Chapter-6

SUMMARY AND CONCLUSION
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In recent days, the most alarming trend in sericulture industry is uprooting of mulberry plants in Karnataka, which shares more than 60 percent of total cocoon production in India, due to repeated crop failure and low price for the cocoons produced. To achieve sustainable sericulture, concerted efforts have been made by the scientists developing advanced sericulture technologies (ST) while, some of these technologies have been found promising and the other become ineffective in the field opening an ample scope for innovation.

The advent of information technology (IT) and exponential growth of WWW, the most popular means of information dissemination and discovery through the internet, we have planned to integrate ST and IT as a first step of our investigation to start with analysis and digitization of fertility status of mulberry gardens soil. To achieve this task we have considered Belgaum, Dharwad and Uttar Kannada districts, which are potential areas for rearing of bivoltine parental strains for production of F1 hybrids.

6.1 Analysis of mulberry garden soil

The soil samples of mulberry field located in Belgaum, Dharwad and Uttar Kannada Districts of North-Karnataka were collected as per the standard procedure for three years from 2003 to 2005. These soil samples were subjected to mechanical and chemical analysis and cataloged. Sand, Silt and Clay percentage was analyzed by hydrometer method, Water Holding Capacity (WHC) by Keen’s cup method. pH, Organic Carbon (OC), Electrical Conductivity (EC),
Available Nitrogen (N), Phosphorus (P) and Potassium (K) were estimated by following the standard procedures.

All the data generated for three years from 2003 to 2005 were subjected for statistical analysis and cataloged with their appropriate accession number for each soil sample derived from different mulberry gardens.

6.1.1 Belgaum district

a. Physical properties

Sand - During three years, the average percent of sand in mulberry gardens soil ranges from 17.05 to 25.33 in Bailhongal taluk, 27.19 to 32.97 in Belgaum taluk, 29.58 to 37.11 in Gokak taluk, 28.39 to 34.36 in Hukkeri taluk, 30.61 to 32.94 in Khanapur taluk and 31.05 to 34.34% in Savadatti taluk.

Silt- The average percent of silt in mulberry gardens soil varies from 11.17 to 15.50 in Bailhongal taluk, 15.58 to 19.17 in Belgaum taluk, 15 to 23.61 in Gokak taluk, 14.49 to 19.02 in Hukkeri taluk, 13.42 to 16.50 in Khanapur taluk and 14.42 to 16.11% in Savadatti taluk.

Clay- The average percent of clay in mulberry gardens soil ranges from 60.53 to 70.50 in Bailhongal taluk, 48.83 to 55.75 in Belgaum taluk, 40.39 to 51.39 in Gokak taluk, 48.08 to 54.86 in Hukkeri taluk, 51.56 to 55.44 in Khanapur taluk and 49.39 to 53.91% in Savadatti taluk.

Water Holding Capacity (WHC)- The average percent of WHC in mulberry gardens soil varies from 17.47 to 49.91 in Bailhongal taluk, 35.37 to 56 in Belgaum taluk, 23.69 to 47.31 in Gokak taluk, 34.93 to
50.34 in Hukkeri taluk, 41.45 to 57.17 in Khanapur taluk and 33.65 to 48.08% in Savadatti taluk.

b. Chemical properties

**pH**- The average percent of pH in mulberry gardens soil ranges from 5.81 to 8.16 in Bailhongal taluk, 5.82 to 7.94 in Belgaum taluk, 5.74 to 8.04 in Gokak taluk, 6.36 to 8.22 in Hukkeri taluk, 6.39 to 7.85 in Khanapur taluk and 6.67 to 7.78 in Savadatti taluk.

**Organic Carbon (OC)**- The average percent of OC in mulberry gardens soil ranges from 0.25 to 0.51 in Bailhongal taluk, 0.31 to 0.96 in Belgaum taluk, 0.30 to 0.55 in Gokak taluk, 0.35 to 0.60 in Hukkeri taluk, 0.36 to 0.52 in Khanapur taluk and 0.32 to 0.52% in Savadatti taluk.

**Electrical Conductivity (EC)**- The average percent of EC in mulberry gardens soil ranges from 0.092 to 0.336 in Bailhongal taluk, 0.114 to 0.292 in Belgaum taluk, 0.107 to 0.206 in Gokak taluk, 0.094 to 0.243 in Hukkeri taluk, 0.173 to 0.278 in Khanapur taluk and 0.166 to 0.280 m.mhos/cm in Savadatti taluk.

**Nitrogen (Kgs/ha)**- The soils of mulberry gardens contain the available nitrogen that ranges from 82.05 to 207.17 in Bailhongal taluk, 94.49 to 277.13 in Belgaum taluk, 82.29 to 250.37 in Gokak taluk, 91.62 to 213.41 in Hukkeri taluk, 84.53 to 218.86 in Khanapur taluk and 75.46 to 179.03 in Savadatti taluk.

**Phosphorus (Kgs/ha)**- The available phosphorus varies in different mulberry garden that was from 9.52 to 28.34 in Bailhongal taluk, 8.45 to 21.41 in Belgaum taluk, 8.65 to 18.88 in Gokak taluk, 8.65 to 14.84 in Hukkeri taluk, 11.73 to 25.53 in Khanapur taluk and 8.48 to 17.07 in Savadatti taluk.
Potassium (Kgs/ha)- The soils of mulberry garden contain potassium ranges from 41.28 to 93.29 in Bailhongal taluk, 39.86 to 141.17 in Belgaum taluk, 43.41 to 131.14 in Gokak taluk, 46.63 to 160.85 in Hukkeri taluk, 54.90 to 146.73 in Khanapur taluk and 47.32 to 125.20 in Savadatti taluk.

6.1.2 Dharwad district

a. Physical properties

Sand- During three years, the average percent of sand in mulberry gardens soil ranges from 14.51 to 23.72 in Dharwad taluk, 15.50 to 23.33 in Hubli taluk and 39.20 to 53.42% in Kalghatagi taluk.

Silt- The silt percentage ranges from 21.45 to 28.86, 20.66 to 32.89 and 17.03 to 25.78% in mulberry gardens soil of Dharwad, Hubli and Kalghatagi taluks respectively.

Clay- The average percent of clay in Dharwad taluk ranges from 51.22 to 60.63, it varies from 45.44 to 61.53 in Hubli taluk and 27.36 to 38.25% in Kalghatagi taluk.

Water Holding Capacity (WHC)- The average percent of WHC in mulberry gardens soil of Dharwad, Hubli and Kalghatagi taluk ranges from 45.59 to 60.52, 40.05 to 69.64 and from 39.31 to 58.06% respectively.

b. Chemical properties

pH- The average percent of pH in mulberry gardens soil of Dharwad taluk ranges from 5.56 to 6.18. In Hubli taluk, it ranges from 6.10 to 8.26 and from 5.88 to 7.96 in Kalghatagi taluk.
Organic Carbon (OC)- The average percent of organic carbon in mulberry gardens soil of Dharwad taluk ranges from 0.23 to 0.75. In Hubli taluk it ranges from 0.37 to 0.64 and in Kalghatagi taluk it ranges from 0.34 to 0.69%.

Electrical Conductivity (EC)- The average percent of electrical conductivity in mulberry gardens soil of Dharwad, Hubli and Kalghatagi taluk ranges from 0.102 to 0.208, 0.087 to 0.358 and 0.081 to 0.318 m.mhos/cm.

Nitrogen (Kgs/ha)- The available nitrogen in mulberry gardens soil of Dharwad taluk was 74.24 to 240 Kgs/ha. In Hubli taluk it ranges from 80.10 to 276.83 and in Kalghatagi taluk it ranges from 69.04 to 254.36 Kgs/ha.

Phosphorus- The available phosphorus in mulberry gardens soil of Dharwad, Hubli and Kalghatagi taluk ranges from 10.53 to 25.42, 10.15 to 28.30 and 8.76 to 28.54 Kgs/ha respectively.

Potassium- The available potassium in mulberry gardens soil of Dharwad, Hubli and Kalghatagi taluks ranges from 52.28 to 160.14, 31.78 to 150.86 and 43.52 to 165.34 Kgs/ha respectively.

6.1.3 Uttar Kannada district

a. Physical properties

Sand- The average percent of sand during three years in mulberry gardens soil of Mundgod and Sirsi taluk ranges from 47.95 to 61.81 and 25.17 to 30.16 percent respectively.

Silt- The silt percentage in mulberry gardens of Mundgod taluk ranges from 15.42 to 21.17 and in Sirsi taluk it ranges from 16.92 to 25.61%.
Clay- The average percent of clay in mulberry gardens soil of Mundgod taluk ranges from 21.28 to 32.39, whereas in Sirsi taluk it ranges from 45.28 to 58.63%.

**Water Holding Capacity (WHC)**- The average percent of WHC in mulberry gardens soil of Mundgod taluk ranges from 30.02 to 53.57. In Sirsi taluk it ranges from 27.08 to 52.13%.

**b. Chemical properties**

pH- The average percent of pH in mulberry gardens soil of Mundgod taluk ranges from 5.72 to 8.24 and in Sirsi taluk it ranges from 5.54 to 8.19 percent.

Organic Carbon (OC)- The average percent of organic carbon in mulberry gardens soil of Mundgod taluk ranges from 0.28 to 0.66, and in Sirsi taluk it ranges from 0.34 to 0.59%.

Electrical Conductivity (EC)- The average percent of electrical conductivity in mulberry gardens soil of Mundgod taluk ranges from 0.089 to 0.348 and average percent in Sirsi taluk ranges from 0.097 to 0.360 m. mhos/cm.

Nitrogen (Kgs/ha)- The average percent of nitrogen in mulberry gardens soil of Mundgod taluk ranges from 57.77 to 226.39 and 83.65 to 253.75 Kgs/ha in Sirsi taluk.

Phosphorus- The average percent of phosphorus in Mundgod taluk ranges from 9.30 to 25.12 and 9.02 to 25.81 Kgs/ha in Sirsi taluk.

Potassium- The average percent of potassium in mulberry gardens soil of Mundgod taluk ranges from 46.19 to 141.40 and in Sirsi taluk it ranges from 43.57 to 141.90 Kgs/ha.
Thus, soil samples collected from 400 mulberry gardens of 160 villages exhibit varied fertility status and correlated with that of standard ratings established for optimum growth and development of mulberry to develop suitable package of practices. The data thus generated was computed and cataloged to use it as standard cataloging system for comparative analysis. The variations noticed in preceding year facilitate the sericulturists or government authorities or non-government organizations for systematic follow-up action to achieve sustainable cocoon crop production in India or any developing countries practicing sericulture.

Computing the fertility status of the mulberry gardens soil of Belgaum, Dharwad and Uttar Kannada districts with that standard rating for mulberry growth development, we have developed "Soil Test Oriented Package of Practices (STOPP)" for individual accession number. The STOPP is suggested for production of quality mulberry leaf with higher yield without damaging structure and biochemical properties of the soil. Further, we have designed cataloging system to retrieve the data of interest in preceding years with ease for comparative analysis and follow-up action.

6.2 Mulberry garden soil database (MGSDb)

To make transfer of technology user-friendly and fast we have adapted a novel approach to decipher the fertility status of the mulberry garden soil by constructing a database for mulberry garden soil (MGSDb). The end users can retrieve any data of interest with ease and made it available to farmers as well as any government and non-government organizations for follow-up action.
The ‘Soil Database’ was constructed primarily using HTML followed by Dream Weaver v 7.0 to make it user-friendly. We have followed here several strategies and established suitable link buttons to the related web pages to navigate from one to another other as per specific need.

For the first time, we have employed a cataloging system for each soil samples collected from mulberry fields with appropriate codes. The first letter in the abbreviated code stands for the place, second letter denotes farmer name and the numerical number explicit soil sample number. For example, DM01 stands for D-Dharwad, M-Menasinakai P., the numerical number 01 refers to soil sample number. The cataloging code (abbreviated) was used as an accession number in the classification chart based on standard ratings suggested for good growth and development of mulberry for the first time.

The present “Soil Database” housed in the homepage ‘INDSILK DATABASE’. The ‘Soil Database’ starts with the text link of introduction, which emphasizes the significance, aims and approaches of the database constructed. Another link was provided for Karnataka State map consisting of respective districts. The maps have clear outlines and links to access individual districts. The list of sericulturist’s link exhibit the details of farmers who have been engaged in sericulture farming with their specific accession numbers and places and they were grouped into their respective taluk. A link was established at District level to get list of sericulturists in that area. The link provided at each farmer name, display the details of soil properties. A link was established for physical and chemical
properties of individual farmer. A provision was also made to know
the properties of individual soil type belonging to different areas. All
the data were analyzed and grouped accordingly. Only accession
number of each soil type was entered in soil classification chart and
text link was established to each accession number to get all the
details. A link was provided under "Amendments" at soil database
webpage and at the end of every individual page for necessary
follow-up action under STOPP. Appropriate link buttons were also
provided in each webpage to navigate from one to other and even
back.

Further, in order to transfer these data to the door step of the
farmers and make available to the sericulturists across the world we
have uploaded part of this data (Dharwad District) to the Karnataka
University website http://www.kud.ernet.in/PG_Deparments/Science_Departments/Sericulture/research.htm. Now,
the data for three districts studied is stored in CD (appended at the
back cover page of the thesis) and will be uploaded to the website.
Thus, the main aim of constructing a "mulberry garden soil database
(MGSDb)" is not only to provide a convenient environment to store
and retrieve all the information on mouse click by the needy but, also
recommended for follow-up actions.