DISCUSSION

The comparative performance of certain economically important cash crops as intercrops in Som (*Persea bombycina* kost.) plantation as presented in the previous chapter provided a detailed account on growth and yield attributes, economics, land use efficiency, soil fertility status, sustainability, production and employment generation, efficiency of different intercropping systems, performance of tested crops in intercropping against sole cropping etc. Attempts have been made in this chapter to discuss the important findings recorded during the course of study in respect of ‘cause and effect’ relationship of notable variations in the results wherever it is possible under the following heads:

Experiment No.-1: Performance of Som as well as selected intercrops in different intercropping systems

5.1. A Performance of Som in intercropping systems

5.1. Aa Growth and development attributes of Som

Most of the growth and development attributes (plant height, crown length) of Som increased with the advancement of crop age irrespective of cropping systems and more values in respect of most of the growth and development attributes (plant height, crown length) was recorded during *katia* season as compared to *Jethua* season.

It was observed from pooled analysis that association of various intercrops had no adverse effect on growth and development attributes of Som in respect of plant height, crown length, leaves/secondary branches, tree girth and lamina
breadth. Similar results have also been reported by Nelliat et al. (1974) in Coconut and by Anonymous (1988) in Guava at eastern parts of Himalayas in association with Ginger and Turmeric when both main crops and intercrops were adequately and separately fertilized. Bandyopadhyay et al. (2004) also observed no adverse affect on Areca nut when Colocasia was grown as intercrop.

Further, significant improvement (11.2 % more) in growth and development attributes of Som in respect of crown width was observed due to association of Colocasia. Similarly, intercropping of Patchouli and Colocasia succeeded by Potato improved growth parameters of Som in terms of number of stems / crown (25 % more), primary branches / stem (51-60 % more), total branches / stem (45-70% more) and total branches / crown (103-115% more). Association of Ginger and Brahmi with Som improved number of stems / crown (25% more) and lamina length (10-13% more). Association of Turmeric and Colocasia succeeded by Onion were also found to be beneficial in respect of number of stems / crown (25% more) and primary branches / stem (16-30% more) respectively. This improvement in growth due to association of different crops 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. Improvement in soil condition and in growth of the main crop was reported by Suryanarayana et al. (2002) when vegetables like Lady’s finger, Brinjal etc. were cultivated as intercrop in Som gardens during gestation period. Beneficial effect of intercropping on growth of Poplar was also reported by Rivest et al. (2009) at Quebec, Canada and by Chifflet et al. (2006) on growth of Walnut tree in France.

On the other hand, in association with Ginger, number of secondary branches / primary branch and total branches / stem of Som decreased significantly. Similarly intercropping of Colocasia succeeded by Potato reported lower lamina length where Turmeric association reduced number of secondary branches / primary branch significantly.

Evaluation indices obtained for different growth parameters of Som with respect to various intercrops revealed that all intercropping treatments improved growth of Som plants over Som alone. More improvement on growth and development
attributes of Som was obtained in association with Colocasia succeeded by Potato (334 % more), Colocasia (287 % more), Ginger (242 % more) and Patchouli (217% more).

5.1 Ab Yield attributes and yield of Som

Although year wise minor variation was observed, from pooled analysis it can be inferred that all the intercropping treatments were statistically at par with Som alone in respect of yield and yield attributes of Som viz., Total leaves/plant, leaf yield/plot and leaf yield/ha. Similar results have also been reported by Njoroge et al. (1989) in Coffee where the size of Coffee bean and quality of roast and liquor were not significantly affected by Potato as intercrop. Further, many workers in mulberry reported similar results according to which a number of vegetables like Cabbage, Knolkhol, Cauliflower, Cereals, legumes like Soybeans, Green gram, Palak. and French bean (Shankar et al., 1998, Yadav & Kumar, 1998 and Mane et al, 2000) can successfully be grown without affecting Mulberry leaf yield.

Further, significant improvement (4.5 % more) was recorded in leaf yield per plant of Som due to association of Turmeric; Better yield of Som may be due to beneficial effects of applied fertilizers, manures and crop management for Turmeric as reported by Hussain et al. (2003) for Potato. Coconut yield increased from 120 nuts to 180 nuts/palm/year as reported by Reddy and Biddappa (2000) when Coconut was intercropped with Turmeric. An increase in yield of Coconut to 111.2 nuts/palm from 98.7 nuts/palm indicating productivity improvement of 12.6 % was also reported by Hedge (1997) when vegetables like Brinjal (Solanum melongena L.), Bhindi (Abelmoschus esculentus (L.) Moench.), Tomato (Lycopersicon esculentum Mill.) etc. were grown in the interspaces of Coconut. Shanthamallaiah et al. (1982 b) reported an increase in the yield of Coconut by 920 nuts/ha when Mulberry was grown as a mixed crop with Coconut. Phukan et al. (2008) also reported 10-11 % more leaf yield of Som due to intercropping of Mulberry.

On the other hand, in intercropping treatments of Som with Colocasia, Brahmi, Colocasia succeeded by Potato, Colocasia succeeded by Onion and Colocasia succeeded by Garlic, single leaf weight decreased significantly.
Evaluation indices obtained for different yield attributes and yield of Som with respect to various inter crops revealed more improvement on yield in association with Turmeric (141 %), Patchouli (24 %) and Colocasia (1.4 %) against 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 inter crops with Som for nutrient and water. Reduction in tiller number of sugarcane in association with Onion was also reported by Hussain et al. (2003). An increase in yield of Coconut by 30.3 per cent with Colocasia was earlier reported by Reddy and Biddappa (2000). Joomjantha and Wanapat (2008) reported significant increase in Cassava (Manihot esculenta Crantz.) foliage yield over control when Sweet Potato (Ipomoea batatas L.) was grown as intercrop with Cassava. Again, in France, Chifflot et al. (2006) and in Quebec, Rivest et al. (2009) observed that above ground biomass of Poplar (Populus deltoids Marsh.) associated with various annual intercrops was 40 % greater than that observed under Poplar monoculture.

5.1. Ac Disease incidence in Som

Season wise variation was observed in respect of leaf blight and leaf spot incidence of Som irrespective of intercrops. More blight incidence was recorded in Katia season than Jethua season. Again, irrespective of season, total incidence of leaf blight and leaf spot was higher during 2009 (49.3% and 22.2% respectively).

There was no significant difference among the intercropping treatments and Som alone in respect of total incidence of leaf blight. No influence of intercrop on disease incidence in Mulberry was also reported by Sawalgi (2002). In a Muga and Mulberry integrated culture, Phukan et al. (2008) also reported no cross infection of pests and diseases on the foliage.

In case of leaf spot, association of Colocasia and Ginger showed significantly higher incidence (24-29 % more) than that of the control. On the other hand, in association of Patchouli and Stevia, incidence of leaf spot was significantly lower (5-25 %) than that of the Control.
Evaluation indices obtained for different diseases of Som with respect to various inter crops revealed lowest incidence of disease in association with Patchouli (16 % less), Colocasia succeeded by Garlic (3.7 % less), Brahmi (2.5 % less), Turmeric (2 % less) and Stevia (2 % less) where highest incidence of disease was registered in association with Colocasia (6.8 % more), Ginger (6.8 % more) and Colocasia succeeded by Potato (5.1 %). Association of Patchouli was more effective in minimizing disease intensity in Som than other intercrops.

5.1. Ad Rearing performances of Muga silkworm

Rearing performances in terms of larval weight, effective rate of rearing (ERR) of Muga silkworm and shell weight of Muga cocoons were higher during katia season as compared to Jethua season.

It was observed that there were no significant differences among the silkworms reared on leaves obtained from different intercropping treatments and the silkworms reared on leaves of Control (Som alone) in respect of larval weight, ERR, single cocoon weight, single shell weight and silk ratio. By feeding Mulberry leaves obtained from different intercropped (viz., Cowpea, Green gram, Black gram, Soybean and Groundnut) plots also revealed non-significant difference in mature Mulberry worm weight and post cocoon parameters indicating to deleterious effect of intercrops on leaf quality (Shankar et al., 2000). Another study carried out at Dharwad also showed non-significant difference with respect to larval characters of silkworm when Mulberry was grown with legume intercrops and Mulberry alone (Duragappa et al., 2005).

Evaluation indices obtained for Rearing performances of Muga silkworm with respect to various inter crops revealed superiority of Som leaves in association with Patchouli, Colocasia succeeded by Onion, Turmeric, Stevia and Colocasia succeeded by Garlic as silkworms reared showed better rearing performances (29-204 %) over rest of the crops and Control. On the other hand, silkworms reared on leaves of Som in association with Colocasia, Colocasia succeeded by Potato, Brahmi and Ginger showed poor rearing performances than that of Control.
5.1. Ae  Economics of Muga culture

Economic analysis of Muga culture revealed that muga cocoon production from one hectare Som plantation in association with Ginger, Turmeric, Colocasia, Patchouli and Colocasia succeeded by Potato were higher (0.45-2.0%) than Som alone which in turn produced more gross income than that of Som alone.

Maximum gross and net income per hectare Som plantation was in association with Colocasia and Colocasia succeeded by Potato. Maximum cost of cocoon production and benefit to cost ratio were also in association with Colocasia and Colocasia succeeded by Potato.

On the other hand, gross income from one hectare Som plantation in association with Stevia, Brahmi, Colocasia succeeded by Onion and Colocasia succeeded by Garlic were less than Som alone. In association with Stevia, Brahmi and Colocasia succeeded by Onion, both net income and benefit to cost ratio were also less than Som alone.

5.1. B Performance of selected crops in association with Som

5.1. Ba  Growth and development attributes

Most of the growth and development attributes (plant height, plant spread, number of leaves per plant, leaf area index) of inter crops increased with the advancement of crop age irrespective of cropping systems.

Garlic followed by Onion had higher initial plant population but recorded the lowest survivability (61.1%). On the other hand, Colocasia, Brahmi and Patchouli had lesser initial plant population but Patchouli followed by Colocasia had the highest survivability among the crops (92.3%). Colocasia had maximum plant height (121 cm) and plant spread 875 (cm²) where as Brahmi registered the lowest plant height (49.2 cm) and Garlic registered the lowest plant spread (34.3 cm²). Stevia registered maximum number of leaves per plant (342) against minimum number of
leaves per plant recorded by Garlic (6.7). At maximum growth stage, the highest LAI was recorded in Patchouli (6.9) followed by Colocasia (6.6) where the lowest LAI was recorded in Onion and Garlic (0.2).

Evaluation indices obtained for growth and development attributes of various intercrops revealed superiority of Patchouli, Colocasia and Turmeric as intercrops over rest of the crops. Well growth of Patchouli under shaded environment was also reported by many workers (Doraswamy, 1967 and Hussain et al., 1988). Better performance of Turmeric as intercrop with Poplar in respect of survival, plant height, leaf length and leaf breadth was reported by Jaswal et al. (1993). Significant improvement in morphological features of Turmeric (viz., plant height, number of leaves per plant, number of fingers per rhizome, length and weight of single finger and single rhizome weight) under Som plants were also reported by Hazarika et al. (2009).

5. 1. Bb Yield and yield attributes

In respect of economic yield of intercrops, Colocasia succeeded by Potato and Colocasia succeeded by Onion produced maximum yield per plant (541.8 g and 515 g respectively), per plot (91.4 kg and 87.9 kg respectively) and per hectare (6.35 t and 6.10 t respectively). On the other hand, minimum yields per plant (34.8 g), per plot (7.49 kg) and per hectare (0.52 t) were recorded in Stevia. In respect of biological yield of intercrops, Colocasia succeeded by Onion produced maximum yield of 10.34 t/ha Som while Brahmi produced minimum (2.12 t/ha Som) biological yield. In respect of harvest index, Colocasia succeeded by Potato recorded maximum and Stevia recorded minimum harvest index.

Evaluation indices obtained for different yield attributes with respect to various inter crops revealed more competitiveness in Colocasia succeeded by Potato, Colocasia succeeded by Onion, Turmeric and Colocasia succeeded by Garlic. The lowest mean El was recorded for Som + Stevia which showed least compatible among the crops. As intercrop, growing of Colocasia under natural shade of Coconut, Khasi Pine, Som, Areca nut and Mango trees were reported by Dhyani and Chauhan (1989), Pamehgam et al. (2000), Bandyopadhyay et al. (2004) and Haque et al. (2004). A
yield of 8.60 t/ha from Colocasia under shade of juvenile (8-10 years old) Mango trees in Bangladesh was also reported by Haque et al. (2004). Similarly, on a well-drained sandy loam soil in Bihar, tuber yield of Potato as intercrop in a Maize + Potato intercropping system increased significantly when the crops were fertilized adequately (Singh et al., 2005). Raising of Potato as profitable intercrop was reported earlier with Coconut (Rethinam, 1989), Som (Pamiehgam et al., 2000) and Sugarcane (Husain et al., 2003).

5.1. Economics of inter crops

Economic analysis revealed maximum gross return from Colocasia succeeded by Garlic cultivation as intercrops in first year where as in second and third years, maximum gross return came from Stevia. As per pooled analysis, Stevia as intercrop registered maximum gross (₹ 52,000) and net return (₹ 19,880) per hectare per year and Brahmi registered minimum (₹ 20,200) per hectare per year.

On the other hand, Colocasia succeeded by Garlic registered the lowest benefit to cost ratio (BCR) because of maximum cost of cultivation. Higher cost of cultivation in Stevia also resulted in lower BCR of Stevia cultivation as intercrop in Som plantation. As per pooled analysis, Patchouli registered the highest BCR (1.92) because of reasonable cost of cultivation and higher gross return.

5.1.C Combined productivity and economics of Som based intercropping systems

From combined analysis, it was found that all the intercropping treatments registered more crop 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. Greater yield stability in intercropping systems was claimed by various workers (Baker 1980; Rao & Willey, 1980; Rao & Morgado, 1984). 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. According to Gill and Sharma (2005), intercropping increase the productivity and provide income stability under limited soil moisture conditions. Further, Reddy and Biddappa (2000) reported an additional net return of ₹ 5,650/ha from Coconut and Yam intercropping system than Coconut mono cropping. Shanthamallaiah et al. (1982 b) also reported an increased net income of ₹ 7,379/ha from Mulberry as a mixed crop. From a Muga and Mulberry integrated culture, Phukan et al. (2008) reported 64.67 per cent more income than mono Muga culture and 51.81 per cent more income than mono Mulberry culture.

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). Som + Stevia was followed by Som + Colocasia > Garlic and Som +Colocasia > Potato in terms of both cocoon equivalent yield and gross income where in terms of net return, Som + Stevia was followed by Som + Patchouli. Potato in winter and Colocasia in summer as intercrops with Som generated an additional income of ₹ 16,890 and ₹ 17,160 per hectare as reported by Pamehgam et al. (2000).

On the other hand, maximum costs of production was in Som + Colocasia > Garlic, Som + Stevia and Som + Colocasia > Onion treatments.

From BCR point of view, it was found that all intercropping treatments were economically viable though Som + Brahmi, Som + Colocasia > Onion and Som + Colocasia > Garlic treatments recorded lower BCR than Som alone. The highest BCR (1.67) was recorded in Som + Patchouli followed by Som + Stevia (1.54). Som + Turmeric registered equal BCR to that of Som alone.

The maximum monetary benefit of ₹ 19,220 and ₹ 16,820 /ha/yr were recorded in Som + Stevia and Som + Patchouli treatments while Som + Brahmi recorded a minimum monetary benefit of ₹ 6,255/ ha/yr over Som alone. At Lucknow, Muniram et al. (1999) observed an increase in economic return upto ₹ 25,000/ha/year from Patchouli intercropped with Papaya over sole crop of Papaya.
5.1.D Land equivalent ratio (LER) in different intercropping systems

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 and 1.47 respectively) than other crops which gave 60% and 47% more land utilization over Som alone. Graves *et al.* (2007) opined that LER of 1.4 means 1 hectare under intercropping system produces as much as 1.4 hectares where trees and crops would be produced separately. Higher LER, net return and benefit cost ratio values in intercropping systems compared to sole cropping indicating advantage of intercropping over sole crops were reported by many workers (Patra *et al.*, 1999; Daniel *et al.*, 2001; Polthanee *et al.*, 2001; Padhi, 2002; Ayoola & Adeniyan, 2006 and Pathak & Singh, 2006). In a Cassava - Maize and Cassava - Melon intercropping systems, intercropping had no significant effect on Cassava root yield rather reduced Maize and Melon seed yield compared to sole cropping but LER values were higher under intercropping than sole cropping as reported by Ayoola and Adeniyan (2006).

5.1.E Effect of intercropping on soil properties

Intercropping had shown improvement in soil properties over Som alone and over initial soil nutrient status in respect of available nitrogen (N), available phosphorus (P) and organic carbon (C). This improvement in soil properties may be the result of residues from aboveground intercrop biomass and in situ decomposition of intercrop roots. Bopaiah and Shetty (1991) reported higher microbial biomass, organic carbon, total nitrogen, phosphorus and potash in the root region soils of intercropping system than in the Coconut monocropping. Upadhaya *et al.* (1994) also reported an improvement in soil fertility of Orange orchards as a result of the recycling of nutrients through organic matter applied in Ginger intercrop. Further, Price *et al.* (1999) reported that organic matter from intercrops results in an increase in soil microbial biomass and earthworm populations contributing to the improvement of soil fertility. Muga and
Mulberry integrated cultivation also improved soil nutrient status at Jorhat, Assam over the initial status as well as over the parallel mono Som and mono Mulberry cultivation as reported by Phukan et al. (2008). Effect of intercropping on stimulating soil microbial biomass, mineralization of nitrogen and recovery of fertilizer residue by Poplar roots was reported by Chifflot et al. (2006) in France and Rivest et al. (2009) in Quebec, Canada.

From evaluation, indices obtained for available nutrient status with respect to different treatments indicated higher availability of nutrients in Som + Patchouli, Som + Colocasia > Potato and Som + Colocasia treatments.

Experiment No.-2: Performance of tested inter crops in sole cropping system

5.2. A Growth and development attributes

Most of the growth and development attributes (plant height, plant spread, number of leaves per plant, leaf area index) of tested crops increased with the advancement of crop age irrespective of cropping systems.

Garlic followed by Onion had higher initial plant population but recorded the lowest survivability (58%). On the other hand, Colocasia, Brahmi and Patchouli had lesser initial plant population but Colocasia followed by Patchouli had the highest survivability (82%) among the crops. Colocasia had maximum plant height (92.1 cm) and plant spread (770 cm²) where as Brahmi registered the lowest plant height (4.07 cm) and Garlic registered the lowest plant spread (33.3 cm²). Stevia registered maximum number of leaves per plant (361) against minimum number of leaves per plant recorded by Onion (5.83) and Garlic (5.93). At maximum growth stage, the highest LAI was recorded in Patchouli (6.5) followed by Colocasia (5.8) where the lowest LAI was recorded in Onion and Garlic (0.2).
Evaluation indices obtained for growth and development attributes of various crops revealed superiority of Patchouli, Colocasia and Stevia as sole crops over rest of the crops.

5.2.B Yield and yield attributes

In respect of economic yield of intercrops, Colocasia and Turmeric produced maximum yield per plant (490 g and 266 g respectively). However, maximum yield per plot and per hectare were recorded in Sole Turmeric (206 kg & 14.3 t respectively) followed by Sole Ginger (187 kg & 13 t respectively). On the other hand, minimum yields per plot (4.27 kg) and per hectare (0.28 t) were recorded in Sole Garlic where Brahmi recorded minimum yield per plant (7 g). In respect of biological yield of intercrops, Turmeric produced maximum yield of 19.1 t /ha while Garlic produced minimum (2.65 t /ha) yield. The maximum and minimum harvest indexes were recorded in Turmeric and Garlic respectively.

Evaluation indices obtained for different yield attributes with respect to various crops revealed more competitiveness in Colocasia, Turmeric and Ginger. The lowest mean EI was recorded for Sole Garlic which showed least compatible among the crops.

5.2.C Economics of tested crops in sole cropping

Economic analysis revealed maximum gross (₹ 1, 84,000 per hectare per year) and net return (₹ 87,500 per hectare per year) from Stevia cultivation as sole crops where as, Brahmi registered minimum gross (₹ 33,600) and net return (₹ 100 per hectare per year).

On the other hand, maximum cost of cultivation (₹ 96,500) and highest BCR (1.91) were also registered in Stevia cultivation as sole crops. Again, the lowest BCR (1.01) was registered in Sole Onion cultivation.
5.2.D Effect of sole cropping on soil properties

Cultivation of various crops had shown improvement in soil properties over initial soil nutrient status in respect of available nitrogen (N), available phosphorus (P) and organic carbon (C). This improvement in soil properties may be the result of residues from above ground crop biomass and in situ decomposition of crop roots.

From evaluation indices obtained for available nutrient status with respect to different sole cropping indicated higher availability of nutrients in Sole Brahmi and Sole Colocasia treatments.

5.3 Comparative analysis of the performance of tested crops in intercropping against sole cropping

5.3. A Growth and development attributes

Irrespective of crops, sole cropping recorded significantly higher plant population than intercropping treatments but plant mortality percentage was relatively higher in sole cropping compared to intercropping treatments. Survival percentage of the crops in intercropping treatments was 3.7% to 46.4% more than respective sole cropping. All the intercropping treatments had higher plant height (10.4% to 57.2%) and Plant spread (2.2% to 29%) than respective sole cropping of all the crops except in Stevia which showed 20.3% and 14.4% decrease in plant height and plant spread respectively. Relatively higher number of leaves (9.8% to 24.0%) was recorded in intercropping treatments than respective sole cropping of all the crops except in Ginger, Patchouli and Stevia which showed decrease in number of leaves by 3.7%, 4.0% and 5.0% respectively. Ginger, Turmeric, Colocasia, Patchouli and Brahmi in intercropping had higher LAI (6.1% to 29.4%) compared to respective sole cropping. On the other hand, Stevia recorded decrease in LAI (45%) in intercropping than that of sole cropping. No differences in LAI in respect of Potato, Onion and Garlic were observed in between sole cropping and intercropping. The over all mean values
revealed superiority of all intercropping treatments in terms of growth and development attributes over respective sole cropping.

5.3. B **Yield and Yield attributes**

Turmeric, Colocasia, Patchouli and Brahmi had higher economic yield per plant (2.1% to 71.4% more) and per hectare (13.4% to 78.0% more) in intercropping with Sorn than respective sole cropping. On the other hand, Stevia, Potato and Garlic recorded decrease in yield (3.6% to 13.4%) in intercropping than respective sole cropping. Ginger and Onion also showed reduction in economic yield per plant in intercropping. In respect of biological yield, Stevia, Potato, onion and Garlic showed reduction in intercropping where as all other crops had higher biological yield in intercropping than that in respective sole cropping. In terms of harvest index, all the intercropping treatments had higher values than respective sole cropping. The over all mean values revealed better performances of crops in terms of yield and harvest indices in intercropping systems over respective sole cropping except Stevia. The mean value lower than one was recoded for Stevia which revealed more preference of Stevia to open condition than partial shade condition. Sharanabasappa* et al.* (2007) also reported marginal reduction in herbage yield of Stevia when it was grown as intercrop with Teak compared to Stevia sole crop.

5.3. C **Economic evaluation**

All the crops except Stevia, Potato and Garlic resulted more gross income (6.17% to 78.1%), more net return (19.8% to 99.5%) and more BCR (7.8% to 50.9%) over respective sole cropping. The over all mean values revealed better economic viability of all the crops except Stevia and Potato in intercropping systems over respective sole cropping.
5.3. D Post harvest soil nutrient status

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 over sole cropping. Turmeric resulted in more availability of N (2.88 %) and P (17.1 %) in intercropping than respective sole cropping. Except Brahmi and Colocasia, all other crops also resulted in improvement of available K. Maximum increase in pH (8.17%) was recorded in Patchouli. Stevia, Onion and Garlic resulted in increase of Organic Carbon.

5.4 Production and Sustainability analysis

All the tested Som based intercropping systems were more efficient than Som alone with respect to production efficiency, profitability, sustainability and employment generation efficiency. 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) than rest of the treatments. 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. Sustainable return index (SRI) was found negative in all the systems. However, 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.

The results of the present study revealed that all the tested Som based intercropping systems are more efficient than Som sole crop with respect to total productivity in terms of cocoon equivalent yield, production efficiency, net returns, profitability, sustainability and employment generation efficiency. However, from BCR...
point of view, Som + Patchouli were found to be superior over all the systems which was followed by Som + Stevia. On the other hand, Som + Colocasia > Garlic, Som + Colocasia > Onion and Som + Brahmi systems were found economically non-viable over Som sole cropping.

Hence, it can be concluded that existing Som sole cropping 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 plantation of Muga host plant, Som. However, amongst all the systems, 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.