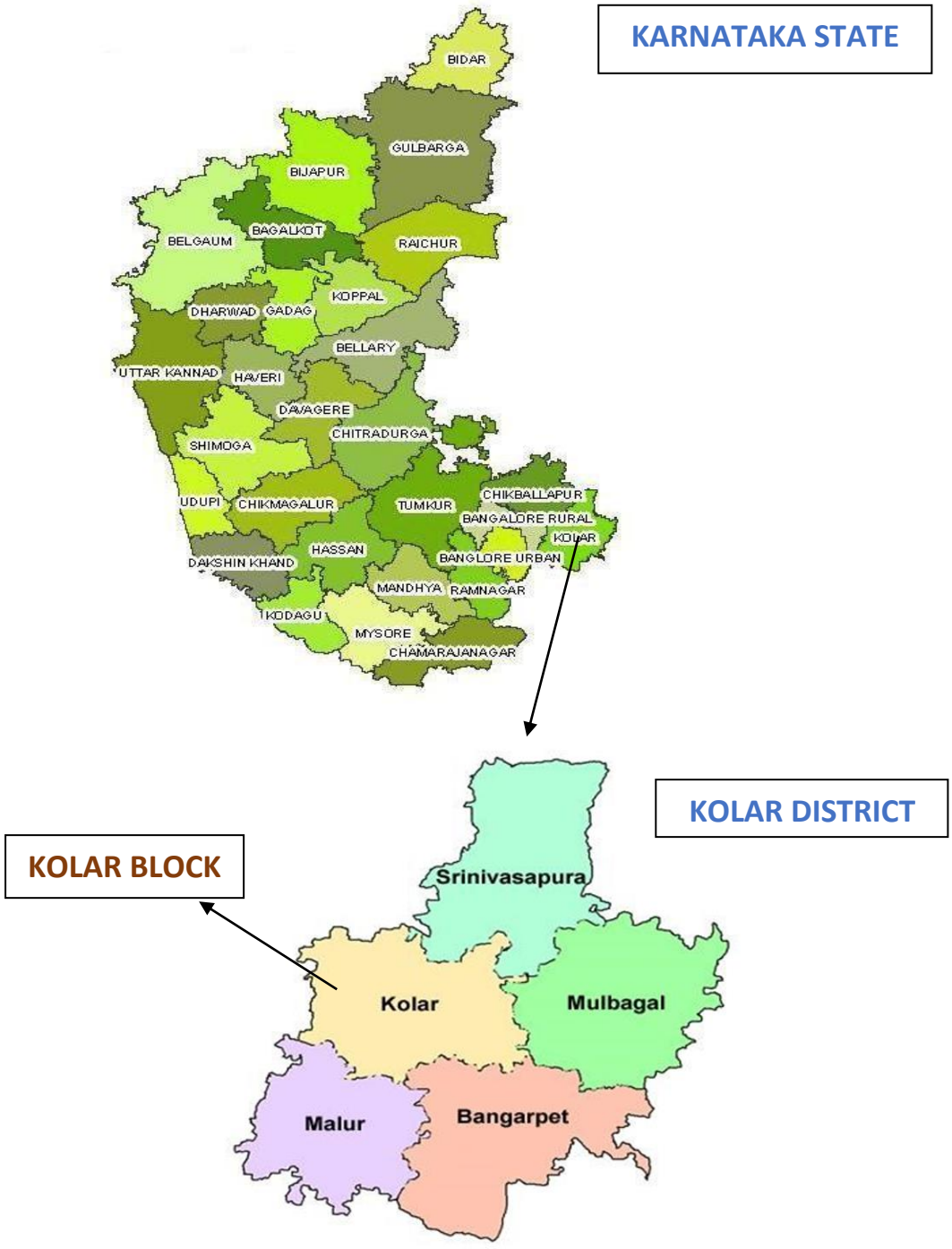

Fig. 1: Map showing the study area

Table 3.3: Land utilization (%)

S. No	Particulars	Area (%)
1	Net Sown Area	39.55
2	Forest	4.59
3	Uncultivated land	28.34
4	Remaining area	27.53

Source: Kolar District at a Glance 2014-15, District Statistical Office, Kolar.

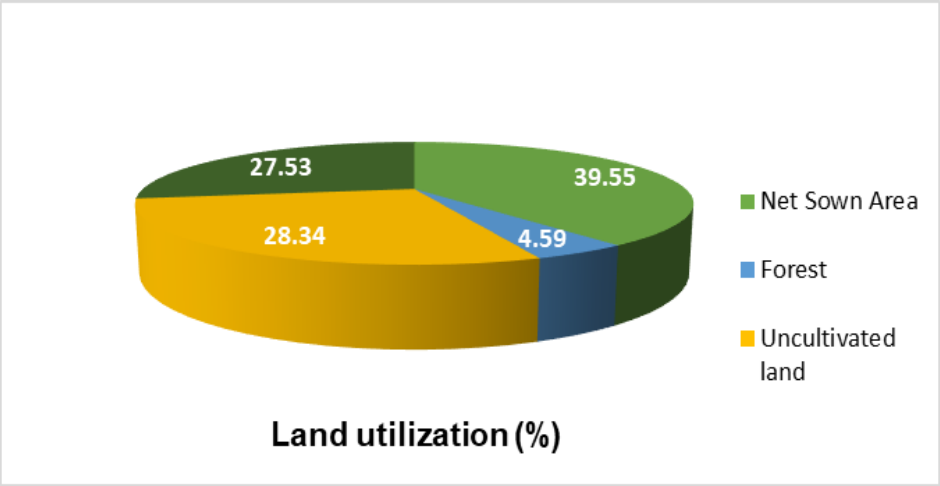

Fig. 2: Land utitlization in Kolar district of Karnataka

3.1.5 Cropping pattern

The net sown area in Kolar district was, 167666 ha during 2014-15. Cereals and other minor millets are the major crops grown in the district. The major cereals and minor millets grown in the district are Ragi, paddy, maize, Pulses, oil seeds, fruits and vegetables.

Approximately 17,890 hectares of area under Mulberry in the district producing 12,771 tonnes annually, with Kolar block as a leading producer. Cocoon productivity in Kolar district is 900 Kg/Ha, this is higher than the state average of 601 Kg/Ha. Average annual income generated by Sericulture in the district is US $ 33.40 million (INR 160 crores)-expected to grow by 28% in next 5 years. (Source: Kolar District at a Glance, 2015-16)

Table 3.4: Cropping Pattern in Kolar district, Karnataka, 2014-15 (in ha)

S. No	Particulars	Blocks					
		Bangarpet	**Kolar**	**Malur**	**Mulbagal**	**Srinivasapura**	**District total**
1	Cereals and millets	11459 (41.06)	13325 (38.57)	7959 (40.10)	12364 (27.73)	8327 (20.40)	53434 (31.86)
2	Pulses	4493 (16.01)	5293 (15.32)	3843 (19.36)	4161 (9.33)	3030 (7.42)	20820 (12.42)
3	Oilseeds	2132 (7.64)	333 (0.96)	910 (4.58)	8417 (18.88)	1848 (4.52)	13640 (8.13)
4	Fruits	4663 (16.71)	4947 (14.32)	2651 (13.35)	12412 (27.84)	22588 (55.36)	47261 (28.19)
5	Vegetables	1667 (5.97)	3181 (9.20)	2592 (13.06)	3087 (6.92)	1101 (2.69)	11628 (6.93)
6	Sugarcane	55 (0.19)	0 (0)	0 (0)	61 (0.13)	0 (0)	116 (0.06)
7	Mulberry	2534 (9.08)	6663 (19.28)	1398 (7.04)	3276 (7.34)	2907 (7.12)	16778 (10.01)
8	Other non-food crops	902 (3.23)	800 (2.31)	492 (2.47)	794 (0.17)	1001 (2.4)	3989 (2.37)
9	Total	27905 (100)	34542 (100)	19845 (100)	44572 (100)	40802 (100)	167666 (100)

District total Source: Kolar District at a Glance 2014-15, District Statistical Office, Kolar.

Table 3.5: Cropping pattern (%)

S. No	Particular	Area
1	Cereals	33.34
2	Pulses	10.58
3	Oil seeds	6.03
4	Commercial crops	0.10
5	Horticultural crops	49.95

Source: Kolar District at a Glance, 2015-16

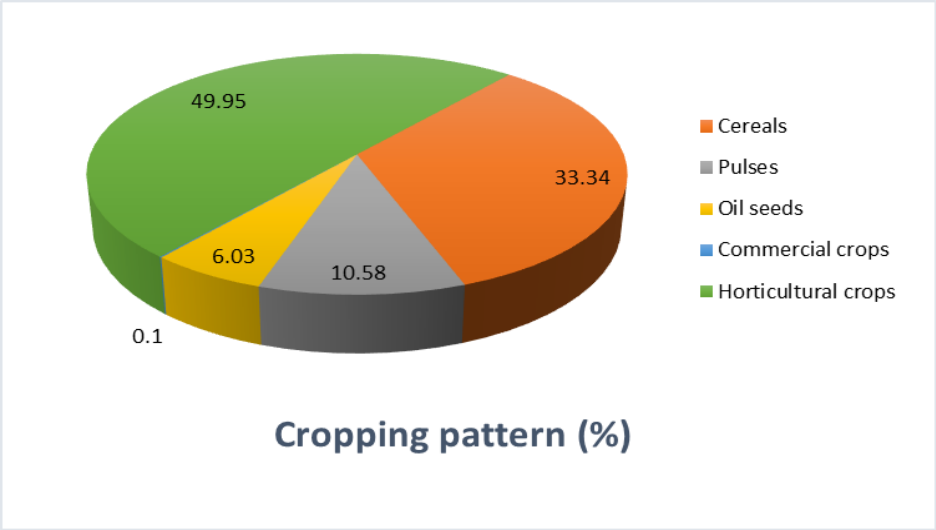

Fig. 3: Cropping pattern in Kolar district of Karnataka

3.1.6 Economic Profile

Kolar's total GDDP stands at INR 16,801 Crores, contributing 1.82% to state GSDP and its per capita annual income in the district being INR. 95,828 for the year 2014-15. Urbanization in the district is 31% as compared to 39% in the state. Types of industries are Agro processing, Textiles, Engineering, Auto, Electrical & Electronics, Chemicals, etc. Agriculture and Small Scale Industrial units are the largest employment generating areas.

Table 3.6: Details of mulberry area, cocoon production, raw silk production in Karnataka

S. No.	Particulars	2013-14	2014-15	2015-16
1	Mulberry area (ha)	80,872	88,489	87,598
2	No. of Sericulture Families	1,34,661	1,29,509	1,23,442
3	Cocoon Production (MTs)	61,419	68,759	70,436
4	Raw silk Production (MTs)	8,574	9,645	9,823

Source: Dept. of Sericulture, Karnataka

3.2 Selection of respondents

The present study was confined to Kolar district of Karnataka state. A multistage sampling procedure was adopted to select the block, villages and farmers. Kolar district was selected for the study as this district has a cocoon productivity of 900 kg per hectare which is more than state average of 601 kg per hectare (2016-17). Kolar district comprises five blocks namely Kolar, Bangarpet, Mulbagal, Srinivaspur and Malur. Out of which, Kolar block was selected purposively which was transacting nearly 3000 kilos of cocoons per day and it is highest than other blocks.

Under Kolar block 5 villages were selected for study *i.e.* Ammanallur, Bairandahalli, Chaldiganahalli, Kadagattur and Karenahalli, which were having maximum area under mulberry. A total of 60 farmers were selected from these 5 villages and they are classified into 3 groups based on DFLs rearing a) small farmers (< 50 DFLs) b) medium farmers (50-100 DFLs) and c) large farmers (> 150 DFLs). In each group 20 farmers were selected randomly for the study of cocoon production. Two important marketing channels were identified in the study area. They are:

Channel 1 - Producer-Wholesaler-Consumer(Reeler)

Channel 2 - Producer-Wholesaler-Retailer-Consumer(Reeler)

A total of 10 intermediaries were selected to study marketing aspect, out of which 5 are wholesalers and 5 are retailers and the primary data was collected from them to study the marketing margin, price spread, producer's share and marketing efficiency.

Table 3.7: Selection of respondents in study area

S. No	Particular	Size group			
		Small	Medium	Large	Total
1	Total number of sericulturists	65	80	105	250
2	No. of sericulturists selected	20	20	20	60
3	Percent of sericulturists selected	30.76	25.0	19.04	24.0

The Sericulturists were interviewed personally by using a pre-tested structured schedule for the purpose. Primary data pertaining to sericulturists on socio-economic characteristics, land holdings, asset position, cost and returns, marketing of cocoons and constraints involved in production of silk cocoon were collected. Keeping in view the objectives of the study, the data pertaining to 2017-18 period were collected from the respondents during the months of October - December 2017.

The secondary data regarding cropping pattern, land utilization and general information of district were collected from Department of Statistics, Kolar.

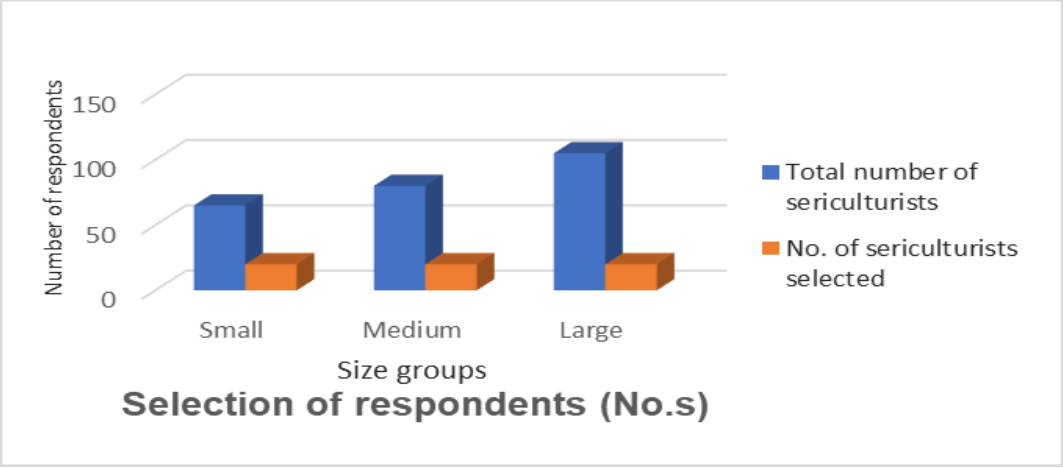

Fig. 4: Selection of respondents under different size groups of farmers

3.3 Analytical tools and techniques

For the quantitative assessment of the objectives set out in the study, the following analytical tools were employed. The primary data collected from 60 respondent farmers was subjected to simple tabular analysis. Tabular analysis including the computation of means, percentages etc., were employed for analyzing cost and returns and marketing aspects.

3.3.1 Cost and returns

Cost and returns covering fixed cost and operational cost were calculated by using the following costs.

A) Variable cost

a) **Cost of DFLs**: The cost of DFLs was calculated at the actual price paid by each farmer.

b) **Transportation cost of DFLs**: The cost involved in transportation of DFLs from chawki rearing center to rearing house was calculated as incidental cost.

c) **Cost of mulberry leaf**: The actual quantity of mulberry leaf consumed for the silkworm was multiplied by the imputed cost (per kg) of leaf for each farmer. The purchased leaves, if any, were accounted at the actual cost.

d) **Human labour**: Human labour was valued at the prevailing wage rate paid by each farmer on per man-day basis. Separate wage rate was paid for men and women. The cost of family labour was imputed at the wage rate paid to the hired casual labour.

e) **Cost of disinfectants**: It was the cost of all the chemicals used to disinfect the rearing house after each rearing is over. The actual purchase price of all the chemicals was considered as the total cost of disinfectants.

f) **Cost of Uzi trap**: It was the actual cost of Uzi trap used in rearing the silkworms.

g) **Hired charge of mountages**: It was the actual cost paid to hire the mountages. In case of owned mountages the imputed cost was used at the hired charge prevailing in the study area.

h) **Cost of paraffin paper**: The actual price of paraffin paper was Rs. 10 per kg

i) **Cost of newspaper:** It was the actual purchase price of the newspaper. The price of newspaper was Rs. 10 to Rs. 12 per kg

j) **Interest on working capital**: This was computed at the rate of 10 percent per annum on the cost of DFLs, mulberry leaf, human labour, disinfectants cost, hired charges of mountages, paraffin paper cost, newspaper cost for a period of one month which is the average period required to raise one cocoon crop.

B) Fixed cost

a) **Depreciation charges of rearing equipments**: The rearing equipments comprised rearing stands, mountages, uzinets, uzicide sprayer and leaf cutting knives. The depreciation charges were worked out by using straight line method. The life span refers to average expected life of the asset as furnished by the farmers.

$$Annual\ Depriciation = \frac{Purchase\ value\ or\ construction\ value\ of\ assets - Junk\ value}{Expected\ life\ of\ the\ assets}$$

b) **Apportioned cost of rearing house**: The apportioned cost of rearing house for a lifespan depending on the type of construction was included under this cost.

c) **Interest on fixed capital**: The annual charge on fixed assets and equipments was charged at 12 percent per annum. This was then apportioned based on the number of cocoon crops raised per year.

C) Returns from silkworm rearing

a) **Cocoons**: The main product of silkworm rearing is cocoons it includes both good quality cocoons and low-quality cocoons they were valued at the actual prices prevailing in the market.

b) **Fodder**: The leaves left over after every feeding were used as fodder, it was valued at the prevailing price of green fodder.

c) **Litter**: The faecal pellets of silkworm was used as FYM and the actual price of FYM per quintal was considered as the price of the litter per quintal.

D) Profitability aspect

i. **Gross profit**: The gross income obtained from silk cocoon production includes value of main product and byproduct *i.e.* value of litter and fodder.

ii. **Total expenses**: The total expenses incurred in cocoon production includes total fixed cost and total variable cost.

iii. **Net profit:** The net income from silk cocoon production was estimated by deducting the total expenses of silk cocoon production from the gross income obtained.

Net profit = Gross profit – Total expenses of cocoon production

iv. **Cost of production**: Cost of production was worked out as cost involved in per kilo of cocoon production.

v. **Benefit – cost ratio**: To evaluate the profitability associated with the silk cocoon production B:C ratio is used.

B:C ratio = Gross Returns / Total Expenses

vi. **Break-even analysis**: It is used to determine whether the firm will be able to cover all its expenses and begin to make profit.

$$Break\ even\ production = \frac{Total\ expenses - Value\ of\ byproduct}{Price\ per\ unit\ of\ output}$$

$$Break\ even\ price = \frac{Total\ expenses - Value\ of\ byproduct}{Physical\ output}$$

vii. **Financial test ratios**

a) Operating Ratio = Total Operating Expenses / Gross Income

This ratio underlies the magnitude of working expenditure incurred for a rupee of gross income.

b) Fixed Ratio = Fixed Expenses/ Gross Income

This ratio indicates the extent of fixed cost incurred to realize a rupee of gross income.

c) Gross Ratio = Total Expenses/ Gross Income

All these ratios with value less than 1 indicate the profitable run of farm business.

E) Yield gaps

The yield gaps were quantified using tabular analysis. Some of the concepts which have been used in the study are defined below.

a) Experimental Station Yield (Yp): It refers to that which is obtained in the experiment station.

b) Potential Farm Yield (Yd): It is the yield obtained on the demonstration plots on the farmers' fields in the study area.

c) Average Farm Yield (Ya): It refers to the yield realized by the farmers on their farms under their management practices.

d) Total Yield Gap (TYG): It is the difference between the Experimental Station Yield (Yp) and the Average Farm Yield (Ya). This Total Yield Gap comprises Yield Gap-I and Yield Gap-II. The Yield Gap I & II were calculated by using the following formula.

a. Yield Gap I

The difference between the Experimental Station Yield (Yp) and the Potential Farm Yield (Yd) is known as Yield Gap I.

$$Yield\ gap\ I\ = \left[\frac{(Yp - Yd)}{Yp}\right] \times 100$$

b. Yield Gap II

The difference between the Potential Farm Yield (Yd) and the Average Farm Yield (Ya) is known as Yield Gap II.

$$Yield\ gap - II = \left[\frac{(Yd - Ya)}{Yd}\right] \times 100$$

e) The Index of Yield Gap (IYG): It is the ratio of the difference between the Experimental Station Yield (Yp) and the Average Farm Yield (Ya) to the Experimental Station Yield (Yp) expressed in percentage terms. It was calculated by using the following formula.

$$IYG = \left[\frac{(Yp - Ya)}{Yp}\right] \times 100$$

F) Marketing aspect

a) Marketing cost

This is the total cost incurred in marketing by the producer and by various intermediaries involved in purchase and sale of cocoons. This includes the cost of packing material, transportation cost of cocoons, loading and unloading charges, the market fee and other incidental expenses incurred in marketing of cocoons.

b) Marketing margin

It is the difference between the total payments and receipts of the middlemen.

$$A_{mi} = P_{Ri} - (P_{Pi} + C_{mi})$$

Where,

P_{Ri} = total value of receipts per unit (sale price)

P_{Pi} = purchase value of goods per unit (purchase price)

C_{mi} = cost incurred on marketing per unit

c) Producer's price

This is the net price received by the farmer at the time of first sale.

$$P_F = P_A - C_F$$

Where,

P_F = producer's price

P_A = wholesale price in primary assembling market

C_F = marketing cost incurred by farmer

d) Price spread

It is the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of the farm produce.

e) Marketing efficiency

It is the ratio of the total value of cocoons marketed to the marketing cost. The higher the ratio, the higher efficiency and vice versa. (G.S. Shepherd)

$$E= [(V \div I) – 1] \times 100$$

Where,

E= Marketing efficiency

V = Total value of cocoons

I = marketing cost

f) Producer's share: It is the price received by the farmer expressed as a percentage of the price paid by the consumer.

$$P_S = (P_F \div P_r) \times 100$$

Where,

P_S = Producer's share

P_F = producer's price

P_r = retail price

G) Constraints

Garrett's ranking technique

Garrett's ranking technique was used to identify the constraints in cocoon production and marketing of cocoons in study area. Garrett ranking is applied to rank a set of items or factors as perceived by the sample respondents based on their priority. The order of merit assigned by the respondents was converted into scores using the formula given by Garrett and Woodworth (1977).

$$Percent\ position = \frac{100(Rij - 0.5)}{Nj}$$

Where, Rij = the rank of the ith item by jth individual and Nj = the number of items ranked by the jth individual.

By referring the Garrett's table, percent position estimated was converted into score. Then, for each factor the scores of various respondents were added and the mean score was calculated. The factor with the highest mean score was considered to be the most important constraint. Thus, mean score for each constraint was ranked by arranging them in the descending order.

CHAPTER – 4

RESULTS AND DISCUSSION

The required data were gathered and the findings of the study are presented in this chapter under the following headings in consonance with the objectives of the study.

4.1 Socio-economic profile

4.2 Cost structure and profitability from silk cocoon production

4.3 Marketing aspects of silk cocoons

4.4 Production and marketing constraints faced by silkworm rearers

4.1 Socio-economic profile

4.1.1 Age

Age is very essential in identifying the population and also to know the engagement of different age groups in the process of sericulture activities in the study area. To study the age wise distribution of sample respondents, the age of farmers was divided into 3 different age groups, young age (30 years) middle age (31-50 years) and old age (above 50 years) as shown in the Table 4.1.

Table 4.1: Age wise distribution of the respondent farmers

Unit: No.

S. No.	Age group	Size groups			Total
		Small	Medium	Large	
1	Young age (Up to 30 years)	01 (05.00)	01 (05.00)	01 (05.00)	03 (05.00)
2	Middle age (31 to 50 years)	15 (75.00)	16 (80.00)	15 (75.00)	46 (76.67)
3	Old age (Above 50 years)	04 (20.00)	03 (15.00)	04 (20.00)	11 (18.33)
Total		**20 (100)**	**20 (100)**	**20 (100)**	**60 (100)**

- Figures in parentheses indicate percentage to the total.

Among all the three categories of farmers, the highest number of farmers were fall under the middle age group (76.67 percent), followed by old age (18.33 percent) and young age (5.00 percent). This indicated that most of the farmers were young and in the middle age groups and hence farmers in this age can with stand risks and able to adopt new innovations and modern farming practices.

4.1.2 Caste

The details on caste wise distribution of various groups of farmers are presented in Table 4.2. Among all the three groups of farmers, the higher percentage of farmers comes under OBC category, in which medium and large farmers were 85.00 percent each and small farmers were 80.00 percent. The percentage of farmers under SC and ST were less compared to OBC category. The comparison between the three groups of farmers in the study area revealed that the average caste wise distribution of OBC category was marginally higher with a total number of 50 compared to 7 in SC category and 3 in ST category.

Table 4.2: Caste wise distribution of respondent farmers

Unit: No.

S. No.	Caste category	Size groups			Total
		Small	Medium	Large	
1	SC	03 (15.00)	02 (10.00)	02 (10.00)	07 (11.67)
2	ST	01 (05.00)	01 (05.00)	01 (05.00)	03 (05.00)
3	OBC	16 (80.00)	17 (85.00)	17 (85.00)	50 (83.33)
Total		**20 (100)**	**20 (100)**	**20 (100)**	**60 (100)**

- Figures in parentheses indicate percentage to the total.

4.1.3 Type of family

The Table 4.3 shows the type of family found on sample farms. Out of 60 families, the maximum number of families are nuclear with 85.00 percent compared to joint families (15.00 percent). Among them, 90.00 percent of small farmers had nuclear family followed by medium (85.00 percent) and large farmers (80.00 percent). Under joint family, the large farmers had 20.00 percent which was higher compared to medium group (15.00 percent) and small group (10.00 percent).

Table 4.3: Type of family of the respondent farmers

Unit: No.

S. No.	Type of family	Size groups			Total
		Small	Medium	Large	
1	Joint family	02 (10.00)	03 (15.00)	04 (20.00)	09 (15.00)
2	Nuclear family	18 (90.00)	17 (85.00)	16 (80.00)	51 (85.00)
Total		**20 (100)**	**20 (100)**	**20 (100)**	**60 (100)**

- Figures in parentheses indicate percentage to the total.

4.1.4 Level of education

The study observed 5 types of educational qualification of farmer respondents, namely illiterate, primary, secondary, matriculation, under graduate and PG. As revealed from Table 4.4 that the majority of farmers had matriculation in all three categories of farmers. The percentages of these farmers who had matriculation were 30.00, 35.00 and 40.00 percent in small, medium and large farmers respectively, as against 35.00 percent for the entire group. The secondary education has highest percentage next to matriculation in the sample farmers and the highest was seen in medium group (30.00 percent) followed by small group and large group with 25.00 percent each.

Under graduate and PG education was seen as the highest level of education in the sample farmers. None of the farmers had PG education and therefore only graduation is considered under highest level and the highest was seen in small farmers (35.00 percent) followed by medium (15.00 percent) and large group (10.00 percent). The graduation of the entire sample respondents of farmers was 20.00 percent. The primary education was 13.33 percent for entire farmer respondents. As regards illiteracy, the medium and large farmers had similar illiteracy rate of 10.00 percent each compared to small farmers which had illiteracy rate of 5.00 percent. The illiteracy rate of the entire sample respondents was 8.33 percent.

Table 4.4: Education level of the respondent farmers

Unit: No.

S. No.	Educational level	Size groups			Total
		Small	Medium	Large	
1	Illiterate	1 (5.00)	2 (10.00)	2 (10.00)	5 (8.33)
2	Primary school	03 (15.00)	02 (10.00)	03 (15.00)	08 (13.33)
3	Secondary school	04 (20.00)	06 (30.00)	04 (20.00)	14 (23.33)
4	Matriculation	06 (30.00)	7 (35.00)	8 (40.00)	21 (35.00)
5	Graduate	06 (30.00)	3 (15.00)	03 (15.00)	12 (20.00)
Total		**20 (100)**	**20 (100)**	**20 (100)**	**60 (100)**

- Figures in parentheses indicate percentage to the total.

There is a need for the extension workers to educate the farmers through interpersonal and visual aid methods about improved practices that can be adopted. It is also seen that number of graduates were taking up sericulture as their occupation. This is an encouraging factor as these farmers were well versed with the new techniques of mulberry production and silk cocoon production.

4.1.5 Family composition

The family size indicates the extent of family labour availability and its use in the farming. The details on the family size of various groups of farmers are presented in Table 4.5. A comparison between the three groups of farmers *viz.,* small farmers, medium farmers and large farmers revealed that the average family size of large farmers was marginally higher with a total number of 119 compared to 117 in medium group and 101 in small farmers group. In composition of family *viz.,* male, female and children, male-being dominant member followed by children and female. The average family size was found similar in case of both medium and large farmers with 6 in number and 5 in small farmers group. A total of 337 members were found in 60 families under study area with an average family size of 6 number.

Table 4.5: Family composition of the respondent farmers

Unit: No.

S. No.	Family members	Size groups			Total
		Small	Medium	Large	
1	Male	37 (36.63)	40 (34.18)	44 (36.97)	121 (35.90)
2	Female	28 (27.77)	37 (31.62)	37 (31.09)	102 (30.26)
3	Children	36 (35.64)	40 (34.18)	38 (31.93)	114 (33.82)
Total		**101 (100.00)**	**117 (100.00)**	**119 (100.00)**	**337 (100.00)**
Average family size		**5**	**6**	**6**	**6**

- Figures in parentheses indicate percentage to the total.

4.1.6 Land holding pattern

The detail on land holding pattern of sample households is presented in Table 4.6. A comparison among all the three groups of farmers shown that large farmers had higher total land holding of 75.67 ha, comprising 27.92 ha of dry land and 47.75 ha of irrigated land compared to medium group that had a total size of holding of 69.19 ha, of which 27.92 ha was dry land and 41.27

ha of irrigated land and small group with 39.24 ha of total land holding, of which 14.56 ha of dry land and 24.68 ha of irrigated land. The average size of land holding was higher with large farmers (3.78 ha) compared to medium (3.45 ha) and small farmers (1.96 ha).

This showed the scope for extending the area and importance of mulberry cultivation in the study area. This could be expanded further by promoting farmers through training and demonstrations to take up mulberry cultivation in the study area on mulberry cultivation practices and rearing of silkworms.

Table 4.6: Land holding pattern of the respondent farmers

Unit: ha.

S. No.	Particulars	Size groups			Total (N=60)
		Small (N=20)	Medium (N=20)	Large (N=20)	
1	Dry land	14.56 (36.95)	27.92 (40.35)	27.92 (36.89)	70.4 (38.24)
2	Irrigated land	24.68 (62.63)	41.27 (59.64)	47.75 (63.10)	113.7 (61.75)
	Total land holding	39.24 (100)	69.19 (100)	75.67 (100)	184.1 (100)
	Average size of land holding	1.96	3.45	3.78	3.07

- Figures in parentheses indicate percentage to the total.

4.2 Cost structure and profitability from silk cocoon production

4.2.1 Cost of production of cocoons for 100 DFL's

The results of Table 4.7 represent the different costs incurred on different stages of silk worm rearing in the study area. The cost of cocoon production was discussed below under three heads namely fixed cost, variable cost and the total cost.

4.2.1.1 Fixed cost

The depreciative cost on rearing assets (excluding rearing house) with medium farmers (Rs. 937) was higher compared to the large (Rs. 918) and small farmers (Rs. 903). The rental value of rearing house was found to be higher with small farmers (Rs. 1187) compared to medium (Rs. 1088) and large farmers (Rs. 1067). Among the various items of fixed investment made the investment made on the rearing house was the major one which was 5.07 percent under small farmers, 4.75 percent with medium farmers and 4.95 percent under large farmers.

4.2.1.2 Variable cost

The cost of human labour and mulberry leaves were two major variable costs under silkworm rearing. The cost of human labour was 36.86 percent under small farmers, 38.72 percent under medium farmers and 39.07 percent under large farmers. In total, labour charges constitutes about 38.19 percent (Rs. 8639.75) followed by mulberry leaf cost with 24.84 percent (Rs. 5619.63) which was very high when compared with the study of Umesh *et al.* (2001) where the cost incurred for human labour in shoot feeding method was 19.38 percent and the results of Purushothaum *et al.* (2009) where the major economic factor contributing for the total cost in sericulture was labour which was 32.54 percent for silkworm rearing. Majority of the farmers in the study area have shifted from tray method of rearing to shoot rearing method because this method of rearing is most economical, convenient and not as labour intensive as other methods (Chandrappa et al, 2001). Even after adopting shoot rearing method which requires less labour, farmers in the study area were utilising excess of human labour when compared to the recommended use (27 mandays for 100 DFL in tray and other traditional method). The mulberry leaf cost was 25.20 percent, 24.93 percent and 24.35 percent with small, medium and large famers respectively. However, quantity of mulberry leaves directly influence the silkworm rearing and cocoon production in sericulture activity.

The other variable cost includes the cost of chawki worms, cost of disease free laying's is also one of the indicators to know the total cost of silkworm rearing per batch and which contributes about 6.43 percent (Rs. 1456.6) followed by mountages hiring charge with 3.82 percent (Rs. 866.32) and cost of disinfectants with 3.07 percent (Rs. 695.11). the cost of paraffin paper (0.79 percent), newspaper (0.81 percent), Uzi trap (0.47 percent), chawki transportation cost (0.47 percent) accounts in lesser amount.

4.2.1.3 Total cost

Different costs are incurred on the basis of size of DFL's and assets process of silkworm rearing and different farmers reared different size of DFL's. The total cost of cocoon production incurred in rearing of 100DFL's under small farmers (Rs. 23407.1) was higher than the medium farmers (Rs. 22897.61) and large farmers (Rs. 21554.91). On an average, for one crop the total cost incurred to rear 100 DFL's was Rs. 22621.40.

Besides, the present study result is marginally less when compared to study conducted by Srinivasa *et al.* (2001) reported that the total cost of production of cocoons was Rs. 37427.46 per acre per crop for multivoltine rearers. A sizable proportion of the total cost was constituted by variable cost at Rs. 20342.20 which accounted 89.92 percent to the total cost and Murthy (1977) reported about 93 percent variable cost share in his study conducted in Bangalore district and relatively high when compared with 83 percent by Chandra Reddy (1987).

Table 4.7: Cost structure involved in silk cocoon production under different categories of farmers

Unit: (Rs. /100DFL's)

S. No.	Cost Item	Size groups			
		Small	Medium	Large	Average
	Variable Cost				
1.	**Cost of DFLs**	1520 (6.49)	1470 (6.41)	1380 (6.40)	1456.6 (6.43)
2.	**Transportation Cost of DFLs**	156 (0.66)	105 (0.45)	62.7 (0.29)	107.9 (0.47)
3.	**Cost of Mulberry Leaves**	5900 (25.20)	5709.2 (24.93)	5249.7 (24.35)	5619.63 (24.84)
4.	**Cost of Labour** **1) Family Labour**	5988 (71.03)	5950 (67.11)	5214 (61.90)	5717.33 (66.68)
	2) Hired Labour	2642 (28.96)	2916 (32.88)	3209.25 (38.20)	2922.41 (33.32)
	Sub Total	8630 (36.86)	8866 (38.72)	8423.25 (39.07)	8639.75 (38.19)
5.	**Cost of Disinfectants** **1) Bed Disinfectant**	176.4 (22.54)	147 (21.76)	141.84 (22.60)	155.08 (24.46)
	2) Lime	93.6 (11.96)	78.4 (11.60)	65.4 (10.43)	79.13 (11.10)
	3) Decol	512.4 (65.49)	450 (66.62)	420.3 (66.97)	460.9 (64.73)
	Total	782.4 (3.34)	675.4 (2.95)	627.54 (2.91)	695.11 (3.07)

6.	**Cost of Uzi trap**	120 (0.51)	100.1 (0.43)	103.95 (0.48)	108.01 (0.47)
7.	**Hiring Charge of Mountages**	940.28 (4.01)	845.11 (3.69)	846.57 (3.92)	866.32 (3.82)
8.	**Cost of Paraffin Paper**	186 (0.79)	180 (0.78)	171.6 (0.81)	179.2 (0.79)
9.	**Cost of News Paper**	194.4 (0.83)	183.4 (0.80)	173.58 (0.81)	183.79 (0.81)
10.	**Interest on Working Capital (@ 10%)**	1915.1 (8.18)	1875.4 (8.19)	1757.4 (8.15)	1849.3 (8.17)
	Total Variable Cost	21066.3 (89.99)	20629.61 (90.09)	19331.71 (89.68)	20342.20 (89.92)
	Fixed Cost				
1.	**Depreciation on rearing assets**	903 (3.85)	937 (4.09)	918 (4.25)	920 (4.07)
2	**Rental Value of Rearing House**	1187 (5.07)	1088 (4.75)	1067 (4.95)	1115 (4.92)
3	**Interest on Fixed Capital (@ 12%)**	250.8 (1.07)	243 (1.06)	238.2 (1.10)	244.2 (1.07)
	Total Fixed Cost	2340.8 (09.99)	2268 (9.90)	2223.2 (10.31)	2279.2 (10.07)
	Total Cost	23407.1 (100)	22897.61 (100)	21554.91 (100)	22621.4 (100)

- Figures in parentheses indicate percentage to the total.

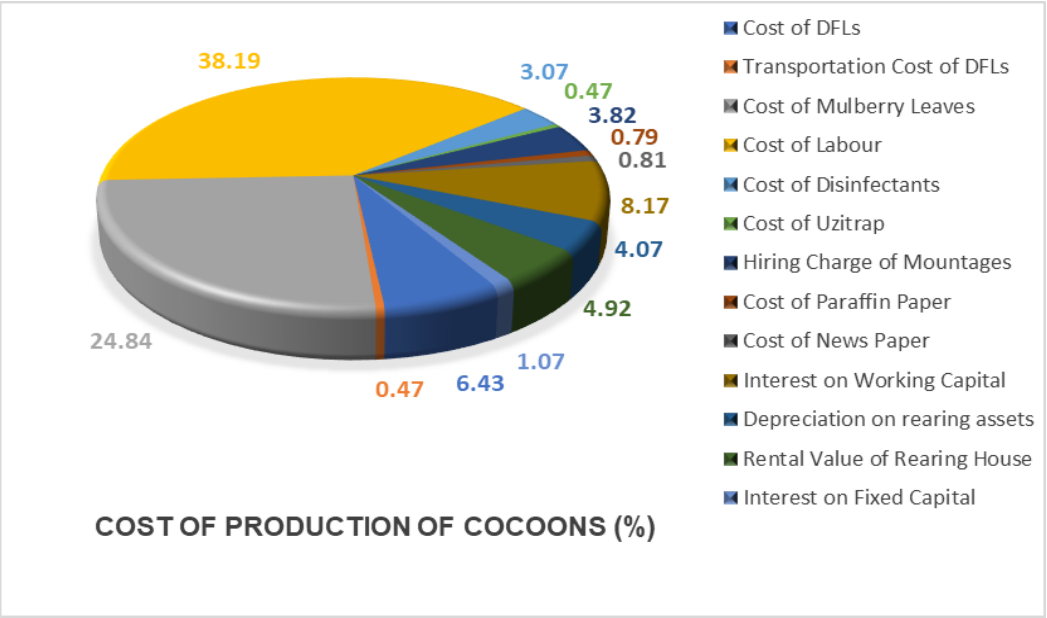

Fig. 5: Percentage contribution of different particulars to the total cost of production

4.2.1.4 Percentage of labour cost and material cost

Sericulture has been identified as labour based venture, with a vast potential to absorb the family labour, especially in the rural areas which otherwise would have remained unemployed or grossly underemployed.

Human labour was mainly employed in the indoor activities for preparation of rearing house and handling of rearing equipments during rearing, disinfection, feeding of silkworms, bed-cleaning, sorting of ripe and diseased worms, mounting of ripe worms in mountages, harvesting and sorting of cocoons. The outdoor activities utilizing labour were leaf harvest, leaf transport, chawki rearing and cocoon marketing. The method of leaf harvest followed in the study area, during first instar of silkworm rearing was by hand picking of individual leaves.

From the period of Chawki rearing to cocoon production and in the entire process of mulberry cultivation and silk worm rearing large number of labourers are required along with material assets. Table 4.8 shows the percentage of cost of labour and material assets used in silk cocoon production. About 42.47 percent (Rs. 8639.75) of total cost was spent on labour charge and the remaining 57.52 percent was on material assets (Rs. 12045.29).

Table 4.8: Percentage of labour cost and material cost involved in silk cocoon production

Unit: (Rs. /100DFL's)

S. No	Particular	Small	Medium	Large	Average
1.	**Labour cost**	8630 (40.96)	8866 (42.97)	8423.25 (43.57)	8639.75 (42.47)
2.	**Material Cost**	12436.3 (59.04)	11763.61 (57.02)	10908.46 (56.43)	12045.29 (57.52)
	Total Variable Cost	21066.3 (100)	20629.61 (100)	19331.71 (100)	20342.20 (100)

- Figures in parentheses indicate percentage to the total.

4.2.2 Average Cocoon Production per 100 DFL's

Based on quality of mulberry leaf yield, cocoon yield differs from one crop to another crop. The main product namely cocoons were sorted after harvest into good quality cocoons and substandard cocoons, the later consisting of flimsy, stained and double cocoons together known as "waste" or "jalli goodu". The proportion of substandard cocoons generally increased with the extent of disease in a crop and was minimal in a healthy crop. These cocoons being unsuitable for reeling or seed purpose were often sold off-hand for a single negotiated price for the entire quantity mostly to lone buyers. When cocoons are sold at the market, price was assessed on the basis of cocoon quality. This was judged by grading shell percentage and the percentage of defective cocoons.

The yield obtained from rearing of 100 DFL's with small farmers was 68.93 kg, which was higher compared to medium farmers yielding 66.29 kg per 100 DFL's and large farmers with 64.97 kg per 100 DFL's which appeared significantly high when compared with the results of Chandrappa *et al.* (2001) reported in his study that the average cocoon yields were 52.10 kg for 100 DFLs in shoot feeding method of rearing, Rao *et al.* (2001) reported the average yield obtained by the Chittoor and Eluru farmers was 42.99 and 38.50 kg per 100 DFLs respectively and Gururaj *et al.* (2007) who also reported an yield of 52.22 kg per 100 DFLs (156.66 kg/300 DFLs). The following Table 4.9 show average yield of cocoon per 100 DFL's by respondents in the study area.

Table 4.9: Total output obtained from silk cocoon production under different categories of farmer respondents

MAIN PRODUCT	Size groups											
	Small			Medium			Large		Average			
	Total quantity (kg)	Price per unit (Rs.)	Total value (Rs.)	Total quantity (kg)	Price per unit (Rs.)	Total value (Rs.)	Total quantity (kg)	Price per unit (Rs.)	Total value (Rs.)	Total Quantity (kg)	Price per unit (Rs.)	Total value (Rs.)
High quality cocoon	61.27	418	25610.86	55.55	441.7	24536.43	56.77	406.25	23062.81	57.86	422	24416.92
Low quality cocoon	7.66	99	758.34	10.74	97.6	1048.22	8.20	96.5	791.3	8.86	97.7	865.62
Total	68.93		26369.2	66.29		25584.65	64.97		23854.11	65.06		25282.54

BYPRODUCT		Size groups							
		Small		Medium		Large		Average	
	Price per unit (Rs.)	Total quantity (Qtl)	Total value (Rs.)	Total quantity (Qtl)	Total value (Rs.)	Total quantity (Qtl)	Total value (Rs.)	Total Quantity (Qtl)	Total Value (Rs.)
Fodder	100	5.1	510	4.8	480	4.7	470	4.87	487
Litter	300	7.5	2250	7.3	2190	7.1	2130	7.3	2190
Total		12.6	2760	12.1	2670	11.8	2600	12.17	2677

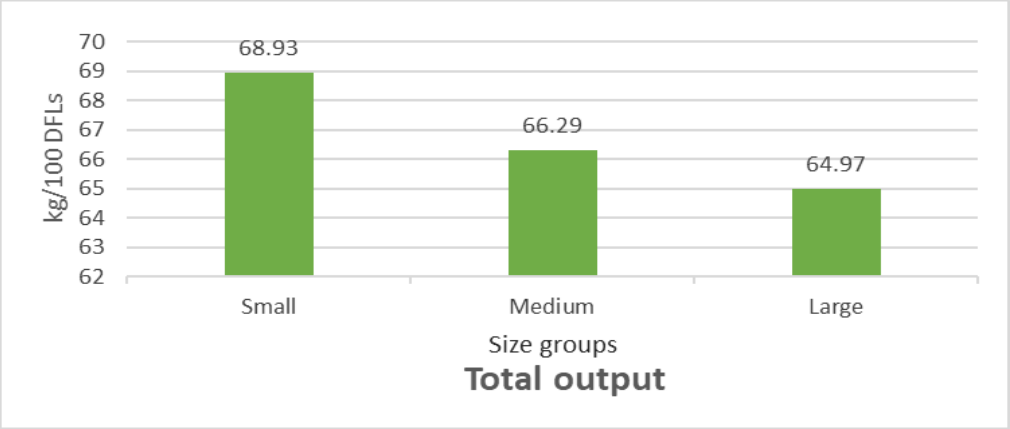

Fig. 6: Total output obtained from silk cocoon production under different size groups of farmers

4.2.3 Returns from sericulture from rearing of 100 DFL's

The gross returns from sericulture was mainly from the sale value of the cocoons and the byproducts. Returns from by-products refers to silk worm manure and waste sticks of mulberry plant, farmers are earning income from these products also, hence it was also one of the indicators to know the total returns of cocoon production.

The Table 4.10 represents the total returns obtained from sale of silk cocoons in the study area. The returns received from rearing of 100 DFL's by small, medium and large farmers was Rs. 26369.20, Rs. 25584.65 and Rs. 23854.11 respectively.

The returns in cocoon production were partly in the form of cash returns which had accrued from the sale of main product and partly in the form of imputed returns on byproducts which were entirely used by the farm households themselves.

The returns obtained from the byproducts contributes about 9.5 percent to the gross returns. The returns received from byproducts was Rs. 2760 for small farmers, Rs. 2670 for medium and Rs. 2600 for large farmers (Table 4.10). From rearing of 100 DFL's, the gross income generated the small farmers was Rs. 29129.20 which was higher than medium farmers which was Rs. 28254.65 followed by large farmers with Rs. 26454.11 of gross income.

The net income of the small farmers was Rs. 5722.10 which was higher than the medium and large farmers with Rs. 5327.04 and Rs. 4899.20 respectively. It was observed from the respondents, based on size of mulberry plant and availability of water, farmers are rearing 5 silkworm batches per annum. Hence, the gross returns obtained from rearing 100 DFL's was Rs. 139797.70 per annum.

The overall cost of production for rearing of 100 DFL's was found to be Rs. 344.70 (Table 4.10). Further the average price of the cocoon for medium farmers was Rs. 441.70/kg which was higher compared to small farmers with Rs. 418.0 followed by large farmers with Rs. 406.25.

Table 4.10: Profitability from silk cocoon production

Unit: Rs. /100DFL's

S. No.	Particular	Size groups			
		Small	**Medium**	**Large**	**Average**
1.	Gross income	29129.2	28254.65	26454.11	27959.54
2.	Total cost incurred	23407.1	22897.61	21554.91	22621.4
3	Net income	5722.1	5327.04	4899.2	5338.14
4	Cost of production	336.98	364.13	333.89	344.70
5	B:C ratio	1.24	1.23	1.22	1.23

Benefit cost ratio signifies the amount of income received per rupee of input invested. Here, input have been used for the total cost and output for the gross returns. Table 4.10 presents a clear picture of input – output relationship in sericulture. On an average, the BC ratio received from sericulture was 1.23 for a rupee invested. The ratio was highest in the small size group of farmers with 1:1.24. It varies between 1:1.23 and 1:1.22 in case of medium and large size group of farmers whereas Umesh *et al.* (2001) reported that for every rupee invested in cocoon production the returns obtained of Rs. 1.82 in shoot feeding and Chandrappa *et al.* (2001) reported in his study that the returns per rupee invested was higher at Rs. 1.76.

Besides, Rao *et al.* (2001) reported the higher cost benefit ratio at Rs. 1:1.70 and 1:1.22, respectively for Chittoor and Eluru areas and Purushothaum *et al.* (2009) showed that cost benefit ratio for sericulture enterprise which was worked out at 1:1.94

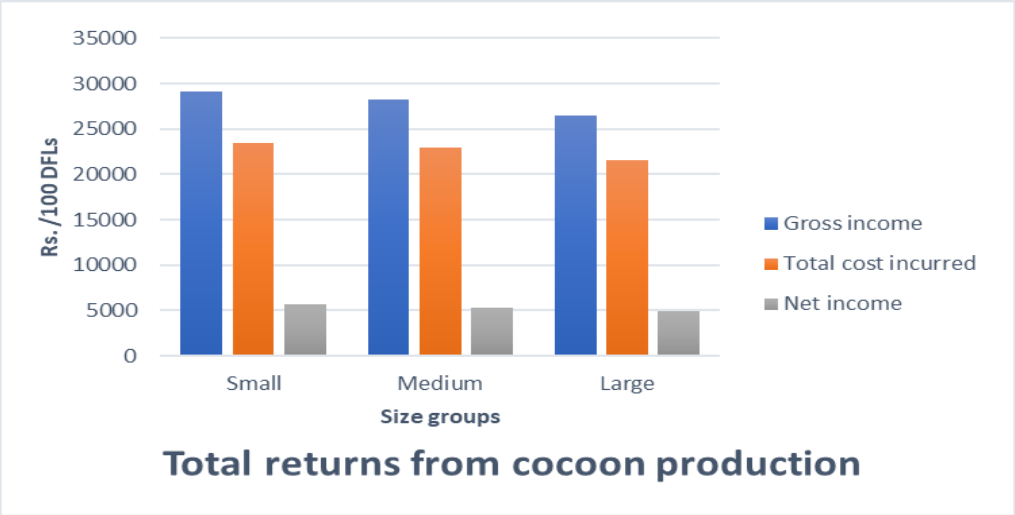

Fig. 7: Total returns obtained from silk cocoon production under different size groups of farmers

4.2.4 Financial test ratios

It indicates the trend in various cost items and whether there has been any over expenditure on the farm. Thus, it helps to know the success or failure of a farm business over time. Table 4.11 presents the financial test ratios of sericulture.

The Operating ratio underlies the magnitude of working expenditure incurred for a rupee of gross income and the results were presented in the value of operating expenses to gross income was higher with 0.73 for both medium and large farmers when compared to small farmers, with a value of 0.72 for the considered study period.

The Fixed ratio indicate the extent of fixed cost incurred to realize a rupee of gross income and it was found to be same with value 0.08 in all the groups.

The Gross ratio is the ratio of total expenses to gross income and it was found to be 0.81 in case of medium and large farmers which was higher compared to small farmers with 0.80.

Table 4.11: Financial test ratios for Sericulture production

S. No.	Financial Ratios	Size Groups			
		Small	Medium	Large	Average
1.	Fixed Ratio	0.08	0.08	0.08	0.08
2.	Operating Ratio	0.72	0.73	0.73	0.73
3.	Gross Ratio	0.80	0.81	0.81	0.81

4.2.5 Break-even analysis

It refers to the determination of the level of resources where there will be no profit or no loss. If production is increased beyond this level, profit shall have added to the business and if it is decreased, loss shall be suffered. Thus, Break-even analysis is an important technique through which one can know the level of profit due to variations in costs and sales.

Break-even production is the point at which the producer neither looses money nor gains profit and it was found to be higher in case of small farmers (55.99 kg/100DFL's) compared to medium (51.83 kg/100DFL's) and large (53.05 kg/100DFL's) farmers. the excess of production over the break-even point is called margin of safety. It was found to be higher for small farmers with 5.04 kg/100DFL's compared to medium and large farmers with 3.72 kg/100DFL's each respectively (Table 4.12).

Similarly, the break-even price was found to be higher for medium (412.19 Rs. /kg) farmers followed by small (382.03 Rs. /kg) and large farmers (378.69 Rs. /kg). The margin of safety in case of break-even price was found to be 35.97 Rs. /kg for small farmers, 29.57 Rs. /kg for medium and 26.57 Rs. /kg for large farmers.

Table 4.12: Break-even analysis of silk cocoon production

S. No.	Particular	Size groups			
		Small	Medium	Large	Average
1.	Production (kg)				
	Actual production	61.27	55.55	56.77	57.86
	Break-even production	55.99	51.83	53.05	53.60
	Margin of safety	5.04	3.72	3.72	4.26
2.	Price (Rs/kg)				
	Actual price	418	441.7	406.25	422
	Break-even price	382.03	412.19	379.68	390.96
	Gap	35.97	29.51	26.57	31.04

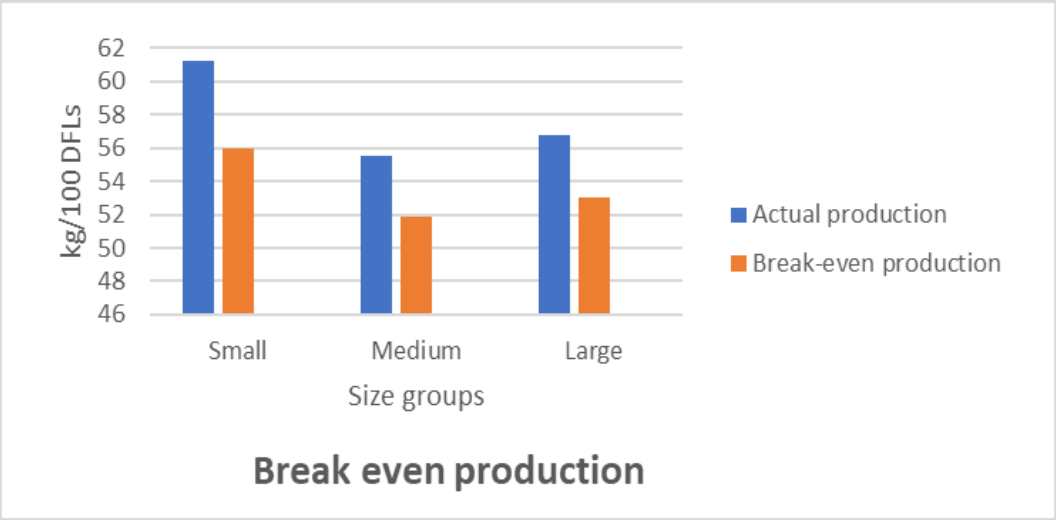

Fig 8: Break even production in sericulture under different size groups of farmers

4.2.6 Yield Gap analysis

In the study area the farmers cultivated mainly V1 variety of mulberry and a multivoltine hybrid Kolar Gold (CSR2 x Pure Mysore). The experimental station yield(Y_p) of cross breed cocoon production was 70 kg/100 DFL's. The potential farm yield(Y_d) is being considered as bench mark yield for comparing yield realized by different farm size groups viz 65 kg/100DFL's. So, the estimated Yield Gap I(Y_p-Y_d) was 5 kg/100DFL's. The estimated Yield Gap between the potential farm yield(Y_d) and average farmers yield(Y_a) *i.e.* Yield Gap II was found to be 3.73 kg/100DFL's, 9.45 kg/100DFL's, 8.23 kg/100DFL's for small, medium and large farmers respectively.

The analysis indicated the existence of a small percentage of untapped potential farm yields in silk cocoon production. The Total Yield Gap was found to be 8.73 kg/100DFL's for small farmers, 14.45 kg/100DFL's for medium and 13.23 kg/100DFL's for large farmers. Further, the Index of Yield Gap(IYG) was estimated to be 12.47 percent, 14.45 percent and 13.23 percent for small, medium and large farmers respectively (Table 4.13).

This gap arises mainly because of the sub-optimal use of new technologies, which may be due to inadequate extension services besides other physical or socio-economic factors operating in farming community in the area. The small farmers obtained higher yield than the medium and large farmers. This may be due to the small rearing capacity, quite high input rate of technology adoption and use of labour component. These were the major advantageous factors which have influenced small farmers to achieve higher yield there by reducing the Yield Gaps.

The socio-economic factors such as, mulberry area, extension guidance and mass media participation have significantly influenced cocoon production. So, it needs more such programs to strengthen the farmers approach towards yield realization and to bring down the Yield Gap.

Table 4.13: Yield Gap in cocoon production

a) Experimental station yield(Y_p) = 70 kg/100DFL's

b) Potential farm yield(Y_d) = 65 kg/100DFL's

c) Yield Gap I = 5 kg/100DFL's

Unit: kg/100DFL's

S. No.	Particular	Size groups			
		Small	Medium	Large	Average
1	Average Farmer's Yield(Y_a)	61.27	55.55	56.77	57.86
2	Yield Gap II	3.73	9.45	8.23	7.14
3	Total Yield Gap	8.73	14.45	13.23	12.14
4	Index of Yield Gap (percentage)	12.47	20.64	18.9	17.34

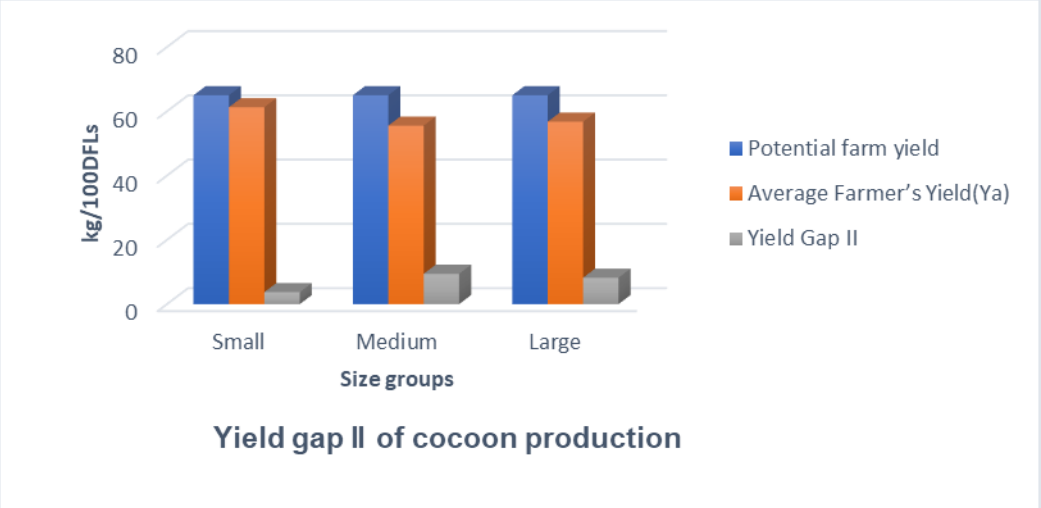

Fig. 9: Yield gap II of cocoon production under different size groups of farmers

4.3 Marketing aspects

4.3.1 Marketing cost of cocoons

The availability of market and marketing facilities provided to the farmers play an important role in determining the profitability of enterprises. The whole process of marketing of silk cocoons in the study area involved packing, transportation and selling functions. Better packing always helped in maintaining the quality and in reducing the losses transit on account of spoilage. Packing of silk cocoons was generally done in gunny bags of capacity of 50 to 60 Kg and 80 to 100 kg. After harvesting of silk cocoons, cleaning and sorting of good quality and low-quality silk cocoons was done but no scientific grading of any kind was practiced by the producers. After this, the silk cocoons were packed in gunny bags.

This included the cost of transportation of cocoons to the market, the market fee, packing material and other expenses. The government cocoon market arranged for the sale of produce and charged a market fee of one percent of the sale value. Open auction system was the common method of sale practiced in all government cocoon markets. It can be seen from the Table 4.14 that the total cost required to sell 100 kg of cocoons in the study area. The total marketing cost per 100 kg of cocoons for small farmers (Rs. 722.4) was comparatively more than the medium (Rs. 620.0) farmers and large farmers (Rs. 532.42). The cost of packing material which accounted for Rs. 223.38 (around 35.74 percent) of the total marketing cost. The marketing fee shared a large proportion of Rs. 253.02 (around 14.00 percent) of the total marketing cost. The next important item was the transportation charges for output which accounted for Rs. 62.84 (around 9.67 percent, loading and unloading accounted for Rs. 46.02 (around 7.15 percent). The other expenses accounted for Rs. 39.8 (around 6.36 percent) of the total marketing cost.

Table 4.14: Cost incurred in marketing of silk cocoons by different categories of farmer respondents

Unit: Rs/100DFL's

S. No.	Particular	Size Groups			
		Small	**Medium**	**Large**	**Average**
1	Packing Material	253.6 (35.10)	220.02 (35.48)	196.53 (36.91)	223.38 (35.74)
2	Transportation Charges	96.4 (13.34)	59.12 (9.5)	32.99 (6.19)	62.84 (9.67)
3	Loading and Unloading Charges	58.34 (8.07)	46.26 (7.46)	33.48 (6.28)	46.02 (7.15)
4	Market Fee	263.76 (36.51)	256.10 (41.30)	238.82 (44.85)	253.02 (40.49)
5	Other Expenses	50.30 (6.96)	38.5 (6.20)	30.6 (5.74)	39.8 (6.36)
	Total	722.4 (100)	620 (100)	532.42 (100)	624.94 (100)

- Figures in parentheses indicate percentage to the total.

4.3.2 Marketing aspects of different channels involved in marketing of silk cocoons

Marketing channel

The results of preference of marketing channels for silk cocoon producers are presented below. In general, the silk cocoon producers disposed their produce through different marketing channels. Two important marketing channels were identified in the study area. They are:

Channel 1 - Producer-Wholesaler-Consumer(Reeler)

Channel 2 – Producer-Wholesaler-Retailer-Consumer(Reeler)

In the first channel, the producer sold his produce to the consumer through wholesaler. Out of 116 kg of cocoon, 108 kg was sold through channel I (Table 4.15).

In channel-II, the producer sold his produce to the wholesaler, further wholesaler sold the produce to retailer. Finally, the produce reaches consumer through retailer for further processing. Only small quantity of produce was sold through channel II. Out of 116 kg of cocoon, 7.67 kg was sold through channel II. The results on quantity of cocoon marketed by sample farmers in local cocoon markets under different channels were presented in Table 4.15.

Channel-wise marketing cost and marketing margin of silk cocoons were shown in Table 4.3.2. This findings were in conformity with Kerutagi *et al.*, (2009). Marketing cost and marketing margin vary considerably from channel to channel and were related directly to the length of the channel *i.e.*, longer the channel, more were the marketing cost and marketing margin. Channel II (Producer - Wholesaler - Retailer - Consumer) being the longest channel and in this channel the highest marketing cost and marketing margin per kg, *i.e.*, Rs. 77.62 and Rs. 250.03 respectively were observed. Channel I (Producer - Wholesaler - Consumer) was the shortest channel accounting for lowest marketing cost, *i.e.*, Rs. 41.65 per kg and low marketing margin *i.e.*, Rs. 150.10 per kg. Thus, it can be concluded that as the length of channel increases the marketing cost and marketing margin also increases and vice-versa.

In other words, the more the numbers of intermediaries involved between the producer and the ultimate consumers, the more is the marketing cost and marketing margin of the intermediaries. It can also be seen from the table that as the consumer paid the lowest price (Rs. 601.68 per kg) when they purchased from Channel 1 and paid the highest price (Rs. 624.98 per kg) when they purchased from channel II with two intermediaries between the producer and consumer. The price paid by the consumer increased with the increase in the length of the marketing channel or with the increased in the numbers of intermediaries involved between the producer and the ultimate consumers.

Intermediaries rendered variety of services in the marketing of cocoon with a view to earn some profit. The price spread in the various channels involved in the marketing of cocoons was given in Table 4.15. Price spread refers to the difference between the price paid by the consumer and the price received by the producer for equivalent quantity of farm produce. This price spread consists of the marketing costs and marketing margins of the intermediaries, which ultimately determine the overall effectiveness of the marketing system. The price spread in Channel I was found to be lowest (Rs. 389.31 per kg) and highest in Channel II (Rs. 665.3 per kg). Thus, it can be concluded that as the length of channel increases the price spread also increases and vice-versa.

A comparative view of producer's share and the shares of the various intermediaries involved in the different marketing channels is presented in Table 4.15. It is evident from the table that the producer's share in consumer's rupee decreased with the increase in the length of the marketing channels. The producer's net share was the highest (69.84 percent) in Channel 1 while lowest (50.9 percent) in Channel II. Thus, Channel II was the less favorable to the producers as their share was the lowest in consumer's rupee. It was due to the presence of large number of intermediaries in between the producer and the consumer. So, the farmers were not getting good remunerative price for their produce in Channel II.

Marketing efficiency was also calculated for the identified two channels by Shepherd's method and presented in Table 4.15. The higher the ratio, the higher efficiency and vice versa. The marketing efficiency was found to be high in Channel I (3.14) and low in Channel II (1.90). It was higher in channel I as price received by farmers was higher and both marketing cost and marketing margin were lower than channel I. Thus, it can be concluded that the channel I was efficient compared to channel II, as the efficiency ratio was higher in channel I.

Table 4.15: Marketing aspects of different channels involved in marketing of silk cocoons

S. No.	Particular	Size Groups							
		Small		Medium		Large		Average	
		Ch-1	Ch- 2	Ch-1	Ch-2	Ch-1	Ch-2	Ch-1	Ch-2
1.	Quantity of cocoon sold (kg)	49 (54)	5 (54)	85 (93)	8 (93)	190 (200)	10 (200)	108 (116)	7.67 (116)
2.	Selling price of producer(Rs.)	413	313	442	342	406.25	300.0	420.42	318.33
3.	Purchase price of consumer (Rs.)	594.3	628.25	623.25	646.7	587.5	600.01	601.68	624.98
4.	Price received by farmer (Rs.)	400.72	283	431.58	323.25	397.75	285	410.01	297.08
5.	Marketing cost (Rs.)	43.53	95.25	41.67	73.37	39.75	64.25	41.65	77.62
6.	Marketing margin (Rs.)	150.10	250.02	150	250.08	150.2	250	150.1	250.03
7.	Price spread (Rs.)	387.11	690.5	383.34	646.9	379.5	628.5	389.31	655.3
8.	Marketing efficiency (Ratio)	3.07	1.81	3.25	1.99	3.09	1.90	3.14	1.9
9.	Producer’s share (Percentage)	69.49	49.82	70.92	52.88	69.10	50.0	69.84	50.9

- Figures in parentheses indicate the total quantity of cocoon sold from respective group of farmers.

4.4 Constraints

The respondents were asked to mention the constraints they experienced in mulberry cultivation, silkworm rearing and marketing of cocoons. Based on the frequency, the constraints were ranked and interpreted.

4.4.1 Constraints faced by respondents in silkworm rearing

It could be noted from the (Table 4.16) analysis that majority of the respondents were opinioned that ‘Problems of Pests and Diseases’, ‘Water Scarcity’ and ‘Labour Scarcity’ were the major constraints in the study area. These are briefly explained below based on ranks.

Problem of pest and diseases was ranked first with the mean score 71.68 percent. Uzi fly infection in the process of silk worm rearing. It could be seen that almost all respondents expressed the attack of Uzi fly. Though the Uzi fly net was used by majority respondents, the yield of cocoons was affected by the incidence of Uzi fly. Infection of flacherie, grassarie and muscardine were also found in the study area (Dodamani *et al.*, 1997). Government is providing some sort of hygienic material to sericulture farmers but those materials are not reaching to the farmers. However still farmers are facing some sort of diseases.

Water scarcity was ranked second with the mean score of 66.01 percent, because water table was growing below the normal level, even after digging 1500 feet tube well there was no water availability. There was scanty of rain fall and also farmers do not have knowledge of water harvesting and use of natural resources, hence, sericulture farmers were facing scarcity of water and was the second major constraint in the study area.

The non-availability of labour was ranked third with the mean score of 60.0 percent, because agriculture is a gambling in monsoon, nearly half of the year farmers are engaging in agriculture activities and the remaining half of the year they are idle, really farmers are well knowledgeable if they conduct water harvesting procedure, they can engage in agriculture activities throughout the year. They have lack of awareness about water harvesting and proper use of water source, therefore rural peoples were migrating to urban

area and they were engaging in different activities like building construction, salesman etc. hence farmers were facing lack of labour availability and high cost of labour and low return in the process of sericulture farming in the study area.

Non-availability of good quality mulberry leaves was ranked fourth with the mean score of 58.05 percent. Respondents also reported that the incidence of pest in mulberry such as leaf eating caterpillar, thrips and mealy bugs and disease like powdery mildew infestation also found prominent in the study area, which drastically reduced the quantity and quality of mulberry leaf yield.

Improper disinfection has ranked fifth with the mean score of 57.98 percent. Maintenance of optimum temperature, aeration and sunlight is very important for producing quality cocoons. Many of the respondents could not do it because of lack of awareness. The disinfectant larvae should be culled out from the beds then and there so as to prevent the infection to other larvae. But majority of the farmers were not having adequate knowledge on the identification of disinfectants and hence lead to more infection. A large number of houses had poor ventilation, flooring and poor insulation against external temperature extremes. These problems were found in the study area and were in line with the problems reported by Khan (1985) and Anil Kumar Yadav (2008).

Lack of technical guidance was ranked sixth with the mean score of 54.98 percent, though number of attempts have been made by government for providing financial assistance and subsidies, are not reaching through media to sericulture farmers and even though if they know, they should pay some amount of commission, before they applying to draw or to get subsidies by sericulture technical service centers and those who are favorable to extension officers they are getting benefits in the study area.

Lack of advanced technologies has ranked seventh with the mean score of 39.43 percent, there was a tremendous change in the process of sericulture farming compare to ancient days. But still farmers are facing some sort of lack of technologies in the maintenance of good climatic condition in

rearing home, construction of rearing home, montages, Chandrikes and variety of new plants and cultivation methods in the process of mulberry cultivation and cocoon production.

Lack of basic necessities has ranked eighth with the mean score of 35.12 percent, basic necessities like water, mounting hall, rearing shed, leaf quality, mesh/net, leaf preservation chamber, chopping board, chop sticks, feathers, ant wells, foam pads paraffin paper, bed cleaning net etc., are major necessities which are available very less in the study area.

High cost of silkworm rearing equipments has ranked ninth with the mean score of 33.05 percent, though sericulture is low investment activity, in the initial stage it requires huge amount of investment for establishment of mulberry garden and construction of silk worm rearing home. Once if they established mulberry garden with tube well, it gives yearlong employment opportunities and returns to sericulture farmers in the process of sericulture farming.

Difficulty in obtaining quality DFL's was ranked at tenth with mean score 18.0 percent. These were some of the major constraints found in the study area. The farmers were not getting adequate credit for cocoon production which was the major problem faced by the farmers and also farmers revealed that there was lack of skilled labours for cocoon production and was the major problems also high wages to workers is one of them. These findings were in conformity with Hirala Jana and Verma (2004).

Table 4.16: Constraints faced by farmers in production of silk cocoons

S. No.	Item	Small (N=20)		Medium (N=20)		Large (N=20)		Overall (N=60)	
		Mean score	Ranking	Mean score	Ranking	Mean score	Ranking	Mean score	Ranking
1.	Non-availability of good quality mulberry leaves	62.6	3	57.35	4	54.2	5	58.05	4
2.	High cost of silkworm rearing equipments	32.05	9	33.7	9	33.4	9	33.05	9
3.	Lack of basic necessities like stands, nets, mountages etc.	35.45	8	34.8	8	35.1	8	35.12	8
4.	Lack of advanced technologies	40.4	7	39.4	6	38.5	7	39.43	7
5.	Improper disinfection	57.6	5	57.0	5	59.35	4	57.98	5
6.	Labour scarcity	60.95	4	59.3	2	59.75	3	60.0	3
7.	Problems of pests and diseases	78.4	1	58.5	3	78.15	1	71.68	1
8.	Lack of technical guidance	50.2	6	40.6	7	54.15	6	54.98	6
9.	Water scarcity	65.85	2	65.1	1	67.1	2	66.01	2
10.	Difficulty in obtaining quality DFL’s	18.0	10	18.0	10	18.0	10	18.0	10

4.4.2 Constraints faced by the respondents in marketing of cocoons

First and foremost, constraint experienced by many of the farmers was ‘Fluctuation in Market Price’. The price fluctuation of cocoon in the market has ranked first with the mean score of 40.63 percent (Table 4.17), because dumping of Chinese silk was started The free flow of silk was disturbed the position of domestic industry, because Chinese silk yarn was cost efficiency and qualitative and in 2001-02 the import of raw silk has increased from 11 percent to 21.2 percent, because Chinas raw silk prices was decreased by US dollar 24.5/kg to US dollar 13.5/kg during 2000 and 2003. Hence, the silk rearers and reelers were worst affected through these rise in imports of raw silk with low prices (Chandan Roy et.al (2015)).

The market price for cocoons is decided mainly based on the quality of cocoons. The poor-quality cocoons may be produced due to various reasons such as improper feeding schedules, disinfectant larvae, maintenance of irregular room temperature etc. Only lower prices will be paid for poor quality cocoons and there may be fluctuation in market prices. Hence there is a role of government to control price fluctuation and strengthen the sericulture farming in the study area.

The second and third constraints faced by the respondents were ‘lack of transportation facility’ (39.9 mean score) and ‘Delayed payments’ (34.96 mean score). The respondents have to take their products to market centers for marketing. Few respondents had the mode of transport on their own. But many of them depended only on hiring vehicles like, van, tempos and buses, for that they have to spend more money. Hence, they faced the constraint of transport. Delayed payments from buyers was the constraint, as the marketing is mainly undertaken by government, sometimes there may be a delayed repayment from buyers. The Government should arrange for the credit facilities through banks at lowest interest rates so as to encourage the emerging entrepreneurs in sericulture. ‘Lack of storage facility’ for cocoons in the market was a constraint faced by the rearers under cocoon marketing with 27.0 mean score.

Table 4.17: Constraints faced by the farmer respondents in cocoon marketing

S. No.	Item	Small (N=20)		Medium (N=20)		Large (N=20)		Average(N=60)	
		Mean score	Ranking	Mean score	Ranking	Mean score	Ranking	Mean score	Ranking
1	Delayed payments	36.32	2	33.9	3	34.65	3	34.96	3
2	Lack of transportation facility	35.8	3	45.5	1	38.4	2	39.9	2
3	High price fluctuation in market	43.8	1	37.5	2	40.6	1	40.63	1
4	Lack of storage facility	27.0	4	27.0	4	27	4	27.0	4

CHAPTER – 5

SUMMARY, CONCLUSION AND SUGGESTIONS FOR FUTURE WORK

5.1 Introduction

Sericulture is the cultivation of silkworms to produce silk. Sericulture is a farm-based, labour intensive and commercially attractive economic activity falling under the cottage and small-scale sector. It particularly suits rural-based farmers, entrepreneurs and artisans, as it requires low investment but, with potential for relatively higher returns. Today, China and India are the two main producers, with more than 60 percent of the world's annual production (http://en.m.wikipedia.org). India is the second largest producer of raw silk after China and the biggest consumer of raw silk and silk fabrics. In India, about 97 percent of the raw silk is produced in the five Indian states of Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu and Kashmir.

India is a unique country producing all the four known varieties of silk, namely, domesticated Mulberry silk (*Bombyx mori*), semi- domesticated Eri silk (*Philosomia ricini*), wild Tasar silk (*Antheraea mylitta*) and exclusive Muga silk (*Antheraea assama), the* wild golden silk being unique to India. Sericulture is a labour intensive industry in all its phases with employment generation of about 7.65 million persons per annum. Since Labour Force Participation Rate (LFPR) in sericulture is far ahead in comparison to similar rural avocations, it has significantly contributed to poverty alleviation thereby achieving the national agenda of inclusive development.

The Sericulture industry in Karnataka, which accounts for more than 65 percent of the total raw silk produced in the country and around 75,000 weavers are involved in manufacturing silk products including silk sarees, fabrics and garments. Karnataka produces 9,000 metric tons of mulberry silk of a total of 14,000 metric tons produced in the country, thus contributing nearly 70 percent of the country’s total mulberry silk. Madhya Pradesh ranks 3rd in non-traditional states of India. Looking into the importance of Sericulture

in rural economy the present study was undertaken with the following objectives.

5.2 Objectives

1. To study cost structure and profitability from silk cocoon production on sample farms
2. To study marketing of silk cocoons in the study area
3. To identify production and marketing constraints faced by silkworm rearers and to suggest the solutions to overcome the constraints

5.3 Materials and methods

The Sericulture industry in Karnataka, which accounts for more than 60 percent of the total raw silk produced in the country. The present study was confined to Kolar district of Karnataka state. Kolar district was selected for the study as this district has a cocoon productivity of 900 kg per hectare which is more than state average of 601 kg per hectare (2016-17). Kolar district comprises five blocks namely Kolar, Bangarpet, Mulbagal, Srinivaspur and Malur. Out of which, Kolar block has been selected purposively which was transacting nearly 3000 kilos of cocoons per day and it is highest than other blocks. Under Kolar block 5 villages were selected for study.

A multistage sampling procedure was adopted to select the block, villages and farmers. The primary data pertains to agriculture year 2017-18(October-December) was collected from sample respondents through personal contact with structured questionnaire. Cost of cultivation, break even production, yield gap, financial test ratio and Garrett ranking techniques were used to analyze the collected data.

5.4 Major findings

1. About 76.67 percent of the respondents were between the age group of 31-50 years, 18.33 percent of the respondents were under old age group and remaining 5.0 percent were young age group.
2. Most of the farmers had matriculation in all three groups of farmers. The percentages were higher in large group (40 percent) and lower in small farmers (30 percent). The percentage of illiteracy (8.33 percent) was less.

Higher level educated farmers in Sericulture could be directly attributed to the outlook such as treating Sericulture as an entrepreneurial opportunity.

3. The significantly higher family size was found in medium and large farmers compared to small farmers. Men dominated the family than women in due to the common cultural norms.
4. The total land holding was highest in large group (75.67 ha), comprising 27.92 ha of dry land and 47.75 ha of irrigated land. The land holding with small farmers was relatively less.
5. The farmers in the study area produced on an average of 65.06 kg of cocoons and 7.3 quintals of litter. Silkworms consumed 2250.3 kg of mulberry leaves, employed 25 mandays and used 63.5 mountages.
6. The total cost of rearing 100 DFL's was found to be Rs. 22621.4 in which variable cost was Rs. 20342.20 (89.92%) and fixed cost was Rs. 2279.20 (10.08%). The highest expenses was incurred by small farmers. The major costs were labour cost (Rs. 8639.75) and mulberry leaf (Rs.5619.63).
7. The gross returns obtained per 100 DFL in study area was Rs. 27959.54. Net returns were Rs. 5338.14 and the B:C ratio was 1.23. out of all three groups of farmers, small farmers were getting higher gross returns and the net returns was more. Hence, the B:C ratio was higher for small farmers.
8. The study of financial test ratios found that the fixed ratio in silkworm rearing was 0.08, operating ratio was 0.73 and the gross ratio was 0.81 from a rupee of gross income obtained from Sericulture business on sample farms.
9. The Break-even production in Sericulture was found to be 53.6 kg/100 DFLs and the breakeven price was found to be Rs. 390.96 for 100 DFLs.
10. The total marketing cost incurred for farmers for selling the cocoons was found to be Rs. 624.94 for 100 DFLs. The marketing channel used by majority of farmers was channel I (Producer – Wholesaler – Consumer) because of its shortest length accounting for lowest marketing cost, *i.e.*, Rs. 41.65 per kg and low marketing margin *i.e.*, Rs. 150.10 per kg, price spread was less (Rs. 389.31 per kg), higher producer's net share (69.84 percent) and the marketing efficiency was found to be high in Channel I (3.14) compared to Channel II.

11. At overall level, the Yield Gap-I was found to be 5kg/100DFL's (*i.e.*, yield gap between the experiment station yield and potential farm yield). Such a yield gap-I could be attributed for the environmental conditions and other infrastructural facilities available in the multilocational trials.
12. The overall Yield Gap-II was found to be 7.14 kg/100 DFL's. This could be attributable to non-adoption of recommended package of practices. The total yield gap was found to be 12.14 kg/100DFL's and index of yield gap was 17.34 percent.
13. The major constraints reported by the respondents in cocoon production were incidence of pests and diseases, water scarcity, labour scarcity, non-availability of good quality mulberry leaves, improper disinfection, lack of technical guidance and the problems faced in marketing of cocoons were fluctuation in market price, lack of transportation facility and delayed payments.

5.5 Result

1. Profitability from sericulture

   • H0: Production of silk cocoons is not profitable to the farmers

   • H1: Production of silk cocoons is profitable to the farmers

2. Marketing of cocoons

   • H0: Cost of marketing of cocoons is same in all groups of farmers

   • H1: Cost of marketing of cocoons is not same in all groups of farmers

3. Production and marketing constraints

   • H0: Farmers does not have constraints in production of cocoons and cocoon marketing.

   • H1: Farmers have constraints in production of cocoons and cocoon marketing.

5.6 Conclusion

Sericulture is practically a paying proposition. As they get themselves self-employed in most of the activities in Sericulture, they are assured of not only the employment but also relatively better income. The uncertainty regarding the wage employment and the low income decided by the prevailing low wages are avoided by these categories of the farmers by accepting the employment generating and relatively high income yielding enterprises like Sericulture. It is; therefore, Sericulture has been considered more of labour intensive crop than capital intensive crop.

The policy makers/government/department/ NGOs should make farmers in understanding the economic viability of Sericulture and motivate them to take up mulberry cultivation by adopting modem technology by sparing a piece of land. This would help them to enhance their income, in addition to other source of income of the households. So that the socio-economic condition of household will improve and that would help them to lead a better living and also one can come out of the clutches of poverty line.

5.7 Suggestions

1. Illiteracy and lack of technical knowledge on part of farmers about recommended practices prevented them from exploiting the greater farm potential. Hence, farmers must not only be educated but also encouraged to adopt recommended practices and technology to the full extent.
2. Since the Yield Gap-I is lower than Yield Gap-II, more demonstrations in the farmers field can be arranged to demonstrate yield potential and motivate farmer to adopt same practices to harvest good cocoon yield.
3. Majority of the farmers in the study area opinioned that incidence of pests and diseases, water scarcity, labour scarcity were the major constraints in silk cocoon production. Hence, extension agents should give more importance in educating farmers about better protection measures and proper disinfection methods. Farmers should also be educated about optimal use of labour.

4. In order to overcome the constraints of labour scarcity and high labour cost, it is necessary to utilize the labour saving implements and machinery to do the farm operations in mulberry cultivation. Hence, awareness should be created on the availability and use of labour saving implements.
5. The State Department of Sericulture and other functionaries should conduct periodical training programmes and demonstrate the required skills regarding all the latest technologies in Sericulture.
6. The problems faced in marketing of cocoons were fluctuation in market price, lack of transportation facility and delayed payments. The Government should arrange for the credit facilities through banks at lowest interest rates so as to encourage the emerging entrepreneurs in Sericulture.
7. Extension programmes must be carefully designed to make them effective in convincing the farmers. It is needless to say that farmers assessment of constraints, possible technology and policy options will be prerequisite to bring out any desirable changes. Therefore, the perception and views of the farmers need to be considered at each stage by researchers, policy makers and extensionists.

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Appendix: INTERVIEW SCHEDULE
Production and Marketing of Silk cocoons in Kolar District of Karnataka – An Econometric Analysis
(Schedule for Primary Data Collection from Farmers)

I. GENERAL INFORMATION OF THE RESPONDENT

Name of the respondent	
Age	
Type of family (joint/nuclear)	
Education	
Main occupation	
Village	
Taluk	
District	

Family composition

Sl. No.	Members	M/F	Age	Relationship with the head	Education	Occupation
1.	Male					
2.	Female					
3.	Children					

II. Farm Inventory Position

A. Land inventory **(in Ha)**

Sl. No.	Particulars	Dryland		Irrigated		
		Area	Land value/ Rent(Rs/ac)	Area	Land value/ Rent(Rs/ac)	Source of irrigation*
1.	Area owned					
2.	Leased in					
3.	Leased out					
4.	Fallow land					

***1-Canal; 2-Tank; 3-Open Well; 4-Tube Well; 5-Others (specify):**

B. Farm buildings

Sl. No.	PARTICULAR	Year of construction	Construction cost (Rs.)	Present value (Rs.)
1.	Dwelling house			
2.	Farm house			
3.	Cattle Shed			
4.	Poultry shed			
5.	Pump Shed			
6.	Preserving chamber			
7.	Rearing house			
8.	Others, if any (specify)			

C. Farm machinery and equipments

Sl. No.	PARTICULAR	Number	Year of purchase	Purchase value (Rs.)	Present value (Rs.)
1.	Tractor				
2.	Iron plough				
3.	Wooden plough				
4.	Harrows				
6.	Seed drill				
7.	Bullock cart				
8.	Pump set				
9.	Sprayers				
10.	Dusters				

D. Silkworm rearing equipments

Sl. No.	Particular	Year of purchase/ construction	Expected life (Years)	Cost of purchase value (Rs.)	Present value (Rs.)	Depreciation
1.	Rearing house					
2.	Equipments					
3.	Sprayer					
4.	Dusters					
3.	Rearing trays					
4.	Uzi fly net					
5.	Rearing stands					
6.	Mountages					
7.	Leaf cutting knives					

8.	Miscellaneous					

III. **COST OF SILK WORM REARING**

S. No.	PARTICULAR	Cost (Rs.)
A.	**Variable costs**	
1.	DFL's/Chawki worms	
2.	Transportation cost of DFL's/ Chawki worms	
3.	Human labor a. Family b. Hired	
4.	Mulberry leaves	
5.	Disinfectants a. Bed disinfectants b. Lime dust c. Decol	
	Total	
6.	Uzi fly trap	
7.	Sprayers	
8.	Paraffin paper	
9.	News paper	
10.	Interest on working capital	
	Total variable cost	
B.	**Fixed costs**	
1.	Depreciation on rearing house and equipment	
2.	Interest on fixed capital	
	Total fixed cost	
C.	**Total Cost (A+B)**	

OUTPUT AND TOTAL RETURNS

S. No.	PARTICULAR	Quantity	Price per unit (Rs.)	Total value (Rs.)
1.	Main product (Kgs)			
	A. Good quality cocoon			
	b. Low quality cocoon			
2.	Byproduct (quintal)			
	a. Fodder b. Litter			

III. MARKETING COST OF SILK COCOONS

S. No.	PARTICULAR	Cost (Rs.)
1.	Packing material	
2.	Grading and packing charges	
3.	Transportation charges	
4.	Loading and unloading charges	
5.	Market fee @1%	
6.	Personal expenditure	
	Total	

IV. CONSTRAINTS

PRODUCTION CONSTRAINTS

S. No.	PARTICULAR	RANKING
1.	Non-availability of good quality mulberry leaves	
2.	High cost of silkworm rearing equipments	
3.	Lack of basic necessities like stands, nets, mountages etc.	
4.	Lack of advanced technologies	
5.	Improper disinfection	
6.	Labour scarcity	
7.	Problems of pests and diseases	
8.	Lack of technical guidance	
9.	Water scarcity	
10.	Difficulty in obtaining quality DFL's	

MARKETING CONSTRAINTS

S. No.	PARTICULAR	RANKING
1.	Delayed payments	
2.	Lack of transportation facility	
3.	High price fluctuation in market	
4.	Lack of storage facility	

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MSc [Agri]	Agril. Economics and Farm Management	Jawarharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh	2018	8.28
BSc [Agri]	Agriculture	University of Agricultural Sciences Bangalore, Karnataka	2016	8.54
12th	Physics, Chemistry, Mathematics, Biology	Venkatadri Ind. PU College, Chintamani, PU Board, Karnataka	2012	78.83%
10th	Mathematics, Science, Social Science	Sri Chowdeshwari High School, Ammanallur, KSSEE Board	2010	80.64%

For the partial fulfillment of the master's degree she was allotted a research problem on **"**Production and Marketing of Silk Cocoons in Kolar District of Karnataka – An Econometric Analysis", which was successfully conducted by her and being submitted in the form of this thesis.