Muga silk production has been fluctuating due to inadequacy in timely supply of quality seed and several other inherent constraints. With particular reference to seed, Assam alone presently needs one crore disease free layings (dfls) of Muga (*Antheraea assamensis* Helfer). Consequent upon the short supply of quality seed (disease free layings) of Muga (*Antheraea assamensis* Helfer) in time, the Muga rearers cannot utilize their Som (*Persea bombycina* Kost) or Soalu (*Litsaea polyantha* Juss) plantation for rearing to their fullest potential even during the favorable commercial crops. Further, because of outdoor rearing, Muga silkworms are exposed to fluctuating environmental conditions with profound impact on production and productivity during different seasons. Moreover, crop loss due to pebrine is a perpetual problem in Muga sector. Hence, the possibility of crop failure in Muga culture cannot be ignored. Besides, most of the world's production in Muga comes from smallholdings. Because of the limited size of the holdings and limited rearing capacity, farmers get limited returns from the Muga culture which is not sufficient for most of the families to survive only on the income of Muga culture. Keeping in view the above facts, present investigation was carried out to study the performance of certain economically important cash crops as intercrop in existing Som (*Persea bombycina* Kost) plantation and to identify the best intercropping model for better economic dividend in Muga culture.

The investigation was carried out at Central Muga Eri Research & Training Institute, located at Lahdoigarh, Jorhat, Assam during 2007-08 to 2009-10. The study was conducted with two simultaneous experiments. First experiment was conducted to study the performance of selected intercrops with *Persea bombycina* Kost. For this experiment, an area of 5040 m² under existing 13 years old Som plantation of 3m x 3m spacing was selected. The experiment was conducted in Randomized Block...
design with three replications. The treatments consisted of nine intercropping systems viz., Som + Ginger, Som + Turmeric, Som + Colocasia, Som + Patchouli, Som + Stevia, Som + Brahmi, Som + Colocasia > Potato (Colocasia succeeded by Potato), Som + Colocasia > Onion (Colocasia succeeded by Onion), Som + Colocasia > Garlic (Colocasia succeeded by Garlic) which were compared with Som alone (Control). For each treatment, replication wise individual plot of 144 m² size was prepared in the selected area and in each individual plot, three beds of 16.2 sq. m. size (1.8 m breadth and 9.0 m length) leaving 60 cm from each side of the Som plants were prepared. Beds were raised up to a height of 30 cm for plantation of intercrops. Recommended package of practices were followed for maintenance of both Som and intercrops. Three months before plantation of intercrops, selected Som plantation was pruned at a height of 3m above the ground to obtain quality leaves for silkworm as well as to provide favourable environment for establishment of intercrops. Second experiment was conducted to study the performance of selected intercrops as sole crops for which a gross area pf 4720 sq. m was selected and the individual plots were made with 144 sq. m. size each. In each individual plot, a raised bed of 12 m breadth and 12 m length (up to a height of 30 cm above the ground) was prepared for plantation of selected crops.

**Evaluation of Som based intercropping systems**

All intercropping treatments improved growth of Som plants over Som alone. More improvement on growth was obtained in association with Colocasia, Colocasia succeeded by Potato, Ginger and Patchouli. This improvement in growth may be due to different factors like stimulation of soil microbial biomass, more nitrogen mineralization, recovery of fertilizer residues used in intercropping by the roots of Som plants etc. which may improve their mineral nutrition. More improvement on yield of Som was found in association with Turmeric, Patchouli and Colocasia though all intercropping treatments were statistically at par with Som alone in respect of leaves /plant, leaf yield /plot and leaf yield/ha. Of course, significant improvement in leaf yield per plant of Som was recorded due to association of Turmeric. On the other hand, there was slight reduction in yield of Som in association with Ginger, Stevia,
Brahmi, Colocasia succeeded by Potato, Colocasia succeeded by Onion and Colocasia succeeded by Garlic. Reduction in yield may be because of more competition of intercrops with Som for nutrient and water: The incidence of leaf spot and leaf blight diseases of Som in association with Patchouli, Colocasia succeeded by Garlic, Brahmi, Turmeric and Stevia were comparatively less than Som alone. Among the intercrops, association of Patchouli was found more effective in minimizing disease intensity of Som. Muga silkworm fed with leaves of Som grown in association with Patchouli, Colocasia succeeded by Onion, Turmeric, Stevia and Colocasia succeeded by Garlic also showed better rearing performances than that fed with leaves of Som grown alone.

Growth and development attributes of various intercrops in terms of survivability, plant height, plant spread and LAI (Leaf area index) revealed superiority of Patchouli, Colocasia and Turmeric as intercrops over rest of the crops showing well growth under Som shaded environment. In respect of economic yield of intercrops, Colocasia succeeded by Potato and Colocasia succeeded by Onion produced maximum economic yield per plant and per hectare but Stevia as intercrop generated maximum gross and net return per hectare per year. On the other hand, Patchouli registered the highest BCR because of reasonable cost of cultivation and higher gross return.

From combined analysis, it was found that all the intercropping treatments registered more cocoon equivalent yield (19.5'000 to 51.3'000 nos. of cocoons per hectare), gross income (₹19,500-51,200), net returns (₹6,255-19,220), and costs of production (₹13,245-37,340) than Som alone. The higher productivity of intercrop system compared to sole crops may be attributed to better light utilization by a crop canopy composed of plants with different foliage distribution. From cocoon equivalent yield, gross income and net return point of view, Som + Stevia ranked first with the highest yield of cocoons per hectare (117.1'000 nos.), gross income (₹1,17,100/ha/yr) and net return (₹41,110/ha/yr) but the highest BCR (1.67) was recorded in Som + Patchouli though all intercropping treatments were found economically viable. The maximum monetary benefit of ₹19,320 and ₹16,820/ha/yr over Som alone were recorded in Som + Stevia and Som + Patchouli treatments. All the intercropping treatments registered LER greater than one indicating greater biological
efficiency of intercropping systems over Som. alone. Som + Brahmi and Som + patchouli recorded higher LER (1.60 & 1.47 respectively) than other crops which gave 60 % and 47 % more land utilization over Som. alone. Moreover, intercropping showed improvement in soil properties over Som. alone and over initial soil nutrient status in respect of available nitrogen, available phosphorus and organic carbon. This improvement in soil properties may be the result of residues from aboveground intercrop biomass and in situ decomposition of intercrop roots. Available nutrient status with respect to different treatments indicated higher availability of nutrients in Som + Patchouli, Som + Colocasia > Potato and Som + Colocasia treatments.

Among different intercropping systems, Som + Colocasia > Potato (304 numbers /ha/day) followed by Som + Patchouli (255 numbers /ha/day) systems showed maximum production efficiency (PE). The maximum profitability (₹ 112.6 /ha/day) was obtained under Som + Stevia intercropping system which was followed by Som + Patchouli registering higher profitability (₹ 106.1 /ha/day) than rest of the systems. Som + Stevia (165.11), Som + Patchouli (165.17) and Som + Colocasia > Potato (165.19) showed more sustainability than other systems. Som + Stevia and Som + Patchouli systems were also found to be more preferable in terms of providing employment. These systems employed maximum number of man-days in a year and showed highest employment generation efficiency (89.59 % and 76.16 % respectively) as compared with other systems.

Performance of tested intercrops in sole cropping vs. intercropping

Relatively higher survival percentage (3.7 % to 46.4 % ), plant height (10.4 % to 57.2 %), plant spread (3.7 % to 29 %), number of leaves (9.8 % to 24.0 %) and LAI (6.1 % to 29.4 %) were recorded in intercropping treatments than respective sole cropping of most of the selected crops which revealed superiority of intercropping treatments over respective sole cropping in terms of growth and development attributes. Turmeric, Colocasia, Patchouli and Bráhmi had higher economic yield per plant (2.1 % to 71.4 % more) and per hectare (13.4 % to 78.0 % more) in intercropping than respective sole cropping. On the other hand, Stevia recorded decrease in yield (13.4 %) in intercropping.
than respective sole cropping which revealed more preference of Stevia to open condition than partial Som shaded condition. Economic analysis also revealed better economic viability of all the crops except Stevia and Potato in intercropping systems over respective sole cropping. As compared to sole cropping, all the crops in intercropping resulted in improvement of soil nutrient status in respect of available N, available P and pH. Turmeric resulted in more availability of N (2.88%) and P (17.1%) in intercropping than respective sole cropping.

The present study revealed that all the tested Som based intercropping systems are more efficient than Som alone with respect to total productivity in terms of cocoon equivalent yield, production efficiency, net returns, profitability, sustainability and employment generation efficiency. Hence, existing Som alone system can effectively be diversified with the inclusion of various crops like Ginger, Turmeric, Colocasia, Stevia, Patchouli, Colocasia, followed by Potato to fetch higher economic returns from a Som plantation.

However, from BCR point of view, Som + Patchouli were found to be superior over all the systems. The study also revealed better performance of patchouli in terms of growth, yield, and harvest index in intercropping system with Som over respective sole cropping. Hence, Som + Patchouli has been identified as the most promising Som based intercropping system for agro climatic condition of Assam for which the package of practices has been appended in Appendix I.