

Dr. SATISH VERMA

Personal Information

Gender: **Male**,
Date of Birth: **3rd March 1959**,
Language proficiency: **Hindi, English, French**

Designation Scientist E (Engineer)
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I. Academic Qualifications

Qualification	University/ Board	Passing Year	Stream	% /OGPA	Thesis/ Dissertations (if Applicable)
Doctorate Ph.D.	National Institute of Agriculture, Paris, France	1989	Farm Machinery & Power	Excellent	<i>Thesis : "Modelling of tractor-plough combination for ploughing operation"</i>
Degree of Advanced Agricultural Studies (DAA)	National Institute of Agriculture, Paris, France Course work and dissertation at CEMAGREF, Paris France	1986	Farm Machinery & Power	14.5/20 72.5%	<i>Dissertation : "Slip measurement systems for tractors"</i>
Master of Engineering	Asian Institute of Technology, Bangkok, Thailand.	1983	Farm Machinery & Power	3.69/4.00	<i>Thesis : "Development & testing of retractable lugged cage wheels"</i>
Bachelor of Engineering	College of Technology & Agricultural Engineering, Udaipur University, Udaipur, Rajasthan	1981	Agricultural Engineering	3.89/4.00	
Higher Secondary	CBSE, New Delhi	1976	Physics. Chemistry & Mathematics	69%	

II. Trainings attended

1. Inventors of India : Knowledge network for incubating innovations with enterprises, 24-26 September 2004 , Indian Institute of Management, Ahemdabad at Ahemdabad.
2. Communication and presentation skills, 18-19 October 2004, International Academy of creation teaching, Bangalore at Mysore
3. Integrating IPR culture in R&D, 5 December 2005, National Research Development Corporation, New Delhi and Controller General of Patents , Designs and Trademarks at Bangalore.
4. Intellectual Property : Protection, Valuation and commercialization, , 6 December 2005, National Research Development Corporation, New Delhi and Patent Office, Chennai at Bangalore.
5. Road show on Protections of Geographical indications in India and United States, 3 December 2008, National Research Development Corporation, New Delhi and US Embassy , New Delhi at Bangalore.
6. Intellectual Property Rights, 1-2 July, 2009, Administration Training Institute, Mysore.

III. Membership of Professional Societies

- Life member of Indian Society of Agricultural Engineers, New Delhi
- Life member of The Institution of Engineers, Kolkata
- Member of National Academy of Sericulture Scientists of India

IV. Achievements

Academic Achievements

- **Tim Kendal Award**, Highest Overall Grade Point Average, Asian Institute of Technology, Bangkok (1984).
- **University Gold Medal**, Highest Overall Grade Point Average, CTAE, Udaipur (1981).
- **I Division Distinction in Physics & Mathematics**, CBSE (1976).

Professional Achievements

- **Seth Baldeo Shah Award** for contribution to mechanization in Sericulture, Central Silk Board (1995).
- **ASPEE Award** for development & commercialization of machines for Sericulture, Indian Society of Agricultural Engineers, New Delhi (2004).
- **Plaque of Honour**, Institution of Engineers (2010).
- **Best Worker Award**, CSRTI, Mysore (2003).
- **Merit Certificate** for work under IVLP, CSRTI, Mysore (2003-07).
- **Merit Certificate** for work under Japan International cooperation Agency, JICA (2002-07).
- **Appreciation Letter**, significant contribution to development of Seri High Pressure Sprayer, CSRTI, Mysore (2009).
- **Appreciation Letter**, significant contribution to development of Seri Humidifier, CSRTI, Mysore (2009).

V. Work Experience Details

Scientist E (Engineer), CSRTI, Mysore	Jul 10 – To Date
Job Profile : Research & Teaching, Administration & Section Head of Sericultural Engineering Division	
Scientist D (Engineer), CSRTI, Mysore	Aug 04 – Jun 10
Job Profile : Research & Teaching, Administration & Section Head of Sericultural Engineering Division	
Executive Engineer, CSRTI, Mysore	May 92 – Jul 04
Job Profile : Research & Teaching, Administration & Section Head of Sericultural Engineering Division	
Assistant Professor, CTAE, Udaipur	Nov 89 – Apr 92
Job Profile: Research & Teaching Farm Machinery and Power Courses to B.E. & M.E. students Guide for B.E. & M.E. students Thesis	
Assistant Professor, SKN College, Jobner	Jun 82 – Jun 88
Job Profile : Research & Teaching	
Teaching Associate, CTAE, Udaipur	Feb 82 – May 82
Job Profile : Teaching	
Assistant Professor, G.V. College, Sangaria	Aug 81 – Jan 82
Job Profile : Teaching Agriculture Engineering Courses	

Extension Experience

1992 – To Date

Involved in popularization of mechanization in mulberry cultivation, silkworm rearing, etc. As a result, today a large number of farmers have adopted paired row and 3 M plantation methods of mulberry cultivation in South Indian States, Maharashtra and Madhyapradesh. Today, the equipments developed and commercialized by CSRTI, Mysore are in good demand.

Organizing exhibitions for Reshme Krishi Mela at CSRTI and outstations since year 2000.

Organized and participated in exhibitions and demonstration at Bangalore, Dharwad, Chennai, Pune, Coimbatore Ananthpur, Hindupur, Chitradurga and many other places. Permanent partner in all the exhibitions and demonstrations organized by Extension Division of CSRTI, Mysore.

There is an excellent response to the technologies developed by CSRTI from farmers and others.

Additional Teaching Experience

1992 – To Date

- M.Sc. in Sericulture Technology & different training programmes on Mechanization in Sericulture at Central Sericultural Research & Training Institute, Mysore
- Teaching courses related to Mechanization in sericulture, Silkworm Rearing Houses design, environment control, etc.
- Project works with B.Tech & M.Tech students of Engineering Colleges. *For details see Annexure 1*

ME 2 students

BE 14 Batches (Each batch on an average contain 4 students)

Diploma 1 Batch of 4 students

VI. International Exposure

Country Visited	Purpose	Year	Duration
Thailand	For M.Tech. at Asian Institute of Technology (AIT), Bangkok	1983 to 1984	1 year 8 months
France	For Ph.D at National Institute of Agriculture, Paris, France	1984 to 1989	5 years
Spain	Personal visit	1984	7 days
Monaco	Personal visit	1984	4 days
Belgium & Holland	Personal visit	1987	10 days
England	Personal visit	1987	6 days

VII. Research & Development Works

The followings technologies, tools, equipments and machines designed and developed for sericulture industry.

A. Mulberry Plantation Methods for Mechanized Cultivation of Mulberry

1. Paired row plantation
2. 3M Plantation method

B. Tools, Equipments and Machines Designed and Developed

1. Mulberry cutting preparation machine
2. Electric power sprayer (Commercialized)
3. High pressure power sprayer (Commercialized)
4. Leaf chopper (for individual farmers) (Commercialized)
5. Chawki leaf chopper (for CRCs) (Commercialized)
6. Seri humidifier (Commercialized)
7. Seri Heater (Under Commercialization)
8. Chawki rearing stands (Under Commercialization)
9. Tray washing machine
10. Chawki dusting machine (Under Commercialization)
11. Hand deflosser (Commercialized)
12. Hand operated cum motorized deflosser (Commercialized)
13. Motorised deflosser (Commercialized)
14. Stands for rotary mountages
15. Plastic mountage pressing and bundling tool
16. Self propelled power sprayer for mulberry gardens
17. Mulberry shoot harvester
18. Cocoon harvester for plastic mountages (Under Commercialization)
19. Mulberry shoot crushing machine
20. Leaf litter separator
21. Cocoon cutting machine
22. Battery operated duster (Commercialized)
23. Low cost humidifier (Under development)
24. High capacity chawki leaf chopper (Under development)
25. Mechanized dusting and shoot feeding system for late age rearing (under development)

C. Commercial Tools, Equipments and Machines Tested, Modified for Adoption in Sericulture

1. Secateurs
2. Pruning saw
3. Looping shears
4. Tractor operated subsoiler for deep cultivation and rainwater harvesting and its insitu conservation
5. Power tiller operated cultivator for inter-cultural operations in mulberry gardens
6. Tractor operated cultivator for inter-cultural operations in mulberry gardens
7. TNAU power tiller operated boom sprayer
8. ASPEE tractor mounted boom sprayer
9. Power weeders
10. Brush cutters for mulberry shoot harvesting
11. Brush cutters for bottom pruning of mulberry gardens
12. Motorised machine (make Bhide) for cutting and crushing mulberry shoots for making compost

D. Silkworm Rearing Houses

1. Young age silkworm rearing house (CRC)
2. Late age silkworm rearing house
3. Mounting hall
4. Standardization of shoot rearing racks

E. Rainwater harvesting and its in-situ conservation in mulberry gardens

VIII. Patents Applied & Obtained

Title of Patent	Application No.	Year of Application	Status
A torch for cleaning and sterilizing of rearing houses, grainages and rearing appliances for silkworm rearing (Flame gun)	147/CHE/2003	2003	Patent Granted No. 217215 Dated 26.3.2008
A machine for pruning mulberry plants	1014/MAS/99	1999	Patent Granted No. 217215 Dated 26.3.2008
Machine for crushing shoots of plants	367/MAS/97	1997	Patent Granted No. A-CH/0959 Dated 3.2.2006
Cocoon deflossing machine	397/MAS/97	1997	Patent Awaited
Machine for preparation of cutting	604/MAS/97	1997	Patent Awaited

IX. Technologies and Machines Commercialized

S.No.	Name of Equipment/ machine	Year of Commercialization	Name of Party/firm Issued licence	Technology Transfer Conditions		
				Period of licence (Years)	Premium Lumpsum (Rs.)	Royalty on sales (%)
1	Motorized cocoon deflossing machine	2002	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	10	100000	3
2	Leaf Chopping machine	2002	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	10	100000	3
3	Flame gun	2002	Kiran Corporation 2-B, Devraj Urs Road Mysore 570 001	5	10000	2
4	Electric sprayer	2005	Sri Balaji Agencies 153/1, Ramavilasa Rd Mysore 570 024	5	20000	3
5	Chawki Leaf chopper	2005	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	7	25000	3
6	Battery operated powder duster	2005	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	5	5000	3
7	Hand operated silk cocoon cleaning machine	2005	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	5	5000	3
8	Motorized cum hand operated deflosser	2005	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	5	5000	3
9	Sericulture sprayer	2008/2012	Raj Entreprises,1265, Hebbal Stage I, Mysore 570 016	5	50000	3
10	Seri Humidifier	2008	Sri Balaji Agencies 153/1, Ramavilasa Rd Mysore 570 024	5	50000	3

X. Fabrication & Supply Of Different Types Of Machines for Popularization

S.No.	Name of equipment/machine	Units supplied	Value (Rs.)
1.	Motorised deflosser	56	8,41,875
2.	Hand deflosser	53	41,860
3.	Hand operated cum motorised deflosser	27	1,06,739
4.	Mulberry cutting preparation	36	3,25,220
5.	Hand duster	40	30,457
6.	Cocoon cutting machine	18	5,02,500
7.	Electric sprayers	290	15,13,370
8.	Leaf Choppers	8	1,71,212
9.	Shoot crushing	3	87,600
10.	Plastic mountage pressing tool	13	2,650
11.	Flamegun	7	6,550
12.	Seri Heaters	160	7,75,600
13.	Seri Humidifiers	25	2,11,000
14.	Other machines	38	3,21,167
Total		774	49,38,800

XI. External Funded Research Project Undertaken

Project Duration	Funding Organization	Amount	Project Detail
Feb 04 – Jan 09	DBT, New Delhi	Rs.81.33 Lakhs	Establishment of Seri technology Complex for Women
Oct 03 – Sep 06	DST, New Delhi	Rs.11.56 Lakhs	Development and popularization of women friendly technologies for avoiding drudgery in sericulture
Jul 03 – Jun 06	ICAR, New Delhi	Rs.13.54 Lakhs	Adoption of appropriate equipments for mechanization in mulberry cultivation
1992 – 1993	CSR&TI Bangalore	Rs.2.63 Lakhs	Development and Performance Evaluation of Package of Tractor and Power Tiller Operated Implements for Mechanization in Mulberry Farming

XII. Seminars & Trainings Organized

Funding Agency	Year	Duration	Title
DST	2005-2009	6 Days	Tools, equipments and machines for avoiding drudgery for women in sericulture (Training Programme)
DBT	2003-2006	6 Days	Ergonomically sound appliances for reduction of drudgery in sericulture (Training Programme)
Central Silk Board	2003	2 Days	Mechanization in Sericulture (Seminar)
Central Silk Board	2011	1 Day	Innovative Farmers workshop
Central Silk Board	2011	2 days	CSRTI Golden Jubilee Seminar

XIII. Publications

Full length papers in refereed journals	23
Papers in conference proceedings/book chapters	30
Books published	5
Chapters in Books	3
Manuals/Teaching Aid Developed/Brochures	8
Others :VCDs on Mechanization in Sericulture (In English, Hindi, Kannada, Tamil, Telugu, Malyalam)	6
Total Publications	75

A. BOOKS/BOOK CHAPTERS

1. **Silkworm Rearing Houses** (2004 - in Kannada)
2. **Silkworm Rearing Houses** (2006 – in English)
3. **Mechanization in Sericulture** (2006 – in English)
4. **Seri Success Through** (2011 – in English)
5. **Sericulture Made Easy** (2013 – in English)
6. **Mechanization of Mulberry Cultivation** – A chapter in Book entitled “ Mulberry Cultivation in South India” published in 2008 by IGNOU, New Delhi
7. **Mechanization in Mulberry Cultivation** – A Chapter in handbook of Sericulture Technologies (2010) published by Central Silk Board, Bangalore
8. **Mechanization in Silkworm Rearing** – A Chapter in handbook of Sericulture Technologies (2010) published by Central Silk Board, Bangalore

B. FULL LENGTH PAPERS IN REFEREED JOURNALS

1. **Verma S. & Gee Clough D.** (1988) Retractive lugged cage wheels for wetland tractors, *Machinisme Agricole* Tropical No. 101, CEEMAT, Antony, France.
2. **Singh P. & Verma S.** (1992) Status and scope of agricultural mechanization in Rajasthan, *Agriculture Situation in India*, Directorate of Economics & Statistics, Deptt. Of Agriculture, Govt. of India, March.
3. **Verma S. & Singh P.** (1994) Needs and prospects of mechanizing Indian agriculture, *Agricultural Mechanization in Asia, Africa and Latin America* , (AMA) Japan, Vol. 25 No1.
4. **Verma S., Jhon M., Subrahmanyam, Aqueel S.A. & Datta R.K.** (1994) Machine for Mulberry Cuttings, May, *Indian Silk*.
5. **Verma S., Jhon M., & Datta R.K.** (1995) Leaf litter separator, February, *Indian Silk*.
6. **Verma S., Jhon M., & Datta R.K.** (1995) Mechanized cocoon deflossing, June, *Indian Silk*.
7. **Verma S., Jhon M., & Datta R.K.** (1995) Machine for crushing mulberry shoots for making compost, October, *Indian Silk*.

8. **Verma S., Jhon M., & Datta R.K.** (1997) Mulberry plantation techniques, May, *Indian Silk*.
9. **Verma S., Jhon M., & Datta R.K.** (1997) Subsoiler – an effective equipment for rain water harvesting and insitu moisture conservation, July, *Indian Silk*.
10. **Raju S., Verma S., John M., Nath S.B., ahsan M.M. and Datta R.K.** (1997) Cost effective heating system for chawki rearing in China, *Indian Silk*, December.
11. **Verma S., Jhon M., & Datta R.K.** (1998) Mulberry pruning machine, April, *Indian Silk*.
12. **Dandin S.B. & Verma S.** (2002) Mechanization in sericulture – Need & scope, May, *Indian Silk*.
13. **Verma S.** (2004) Mechanization in sericulture , May, *Indian Silk*.
14. **Verma S. Babu G.K., Singh G.B. & Dandin S.** (2007) Stands for rotary mountages, *Indian Silk*. November
15. **Verma S. & Dandin S.B.** (2008) Matured Silkworm Separation Machine, *Indian Silk* February
16. **Verma S. & Kamble C.K.** (2008) Resham Udpadan mein Yantrikaran (in hindi), *Indian Silk* May
17. **Verma S. & Kamble C.K.** (2008) Design and construction of Chawki Rearing Houses, *Indian Silk* October
18. **Verma S. & Kamble C.K.** (2008) Seri-Humidifier cum Heater, *Indian Silk* December
19. **Verma S. and Kamble C.K.** (2008) Psychrometric chart- an ideal tool for environment management in silkworm rearing houses, *Indian Journal of Sericulture*, Vol. 47. No. 2,218-225
20. **Verma S.** (2009) PVC stands for young age rearing silkworm rearing, *Indian Silk*, May
21. **Rao TVSS, Naidu WD, Verma S.** and Rao JVK (2009) Mulberry Sericulture – Machines Management, Annadaata, March, p32-35 (in Telugu)
22. **Verma S.** (2011) Modernization through mechanization, *Indian Silk*, January
23. **Kumaresan P., Geetha Devi R.G. and Satish Verma** (2011) Impact of separate silkworm Rearing house on economic performance – A Comparative Analysis, *Indian Journal of Sericulture*, Vol. 50(1) 22-27.

C. PAPERS PRESENTED IN CONFERENCES, SEMIMARS, BULLETINS, ETC. AND PUBLISHED IN PROCEEDINGS

1. **Verma S.** (1986) Lutte contre le tassement des sols (Overcoming soil compaction), *Bulletin Technique de l'Equipment Machinisme Agricole*, October, CEMAGREF, Antony, France.
2. **Verma S.**(1988) Design and testing of retractive lugged cage wheels. Paper No. 88-078 presented at *International Conference of Agricultural Engineering* held from 2-4 march, 1988 at Paris, France.
3. **Verma S., Goupillion J.F. & Billot J.F.** (1988) Anysis of tractor plough combination shows potential of technical progress. Paper No. 88-288 presented at *International Conference of Agricultural Engineering* held from 2-4 march, 1988 at Paris, France.
4. **Verma S.,** (1988) Statut de la mechanization en Inde (in French) *Lecture at Institut National Agronomique Paris-Grignon in the series of lectures on agricultural mechanization in developing countries.*
5. **Verma S.** (1990) Tillage requirements and implements for effective moisture conservation in dryland farming. Paper presented at *V National Convention of Agricultural Engineers of the Institution of Engineers* held at CTAE, Udaipur from September 14-16, 1990.
6. **Verma S. & Singh P.** (1990) Need and propects of mechanizing Indian agriculture in coming decade. Paper presented at *V National Convention of Agricultural Engineers of the Institution of Engineers* held at CTAE, Udaipur from September 14-16, 1990.

7. **Shrimali H., Singh P. & Verma S.** (1990) Camel Cart : State of art report. Paper presented at *V National Convention of Agricultural engineers of the Institution of Engineers* held at CTAE, Udaipur from September 14-16, 1990.
8. **Verma S.** (2000) Engineering design of silkworm rearing houses. Paper presented at the *National Conference on Strategies for Sericulture Research & Development* held at CSRTI, Mysore in November 2000.
9. **Verma S.** (2000) Mechanization in sericulture. Paper presented at the *National Conference on Strategies for Sericulture Research & Development* held at CSRTI, Mysore in November 2000.
10. **Verma S. & Dandin S.B.**(2002) Mechanization in sericulture. *Seminar held during National Agricultural Machinery Exhibition* organized by Institute for Agricultural Technologies (IAT) at Bangalore on 2-5 May, 2002
11. **Verma S. & Dandin S.B.** (2002) Development of machinery and equipments for sericulture. Paper presented at All India Seminar of Advances in Agricultural Mechanization organized the Institution of Engineers at Bangalore on 27-28 December 2002.
12. **Verma S.** (2003) Mechanization in sericulture -Challenges ahead. 90th Indian Science Congress held at Bangalore on 3-7 January 2003.
13. **Verma S. & Dandin S.B.** (2003) Mechanization – an urgent need for sericulture industry in India. *37th Annual convention of Indian Society of Agricultural Engineers* held at Udaipur on 29-31, January 2003.
14. **Verma S. & Dandin S.B.**(2003) Engineering applications in sericulture. Proceeding of National Conference on tropical sericulture for global competitiveness organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
15. **Dandin S.B., Srinivasa G., Verma S. & Rajan R.K.** (2003) Need for women friendly technologies in sericulture. Proceeding of *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
16. **Rajanna L., Jayaram H., Thippeswamy T., Verma S. & Vedavayasa** (2003) Effect of different tillage methods on mulberry yield and quality. Paper presented at *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
17. **Verma S. & Dandin S.B.** (2003) Technological developments for mechanization in mulberry cultivation. . Paper presented at *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
18. **Verma S. & Dandin S.B.** (2003) A semiautomatic machine for cutting of cocoons for silkworm egg production. . Paper presented at *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
19. **Verma S. & Dandin S.B.** (2003) Design and construction of silkworm rearing houses. Paper presented at *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
20. **Verma S. & Dandin S.B.** (2003) Equipments and machines for reduction of drudgery and cost of production of silk cocoons. Paper presented at *National Conference on tropical sericulture for global competitiveness* organized by National Academy of Sericultural Sciences held at CSRTI, Mysore on 5-7 November, 2003.
21. **Verma S., Dandin S.B., Rajasekhar S. & Ranjan R.** (2004) Mechanization scenario in sericulture in India. *38th Annual convention of Indian Society of Agricultural Engineers* held at Dapoli, 2004.
22. **Dandin S.B., Nirmal Kumar, Verma S. & Sirinivasa Babu** (2004) Traditional Knowledge, innovations and commercialization – a sericulture experience. Paper presented at *Workshop on Innovators of India – Knowledge Network for Incubating innovations into enterprise* held at IIM, Ahemdabad on 24-26 September, 2004.

23. **Verma S. & Dandin S.B.** (2005) Technologies for mechanization in sericulture. Paper presented at *39th Annual convention of Indian Society of Agricultural Engineers* held at ANGRAU, Hyderabad on 9-11, March, 2005.
24. **Verma S. Dandin S.B., Rajasekhar S.** (2005) Mechanization in sericulture – New opportunities for agricultural engineers. Paper presented at *18th National Convention of Institution of Engineers on Role of Agricultural Engineers on Development of Cash Crops* held at TNAU, Coimbatore on 26-27 March 2005.
25. **Verma S. & Dandin S.B.** (2006) Mechanization and its impact on mulberry sericulture. Paper presented at *Workshop on appropriate technology for mulberry sericulture in eastern and north eastern India* held at CSRTI, Behrampore (WB) on 17-18th January, 2006.
26. **Verma S. & Dandin S.B.** (2007) Prospects of mechanization in sericulture in Tamilnadu, Lead paper, Workshop on sustainability & entrepreneurship in Tamilnadu held at RSRs Salem, Tamilnadu on 29th March, 2007.
27. Dasappa, Reddy M.M., **Verma S.**, Thippeswamy T and Nagraj B. (2011) Effect of sericompost and vermicompost produced out of mulberry shoots on soil health, yield and quality of mulberry leaf, Golden Jubilee National Conference on Sericulture Innovations: Before and Beyond held at CSRTI, Mysore on 28-29th January, 2011.
28. **Verma S.** (2012) Environment management in silkworm rearing houses under different climatic conditions, National Workshop on Promotion of sericulture for Sustainable Income held at Annamalai University on 17-18th March 2012.
29. **Verma S.** (2012) Mechanization in mulberry sericulture – need and scope, National Workshop on Promotion of sericulture for Sustainable Income held at Annamalai University on 17-18th March 2012.
30. **Verma S.** (2013) Sahtoot reshama utpadan mein yantrikaran – aavasyakta avam sambhabnayein (in hindi), Technical Workshop in Hindi held at CSRTI, Mysore on 6th February 2013.

XIV. MAJOR CONTRIBUTIONS TO SERICULTURE INDUSTRY

1. Mechanization in Sericulture

(a) Mechanization in mulberry cultivation

Prior to 1995 mulberry was planted as 2'x2' or 3'x3'. It is not possible to use any kind of mechanized operation in these spacing. Farmers were using hand tools and bullock drawn implements for intercultural operations. With development and introduction of **Paired row plantation** in 1995, mechanization was introduced first time to mulberry cultivation for intercultural operations. Today, most of the mulberry gardens planted after year 2000 have paired row plantation system. This system facilitates intercultural operation with help of tractor operated cultivators at very fast rate. About one hour is required per acre and intercultural operations with a tractor costs only Rs. 300/acre. With tractor work done is better. The soil is loosened to more depth. The weeds are uprooted completely. Today, large scale mulberry cultivation has become feasible due to adoption of paired row plantation.

The water requirement is less in paired row plantation method as only 40% area is wetted. Farmers save cost of drip irrigation system as only one lateral is required for each row.

Today, a number of equipments such as power tiller and tractor chemical application machines are available for use in paired row system. Many of these have been designed at CSRTI, Mysore.

To facilitate large scale mulberry cultivation and carry out various operations with machines, a new **plantation method called 3M** was introduced in 2005.

Once, it was felt that mechanization may not be feasible in mulberry cultivation but it has been proved that mechanization is very much possible in mulberry cultivation. Today, farmers cultivate mulberry over large area due to mechanization.

Through mechanization, the drudgery involved in many farm operations like intercultural operations and shoot harvesting can be eliminated to a great extent.

The mechanization has also improved quality of leaf thus better growth of the silkworms and finally more production of quality cocoons.

The mechanization in mulberry cultivation has reduced the cost of mulberry leaf production thus reduction in the cost of cocoon production and finally more earning to the farmer.

(b) Mechanization in silkworm rearing

The silkworm rearing is considered very tedious. It involves high amount of labour. Many works are not very pleasant. A number of tools, equipments and machines have been developed and popularized among farmers for reduction of drudgery. Some of the tools and machines are listed below :

- a. Low cost sprayers for disinfection
- b. Leaf choppers
- c. Battery operated duster
- d. Matured Silkworm harvester
- e. Cocoon harvesters
- f. Cocoon cleaners & deflossers
- g. Tray washers

The mechanization in silkworm rearing has reduced drudgery involved in many operations thus attracting more farmers to take up sericulture. Mechanization has led to improvement in quality of cocoons and reduction in production of cocoons.

(c) Mechanization in Silkworm egg production

A motorized cocoon cutting machine was developed around 1998. This machine facilitates fast cutting of the bivoltine cocoons. Earlier the cocoon cutting machines were imported from Japan at cost of Rs. 12-13 lakh per machine. Today CSRTI, Mysore manufacturers and supplies motorized cocoon cutting machines at cost of only Rs. 40,000 per machine. These machines have been supplied to grainages in Karnataka, Andhrapradesh, Maharastra, Himachal Pradesh, UP, Assam, J&K & Tripura. The different type of deflossers are used for cleaning and floss removal in many grainages.

2. Reduction of drudgery for women working in sericulture

More than 50 % workforce in sericulture are women workers. A good amount of research and development work has been done for reduction of drudgery involved in many works involving women. The machines developed at CSRTI, Mysore are women friendly and safe to use.

3. Compost Production from mulberry shoots

A large quantity of mulberry shoots are available on a sericulture farm. These are either fired or left unused. The decomposition of the shoots was a big problem. With development of machines for crushing the mulberry shoots a good quality nutritional rich vermin compost can be produced. Today many farmers are purchasing the shoot crusher for production of vermin compost and compost.

4. Development of about 30 acres of Mechanized mulberry gardens at CSRTI, Mysore

About 30 acres of unused land at CSRTI, Mysore developed for mechanized cultivation during 2002-04. Today, this land has high yielding mulberry gardens. Roads were provided atleast on one side of the garden. Irrigation. Many research experiments including a 2 acre mulberry garden for Chawki rearing is located in these lands. The gardens in new land are appreciated by the farmers and visitors.

5. Rain water harvesting system at CSRTI, Mysore

(a) Rain water harvesting system from buildings

The major buildings of the institute with large roof area have been provided with rain water harvesting system. The water collected from roof is put to the earth through soak pits. During 2005-06 approximately 10 lakh litres of water was collected from roof of the buildings and put into the earth.

(b) Rain water harvesting from mulberry gardens

The rain water in mulberry gardens is allowed to spread over to a large area by raising bunds at the exit point of water from field for *in-situ* conservation through deep percolation. Three ponds with storage capacity of 40 lakh litres in each have been dug in the lowest area of the farm. These ponds collect runoff from roads and mulberry gardens.

6. Silkworm Rearing Houses

Today, a large number of farmers have constructed separate silkworm rearing houses. To facilitate the farmers construction of rearing house, model rearing houses, Chawki centres and mounting hall designed and constructed at CSRTI, Mysore.

7. Research Support to Different CSRTI Laboratories

Produced about 100 MT of *Vijetha* for field testing.

Designed and fabricated pilot plants for different research laboratories.

VX. INFRASTRUCTURE DEVELOPMENT AT CSRTI MYSORE

Directly involved in planning and creation of many infrastructure like new laboratories, hostels, rearing houses, farm development, etc. for last 21 years. Some of the major infrastructures created at CSRTI, Mysore are :

Name of work	Cost of work (Lakhs of Rupees)
1. Training Division (an ISO certified Training Centre)	95.00
2. Pest Management Laboratory	35.00
3. Sericulture Machinery Design & Development Centre	18.00
4. JICA Hostel, Training Centre, Young & Late Age rearing houses	85.00
5. Technology Validation Centre	10.00
6. Young Age Silkworm Model Rearing Centre	5.00
7. Late Age Model Rearing House	4.00
8. Extension of Administrative Block	24.00
9. Mounting Hall for cocooning	2.00
10. Canteen	40.00
11. New Guest House at VP farm	20.00
12. HSD Storage facility	9.00
13. Various renovation works in hostels, guest houses, laboratories	200.00
14. Transgenic green house	12.00

Annexure 1

Thesis/ Project Works taken for B.Tech & M.Tech Degrees with Engineering college Students

S.No.	Title of the Project work	Taken in collaboration with	Degree/ Diploma	Year
1	Development of a tractor operated combined tillage system for dryland farming	Dept. of Farm Machinery & Power, College of Agricultural Engg, Rajasthan Agricultural University, Udaipur(Rajasthan)	M.Tech in Agricultural Engineering	1990-91
2	Power tiller operated compost spreading machine	Dept.of Mechanical Engg. JSS Poly - technic, Mysore	Diploma in Mechanical Engg.	1996-97
3	Design & fabrication of cocoon cutting machine	Dept. of Mechanical Engg. The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2000-01
4	Design and fabrication of mulberry leaf chopping machine	Dept. of Mechanical Engineering, JSS College of Engineering, Mysore	B.E. in Mechanical Engineering	2004-05
5	Design of a mechanical duster	Dept. of Industrial Production The National Institute of Engineering, Mysore	B.E. in Industrial & Production Engineering	2004-05
6	Development of a machine for feeding young aged silkworms and bed disinfectant application	Dept. of Mechanical Engineering, The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2004-05
7	Study of drudgery reduction in inter-culture and harvesting of mulberry through mechanization	Dept. of Farm Machinery & Power Faculty of Agricultural Engg. Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh)	M.Tech. in Agricultural Engineering	2005-06
8.	Design and development of a dusting machine for bed disinfectant application over silkworms	Dept. of Mechanical Engineering, The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2007-08
9.	Design and development of matured silkworm separation machine	Dept. of Mechanical Engineering, The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2007-08
10.	Design and fabrication of mulberry leaves chopping machine	Dept. of Mechanical Engg., The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2007-08
11.	Design and fabrication of power operated dusting machine for late age silkworms	Dept. of Mechanical Engineering, The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2008-09
12.	Air-conditioning for Rearing House of Silkworms	Dept. of Industrial and Production Engineering, The National Institute of Engineering, Mysore	B.E. in Industrial and Production Engineering	2008-09
13.	Modification and evaluation of motorized silkworm separation machine	Dept. of Mechanical Engineering, The National Institute of Engineering, Mysore	B.E. in Mechanical Engineering	2008-09
14.	Design and fabrication of motorized cocoon harvestor	Dept. of Mechanical Engineering, Govt. Engineering College, Chamrajanar	B.E. in Mechanical Engineering	2011-12
15.	Design and Development of High Capacity Mulberry Leaf Chopper	Dept. of Mechanical Engineering, Bahubali College of Engineering, Shravanabelagola - Karnataka	B.E. in Mechanical Engineering	2012-13
16.	Design and development of mechanized lateage silkworm rearing system	Dept. of Mechanical Engineering, Vidhya Vikas College of Engineering & Technology, Mysore	B.E. in Mechanical Engineering	2012-13
17.	Development of a prototype of a machine for dusting of slaked lime and bed disinfectants powders over young age silkworms	Dept. of Mechanical Engineering, Vidhya Vikas College of Engineering & Technology, Mysore	B.E. in Mechanical Engineering	2012-13