Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 1010-1019
Received: 04-03-2019
Accepted: 06-04-2019

MG Kerutagi
Department of Social & Allied Sciences Cost of Cultivation and Market Intelligence Cell, University of Horticultural Sciences, Bagalkot, Karnataka, India

Malatesh Talavar
Department of Social & Allied Sciences Cost of Cultivation and Market Intelligence Cell, University of Horticultural Sciences, Bagalkot, Karnataka, India

Pavitra AS
Department of Social & Allied Sciences Cost of Cultivation and Market Intelligence Cell, University of Horticultural Sciences, Bagalkot, Karnataka, India

Correspondence
MG Kerutagi
Department of Social & Allied Sciences Cost of Cultivation and Market Intelligence Cell, University of Horticultural Sciences, Bagalkot, Karnataka, India

Impact of horticulture based integrated farming system on farmer's income and welfare in Northern Karnataka

MG Kerutagi, Malatesh Talavar and Pavitra AS

Abstract
The results of the research study conducted in Northern Karnataka to assess the impact of horticulture based integrated farming system on farmer's income and welfare revealed that the average age of sample respondents of both integrated and non integrated farming systems were 44 and 61 years with the average family size of 5 in each of the cases. With respect to education, relatively higher proportions of the sample respondents are more literate in IFS than Non-IFS. The average farm size in the identified different farming systems found to be the largest in farming system-I (3.50 ha).The per hectare total cost incurred by sample farmers of IFS was Rs. 1,63,060 and it was Rs.2,67,840 for non integrated farming system sample farmers. The major item of cost under different farming was variable cost. The total variable cost in Non-Integrated farming system was more (Rs. 1, 69,172) compared to integrated farming system (Rs. 97, 612). The gross returns obtained by farmers of integrated farming system were Rs. 2, 62,602 per hectare. Similarly for Non-integrated farming system farmers the gross returns obtained were Rs. 2, 86,939 per hectare. Average net returns realized from different integrated farming systems together were the highest (Rs. 99,539) compared to Non-Integrated farming system (Rs. 19,098). Similarly Returns per rupee of expenditure of integrated farming system was higher (1.61) compared to Non-Integrated farming system (1.07). Integrated horticulture based farming system was a profitable venture and has positive influence on the standard of living and economic status of the farming community compared to Non- Integrated farming system, besides avoiding price risk and improvement in nutritional value of food as expressed by the respondents.

Keywords: Horticulture based farming systems, impact, income and welfare

Introduction
Indian agriculture is characterized by inter and intra linking crop production activities with one or more agricultural and allied enterprises like cattle, sheep, goat, pigs, sericulture, poultry, fishery, bee keeping and vermicomposting. Under the given situation, Indian farming is not commercialized to a large extent on one hand and on the other hand farmer has to make decisions regarding his business of farming with a view to attain sustainability. In this regard, the farming system which provide suitable and sustainable socio-economic environment in resolving solutions to the problems encountered in agricultural production is a vital process.

Integrated Farming System (IFS) practice is now a day's gaining importance among the farmers to get the higher net returns in limited land. During last few decades agricultural research has focused on development of high yielding crop varieties/hybrids, better farm machinery, crop production and plant production technologies that enable the farmers to grow more food. But at the same time, there has been over exploitation of the natural resources leading to decrease in the productivity and profitability. IFS aims at combining farm enterprises like field crops, vegetables, dairy, poultry and goatry for realizing profitable and sustainable agriculture. Unabated land degradation due to nutrient mining combined by topsoil loss due to water erosion and climatic change towards adverse condition and getting good price for farm produce are the serious problems affecting the agriculture. Integrated farming system practices inter act appropriately with the environment without dislocating the ecological, social and economic balance for enhancing the lively hood of farmers.

Integrated farming system (IFS) is one of the best solution for the stability of income and improvement of nutrition for the small and marginal farmers with limited resources. Integration of different enterprise with crop activity will provide ways to recycle products and waste materials of one component as input through another linked component and reduce cost of production of the products which will finally raise the total income of the farm. This becomes quite essential as crop cultivation is subjected to high degree of risk and provides only seasonal, irregular and uncertain income and employment to the farmers. With a view to mitigate the risk and uncertainty in agriculture, IFS serves as an informal insurance.

The integration of several allied enterprises with crop components is crucial in order to optimize the synergies. These integrated systems provide scope not only to augment income of the farmers but also to bring improvement in soil health.

It is propounded by some farm scientists that adoption of IFS is an answer to the problems of increasing food production, increasing net farm income, improving nutritional status, promoting natural resource management and sustainable use of land, water and soil. In spite of all these advantages still many farmers are reluctant to adopt this system. Hence, an attempt was made to assess the overall impact of horticulture based integrated farming system on farmer's income and welfare in Northern Karnataka with the following specific objectives.

Objectives

1. To study the socio-economic characters of sample farmers in the study area.
2. To estimate the cost and return structure under different horticulture based farming systems.
3. To identify the constraints associated with horticulture based farming system farmers as well as non-IFS farmers.
4. To analyze the opinions regarding IFS system as expressed by sample respondents.

Hypotheses

1. Socio-economic conditions of IFS farmers are better than their counterparts.
2. Horticulture based farming system is more economical.
3. Farmers taking up different horticulture based farming systems face several problems.
4. Farmers have positive opinion on horticulture based farming systems.

Material and methods

The horticulture based integrated farming system study was carried out in Mudhol taluka of Bagalkot district and Gokak taluka of Belagavi district of Karnataka state. The total sample of 40 under integrated farming system and 40 under non integrated farming system respondents were purposively selected. Thus the total sample size in the study was 80. The integrated farming system involves the practice of field crops, vegetables, dairy and horticulture in different combinations to recycle the residue and by products of one component to other components.

The primary data were collected from 80 sample farmers through personal interview with pre-structured and pre-tested schedules. The data collected pertained to the agriculture year 2016-2017. The data collected on socio economic conditions of the farmers, technologies and cropping systems practiced by the different farmers as well as benefits and problems faced by the sample farmers. In order to analyze the economics of different farming systems, economic measures like Benefit: Cost Ratio, averages, percentages, budgeting techniques and Garrett ranking techniques were used. Selection of representative sample districts, taluks, villages and respondents are given in the following Table-1.

Table 1: Selection of sample Districts, Taluks, Villages and respondents

Sl. No.	Districts	Taluks	Villages	No. of IFS farmers	No. of non-IFS farmers	Total (No.)
1	Belagavi	Gokak	Benachinamaradi	5	5	10
			Kallolli	5	5	10
			Betageri	5	5	10
			Rajapur	5	5	10
2	Bagalkot	Mudhol	Bisnal	5	5	10
			Sanganhatti	5	5	10
			Yedahalli	5	5	10
			Mahalingapura	5	5	10
Total (No.)				40	40	80

Concepts used

Budgeting technique: To work out the cost and returns in integrated farming system and in Non-IFS System budgeting technique was employed.

t-test: When the two small samples of equal size are drawn from two populations and the samples are dependent on each other then the paired t-test is used in preference to independent t-test.

In the paired t-test the testing of the difference between two treatments means was made more efficient by keeping all other experimental conditions same.

Hypothesis of the study: H0: $\mu = 0$ (no difference between two sample means) H1: $\mu \neq 0$ (difference between two sample means)

Garrett's ranking technique: This technique was used to evaluate the problems and prospects encountered in integrated farming system. In this method, the farmers were asked to rank the given problem and prospects according to the magnitude of the problem and prospect. The orders of merit given by respondents were converted into ranks by using the following formula.

$$\text{Percentage Position} = \frac{100\ (Rij - 0.50)}{Nj}$$

Where,

Rij= Rank given for i^{th} item by j^{th} individual Nj= Number of items ranked by j^{th} individual

The percentage position of each rank thus obtained was converted into scores by referring to the table given by Garrett. Then for each factor the scores of individual respondents were added together and divided by total number of respondents for whom the scores were added. These mean scores of all the factors were arranged in the order of their ranks and inferences were drawn.

Farming system I: It included the farming system of mango, coconut, banana, sapota, vegetables, sugarcane, maize, pulses, flowers, dairy, goat farming, vermicompost and poultry.

Farming system II: It included the farming system of mango, coconut, banana, sapota, vegetables, sugarcane, maize, flowers, dairy, poultry, goat farming and vermicompost.

Farming system III: It included the farming system of mango, coconut, banana, sapota, grapes, chilli, maize, onion, dairy, goat farming, poultry and vermicompost.

Farming system IV: It included the farming system of mango, drumstick, pomegranate, sapota, grapes, chilli, maize, onion, dairy, poultry, goat farming and vermicompost.

Dairy: It included rearing of cattle and buffaloes together in the study area.

Vermicomposting: It is a process of converting organic waste into a nutrient rich fertilizer by using earth worms. The size of the pit in the study area was 15m*1.5m*0.6m (length*width*height).

Results and Discussion

Understanding of socio-economic characteristics of sample respondents is expected to provide a bird's eye view of the general features prevailing in the study area. Therefore, an attempt was made to tabulate some of the important socio-economic characteristics of the sample farmers of both IFS and Non-IFS systems that have been depicted in Table-2. With respect to the age of the sample farmers, it is observed that, in both the cases age of the sample IFS and Non-IFS farmers was 44 and 61 years respectively. The reason for the above result may be the fact that IFS is a recurrent income generating programme and it adds significantly to the family income. The income from IFS is assured unlike agriculture which is uncertain one. It indicated that the younger generation was taking up new technology than the old age people. Average family size of both IFS and Non-IFS farmers together was 5. The analysis of educational status of farmers showed that 10.00 per cent of IFS farmers and 25.00 per cent of Non-IFS farmers were illiterates indicating importance of education to the younger generation. Among the literate respondents 22.50 per cent of IFS farmers and 32.50 per cent of Non-IFS farmers were having primary education. Secondary level education was possessed by 55.00 per cent and 37.50 per cent of IFS farmers and Non-IFS farmers respectively. Further 12.50 per cent of IFS farmers and 5.00 of Non-IFS farmers had above secondary education. Similar results were found by Shilpa (2014) [9]. Thus, it could be observed that higher education can influence the farmers to adopt new technology and innovation as adopted by educated than the others.

The average farm size in the identified Farming Systems revealed that the farm size was found to be the largest in Farming System-I (3.50 ha) followed by Farming System-IV (3.15 ha), Farming System-II (2.70 ha) and Farming System-III (2.14 ha). Similarly average farm size in Non-IFS was 2.80 ha.

Cropping pattern of sample farmers

The major crops grown in *kharif* season were pluses and onion in IFS- I, that contributed 16.85 per cent and 04.49 per cent of the total cropped area, respectively under IFS-II tomato (08.33%) and beet root (06.67%) were the main vegetable crops. In IFS-III onion was observed to be the major crop, which contributed 10.00 per cent to the total cropped area. And also in IFS- IV onion was the major with a share of 16.66 per cent to the total cropped area.During *rabi* season maize and sugar cane were popularly grown in the study area. With respect to maize crop share to the total cropped area was 05.62 per cent, 06.67 per cent, 16.00 per cent and 27.78 per cent respectively in IFS- I, II, III and IV. In case of sugarcane its share to the total cropped area was 04.50 per cent in IFS-I and 06.67 per cent in IFS- II, vegetables like ridge guard, tomato, bhendi and cucumber were the summer crops grown with 03.37 per cent of the total cropped area in IFS-I and 03.33 per cent of the total cropped area in farming system –II.

Among the horticultural crops, mango, coconut and sapota were the major ones which were cultivated as mono crop as well as mixed crop with other perennials and annuals. Among the different types of integrated farming systems, horticulture crops were having the major share. The contribution of mango and sapota in IFS-I was 16.85 per cent and 13.48 per cent to the total cropped area, respectively. In IFS-II the contribution of mango and coconut area was 16.67 per cent and 20.00 per cent of the total cropped area, respectively. In IFS-III, mango was the major horticultural crop with 20.00 per cent of the total cropped area. In IFS- IV, mango, drumstick, sapota and grapes were the horticultural crop grown with a share of 22.22 per cent, 08.33 per cent, 05.56 per cent and 02.78 per cent to the total area, respectively. Similar results were observed with the study conducted by Raghupati (2014).

The cropping pattern of Non-IFS farmers are presented in Table-4. Sugarcane, maize, turmeric, tomato, jowar and wheat are the major crops grown in study area. The gross cropped area of the sample respondents were 94.92 ha.

Livestock and other allied activities under different types integrated farming systems.

The dairy (Cattle+ buffalo) was the major enterprise in the study area as depicted in Table-5. The average number of dairy animals, Goats, Vermicomposting pits and poultry birds are 12.00, 5.30, 10.70 and 138.38 respectively in the study area. The per cent share of possession of dairy animals was relatively more in farming system-III (31.67%) followed by farming system-I (30.00%), farming system-IV (20.83%) and farming system-II (17.50%) in the study area. In the study area, the per cent share of possession of goat was relatively more in farming system-IV (33.96%) followed by farming system-III (24.52%), farming system-II (22.64%) and farming system-I (18.86%) in that order. The per cent share of possession of vermicomposting pits in the study area was relatively more in farming system-I (38.31%) and farming system-IV (23.26%) followed by farming system-III (20.56%) and farming system-II (17.75%), in that order. The per cent share of possession of poultry birds was relatively more in farming system- II (32.02%) followed by farming system-IV (25.75%), farming system-II (23.19%) and farming system-III (19.02%) in the study area

Cost and returns of different enterprises in both IFS and non-IFS farming system

The costs and return structure for the different enterprises for identified integrated farming systems are presented under the following sub heads.

Cost and returns of different enterprises in IFS-I

The per farm cost, returns and respective per cent share of enterprises in IFS- I are presented in the Table 6. The total cost of cultivation observed for IFS-I was Rs.3, 32,863 and the net returns were Rs.1, 98,756. Further, with the existing

enterprises in farming system-I the maximum share in the total variable cost was occupied by poultry with 94.73 per cent. For remaining enterprises such as mango (49.35%), coconut (24.22%), banana (54.28%), sapota (52.69%), vegetables (81.22%), sugarcane (80.17%), maize (63.60%), pulses (75.04%), flowers (78.97%), dairy (82.23%), goat farming (75.89%) and vermi-compost (75.89%) of the total variable cost was observed.

Under IFS- I the per cent contribution of different enterprises to the net returns was observed to be maximum with respect to mango which accounted for Rs.67, 754, followed by sugarcane Rs. 22,640. The net returns contribution from coconut (Rs.2, 842), flowers (Rs. 3,581) and goat farming (Rs. 4,197) to the total was comparatively less. The returns per rupee expenditure was found to be highest in the case of vermi-compost enterprise with 1.92 followed by mango (1.86), dairy (1.64), sugarcane (1.63), vegetables(1.56) poultry (1.55), flowers (1.50), goat farming (1.49), sapota (1.47), maize (1.45), pulses (1.45), coconut (1.38) and banana (1.37).

Cost and returns of different enterprises in IFS-II

The per farm cost, returns and respective per cent share of enterprises in IFS- II are presented in the Table 7. The total cost of cultivation observed for farming system-II was Rs. 3, 42,410 and the net returns was Rs. 2, 51,151. Further, with the existing enterprises in IFS-II the maximum share in the total variable cost was occupied by flowers with 91.51 per cent followed by poultry (89.22 %). For remaining enterprises such as mango (50.21 %), coconut (21.94%), banana (62.11%), sapota (55.38%), vegetables (81.54%), Sugarcane (78.23%), maize (63.91%), dairy (79.21%), goat farming (88.99%) and vermicompost (72.82%) of the total variable cost was observed.

Under IFS- II the per cent contribution of different enterprises to the net returns was observed to be maximum with respect to mango which accounted for Rs. 63,390, followed by sapota Rs. 37,282. The net returns contribution from flowers (Rs. 6,811), coconut (Rs. 8,703) and vermicompost (Rs. 8,094) to the total was comparatively less. The returns per rupee expenditure was found to be highest in the case of vermicompost is 1.90 followed by sapota(1.83), dairy (1.82), mango (1.78), flowers (1.78), coconut (1.76), sugarcane (1.73), vegetables (1.71), goat farming (1.67), poultry (1.67), maize (1.67) and banana (1.51).

Cost and returns of different enterprises in IFS-III

The total cost of cultivation observed for IFS-III was Rs. 5,64,263 and the net returns was Rs. 2,96,327. Further, with the existing enterprises in IFS-III the maximum share in the total variable cost was occupied by chilli with 89.95 per cent followed by poultry (88.69%). For remaining enterprises such as mango (41.46%), coconut (23.93%), banana (56.74%), sapota (47.15%), grapes (46.93%),maize (88.40%), onion (87.74%), dairy (77.64%), goat farming (79.65%) and vermicompost (72.31) of the total variable cost was observed, as evident in Table-8.

Under IFS- III the per cent contribution of different enterprises to the net returns was observed to be maximum with respect to grapes which accounted for Rs. 1,13,918, followed by mango Rs. 61,521. The net returns contribution from coconut (Rs. 5,149), goat farming (Rs. 5,931) and poultry (Rs. 5,981) to the total was comparatively less. The returns per rupee expenditure was found to be highest in the case of vermicompost is 1.82 followed by mango (1.66), dairy (1.58), goat farming (1.56), chilli (1.54), vermicompost (1.53), grapes (1.53), maize(1.49), banana (1.44), poultry (1.43), onion (1.43), sapota (1.41) and coconut (1.39).

Cost and returns of different enterprises in IFS-IV

It could be observed from Table 9. The total cost of cultivation observed for IFS-IV was Rs. 6, 34,025 and the net returns was Rs. 3, 97,474. Further, with the existing enterprises in IFS-IV the maximum share in the total variable cost was occupied by chilli with 89.66 per cent followed by maize (88.55%). For remaining enterprises such as mango (47.32%), drumstick (51.54%), pomegranate (53.04%), sapota (43.72%), grapes (49.47%), maize (88.55%), onion (86.97%), dairy (76.62%), poultry (88.28%), goat farming (83.91%) and vermicompost (72.33%) of the total variable cost was observed.

Under IFS- IV the per cent contribution of different enterprises to the net returns was observed to be maximum with respect to mango which accounted for Rs. 92,492, followed by grapes Rs. 88,808. The net returns contribution from goat farming (Rs. 7,032), poultry (Rs. 9,214) and vermicompost (Rs. 10,650) to the total was comparatively less. The returns per rupee expenditure was found to be highest in the case of vermicompost is 1.91 followed by pomegranate (1.69), dairy (1.67), poultry (1.67), (1.64), sapota (1.64), chilli (1.61), goat farming (1.61), onion (1.57), maize (1.55), grapes (1.53) and drumstick (1.48).

Cost and returns of different crops grown by non-IFS farmers:

The Cost and returns of different crops grown by non-IFS farmers presented in Table-10 revealed that the per hectare cost of cultivation of sugarcane, maize, turmeric, tomato, and jowar was Rs.1,97,535, Rs. 78,237, Rs. 4,58,856 Rs. 4,41,534 and Rs.1,63,038 respectively. Among different crops grown by farmers turmeric gives highest net returns followed by sugarcane, tomato, maize and jowar.

Cost and returns of different enterprises in both IFS and non IFS farming system

The per farm cost, returns and respective per cent share of enterprises in integrated farming system are presented in the Table 11 and Fig.1.

The total cost of cultivation observed for both IFS and non IFS Farming System were Rs. 1, 63,060 and Rs.2, 67,840 respectively. Net returns were Rs.99, 539.43 and Rs.19, 098.The return per rupee of expenditure was maximum in the integrated farming system (1.61) compared to non-integrated farming system (1.07). The farmers realized comparatively high per cent share of returns in IFS. This was mainly because of the high returns per rupee expenditure. And the t test value indicates that since the calculated value (4.72) is greater than the table value (1.68) so reject the null hypothesis, hence there is a difference in the net returns received by the sample farmers in both IFS and non IFS systems. Hence, IFS had a positive impact on farmer's net income. Similar results were found by Raghupati (2014) [8].

Constraints and opinions associated with integrated farming system

Opinions of farmers on the constraints and benefits were elicited. The Garette ranking technique was used to rank these constraints and benefits.

Constraints under integrated farming systems

The constraints faced by the sample farmers were classified as production, financial and marketing constraints that are presented in Table.12.

Production constraints

In case of production constraints of IFS farmers, scarcity of labour was constraint of greater extent as opined by sample farmers with mean score (65.83) followed by non- availability of quality planting materials/breeds/species (58.19), lack of knowledge on balanced use of fertilizers (43.26) and lack of the technical knowledge regarding farming system (36.47). In case of production constraints of non IFS farmers, non-availability of quality planting materials/breeds/species was constraint of greater extent as opined by sample farmers with mean score (69.52) followed by lack of the technical knowledge regarding farming system (57.15), lack of knowledge on balanced use of fertilizers (42.38) and scarcity of labour (29.46). The possible reasons could be the any production system will survive only when it is supplemented with basic quality input like seed/ breed or species. Hence, this might have been rated as top most constraint. Further, many government schemes have failed to reach the farmers to supply the inputs at right time, at right place and required quantity.

Financial constraints

In case of financial constraints with respect to IFS farmers, lack of timely availability of credit (68.12) was greater constraint as opined by farmers followed by high initial cost of production (53.59), non-availability of support prices / subsidies for all enterprises (39.68) and high rate of interest on borrowings (27.55). With respect to non IFS farmers, high initial cost of production (65.34) was greater constraint as opined by farmers followed by high initial cost of production (57.91), high rate of interest on borrowings (33.28) and non-availability of support prices / subsidies for all enterprises (29.68).

With respect to financial constraints non-availability of support prices / subsidies for all enterprises, high initial cost of production and loan disbursement procedure were the major constraints faced by respondents. It is quite natural that any financial institute for advancing loan follows stringent procedures regarding land records and repayment capacity of the borrowers. The social structure of the Indian communities is such that the land records sometimes are not properly maintained by the families and that may lead to confusion during sanction. Further, in the absence of single window system, it may create more problems for disbursement. The production cost is escalating day by day including the labour costs and bringing efficiency into the production system may reduce the cost of production.

Marketing constraints

In case of marketing constraints, a majority of IFS farmers (63.14) expressed that lot of fluctuations in the prices was the major problem followed by lack of transportation and marketing facilities (59.56), lack of marketing facilities at local level and lack of exclusive markets (38.28) and lack of storage facilities for perishable farm produce (29.37). Similar result was found by Younus (2013) [6]. In case of non IFS farmers (65.65) expressed that lack of storage facilities for perishable farm produce was the main problem ranked I followed by lot of fluctuations in the prices (59.12), lack of transportation and marketing facilities (40.37) and lack of marketing facilities at local level (31.89)

Marketing constraints like fluctuation in the prices, untimely payment for the produce and fluctuations in the prices and exploitation by the middleman is very common in our present situation. The farmers find it difficult to sell their produce profitably due to lack of good market and marketing facilities. The absence of linking roads to the nearby markets may be another constraint. These problems needed to be adjusted within the farming system by the farmers and also necessary policy changes should be made by the administrators for the betterment of farming community on sustainable basis.

Opinion regarding IFS system expressed by IFS followers

The opinion regarding IFS system expressed by IFS followers as opined by the farmers have been depicted in the Table 13 and fig-2. It was revealed that by integration of enterprises, the farmers have been getting the income throughout the year and there by improves the standard of living in the study area with mean score (72.86). It was observed that it helps in reduce the price risk (68.12) and also supply of balanced, nutritious and quality food to family (65.36) followed by stability of income and welfare of the farmers (52.45), sustainable soil fertility and productivity by way of organic waste recycling and also improves the soil health (51.22) and it helps in efficient recycling of the farm bio-mass and animal waste (45.69), planting trees on bund will reduce the degradation of forest (38.16), IFS increases productivity by way of increase in economic gain per unit area (32.48), IFS creates good ecology and environment (27.15) and by adoption of complimentary enterprises as a whole increases the input use efficiency (25.63). In total, the farmers had optimistic opinion about the adoption of farming system approach in agriculture mostly to minimize risks through diversification and generation of better income besides employment for their family members. In addition, the farmers had the concern for protecting the environment and ecology by way of prospects in recycling of wastes on their farm.

Table 2: Socio-economic characteristics of the sample respondents

Sl. No.	Particulars	Unit	IFS (n=40)		Non-IFS (n=40)	
			Average	Percentage	Average	Percentage
1	Age of the farmers	Years	44.00	-	61.00	-
2	Size of the family	Number	05.00	-	05.00	-
3	Education					
A	Illiterate		04.00	10.00	10.00	25.00
B	Primary	Number	09.00	22.50	13.00	32.50
C	Secondary		22.00	55.00	15.00	37.50
D	Above secondary		05.00	12.50	02.00	05.00
4	Farming system (In hectare)		2.87	100.00	2.37	100.00
A	Farming system – I		3.50	30.46	-	-

B	Farming system – II		2.70	23.49	-	-
C	Farming system – III		2.14	18.62	-	-
D	Farming system – IV		3.15	27.41	-	-

Table 3: Cropping pattern of sample farmers under different integrated farming systems in the study area

Sl. No.	Particulars	Farming system- I n=10			Farming system- II n=10			Farming system- III n=10			Farming system- IV n=10		
		Area (ha)	Avg.	Percentage	Area (ha)	Avg.	Percentage	Area (ha)	Avg.	Percentage	Area (ha)	Avg.	Percentage
I	**Land used for field crops**												
A	***Kharif* Season**												
1	Pulses	05	0.5	16.85	-	-	-	-	-	-	-	-	-
2	Marigold	03	0.3	03.37	03	0.3	05.00	-	-	-	-	-	-
3	Beet root	-	-	-	04	0.4	06.67	-	-	-	-	-	-
4	Tomato	-	-	-	05	0.5	08.33	-	-	-	-	-	-
5	Onion	04	0.4	04.49	02	0.2	03.33	05	0.5	10.00	06	0.6	16.66
6	Fodder crops	01	0.1	01.12	02	0.2	03.33	01	0.1	02.00	02	0.2	05.55
	Sub total	23	2.3	25.83	16	1.6	26.66	06	0.6	12.00	08	0.8	22.21
B	***Rabi* Season**												
1	Brinjal+ Tomato	02	0.2	2.25	-	-	-	04	0.4	08.00	-	-	-
2	Maize	05	0.5	5.62	04	0.4	06.67	08	0.8	16.00	10	1.0	27.78
3	Sugarcane	04	0.4	4.50	04	0.4	06.67	-	-	-	-	-	-
4	Cucumber	-	-	-	01	0.1	01.67	-	-	-	-	-	-
5	Chilli	01	0.1	1.13	02	0.2	03.33	04	0.4	08.00	04	0.4	11.11
	Sub total	12	1.2	13.50	11	1.1	18.34	16	1.6	32.00	14	1.4	38.89
C	**Summer Season**												
1	Ridge gourd	02	0.2	2.25	-	-	-	-	-	-	-	-	-
2	Tomato	-	-	-	02	0.2	03.33	-	-	-	-	-	-
3	Bhendi	0.5	0.05	0.56	-	-	-	-	-	-	-	-	-
4	Cucumber	0.5	0.05	0.56	-	-	-	-	-	-	-	-	-
	Sub total	03	0.3	3.37	02	0.2	03.33	00	0.0	00.00	00	0.0	00.00
	Total (A+B+C)	38	3.8	42.70	29	2.9	48.32	22	2.2	44.00	22	2.2	61.10
II	**Land used for horticulture crops**												
1	Pomegranate	-	-	-	-	-	-	-	-	-	04	0.4	04.49
2	Banana	10	1.0	11.24	04	0.4	06.67	05	0.5	10.00	-	-	-
3	Grapes	-	-	-	-	-	-	03	0.3	06.00	01	0.1	02.78
4	Sapota	12	1.2	13.48	05	0.5	08.33	05	0.5	10.00	02	0.2	05.56
5	Mango	15	1.5	16.85	10	1.0	16.67	10	1.0	20.00	08	0.8	22.22
6	Coconut	10	1.0	11.24	12	1.2	20.00	05	0.5	10.00	-	-	-
7	Drumstick	-	-	-	-	-	-	-	-	-	03	0.3	08.33
	Total	51	5.1	57.30	31	3.1	51.68	28	2.8	56.00	14	1.4	38.90
	Grand total (I+II)	89	8.9	100.00	60	6.0	100.00	50	5.0	100.00	36	3.6	100.00

Table 4: Cropping pattern of sample farmers under non-IFS in the study area

Sl. No.	Particulars	Area (In hectare)	Percentage
A	**Kharif Season**		
1	Sugarcane	25.06	26.40
2	Maize	14.27	15.03
3	Turmeric	6.25	6.58
4	Tomato	7.42	7.82
	Sub total	53.00	55.84
B	**Rabi Season**		
1	Jowar	16.23	17.10
2	wheat	13.45	14.17
	Sub total	29.68	31.27
C	**Summer Season**		
1	maize	12.24	12.90
	Sub total	12.24	12.90
	Grand total (A+B+C)	94.92	100.00

Table 5: Livestock and allied farming possession in integrated farming systems.

Sl no.	Particulars	Dairy (No.)	Goat farming (No.)	Vermi- Composting (Pits No.)	Poultry (No.)
1	Farming system-1	3.6 (30.00)	1.0 (18.86)	4.10 (38.31)	32.10 (23.19)
2	Farming system-2	2.1 (17.50)	1.20 (22.64)	1.90 (17.75)	44.32 (32.02)
3	Farming system-3	3.8 (31.67)	1.30 (24.52)	2.20 (20.56)	26.32 (19.02)
4	Farming system-4	2.5 (20.83)	1.80 (33.96)	2.50 (23.36)	35.64 (25.75)
	Total (No.)	12.00 (100.00)	5.30 (100.00)	10.70 (100.00)	138.38 (100.00)

Note: Figures in parenthesis are percentage to respective total.
Note: Dairy includes both cattle and buffalo.

Table 6: Cost and Returns of Different Enterprises in IFS-I (Rupees/farm)

S. No.	Particulars	Mango	Coconut	Banana	Sapota	Vege tables	Sugar cane	Maize	Pulses	Flowers	Dairy	Goat farming	Vermi compost	Poultry
1	Amortized established cost	20261 (25.85)	5236 (72.17)	12678 (37.53)	15829 (36.84)	-	-	-	-	-	-	-	-	-
2	Total variable cost	38672 (49.35)	1823 (24.22)	18334 (54.28)	22638 (52.69)	15900 (81.22)	28753 (80.17)	7502 (63.60)	15895 (75.04)	5632 (78.97)	20168 (82.23)	6555 (75.89)	13386 (72.31)	10997 (94.73)
3	Total fixed cost	19432 (24.80)	467 (06.21)	2765 (00.19)	4500 (10.47)	3677 (18.78)	7112 (19.83)	4294 (36.40)	5287 (24.96)	1500 (21.03)	4357 (17.77)	2083 (24.11)	5125 (27.68)	612 (05.27)
4	Total cost	78365 (100.00)	7526 (100.00)	33777 (100.00)	42967 (100.00)	19577 (100.00)	35865 (100.00)	11796 (100.00)	21182 (100.00)	7132 (100.00)	24525 (100.00)	8638 (100.00)	18511 (100.00)	11609 (100.00)
5	Gross return	146119 (100.00)	10368 (100.00)	46322 (100.00)	63127 (100.00)	30504 (100.00)	58505 (100.00)	17114 (100.00)	30733 (100.00)	10713 (100.00)	40204 (100.00)	12835 (100.00)	35577 (100.00)	18005 (100.00)
6	Net return	67754	2842	12545	20160	10927	22640	5318	9551	3581	15679	4197	17466	6396
7	B:C Ratio	1.86	1.38	1.37	1.47	1.56	1.63	1.45	1.45	1.50	1.64	1.49	1.92	1.55
	Farming system as a whole													
a	Total cost	332863												
b	Gross return	531649												
c	Net return	198756												
d	B:C Ratio	1.60												

Note: Figures in parenthesis are percentage to respective total.

Table 7: Cost and Returns of Different Enterprises in IFS-II (Rupees/farm)

Sl. No	Particulars	Mango	Coconut	Banana	Sapota	Vege tables	Sugar cane	Maize	Flowers	Dairy	Poultry	Goat farming	Vermi compost
1	Amortized established cost	22561 (27.64)	8100 (70.56)	10083 (30.36)	15021 (33.26)	-	-	-	-	-	-	-	-
2	Total variable cost	40985 (50.21)	2519 (21.94)	20626 (62.11)	25005 (55.38)	18211 (81.54)	31672 (78.23)	10871 (63.91)	8008 (91.51)	31200 (79.21)	15164 (89.22)	12412 (88.99)	6203 (72.82)
3	Total fixed cost	18111 (22.19)	861 (07.50)	2500 (07.53)	5128 (11.36)	4123 (18.46)	8815 (21.77)	6138 (36.09)	734 (08.39)	8189 (20.79)	1833 (10.78)	1536 (11.01)	2375 (27.88)
4	Total cost	81630 (100.00)	11480 (100.00)	33209 (100.00)	45154 (100.00)	22334 (100.00)	40487 (100.00)	17009 (100.00)	8751 (100.00)	39389 (100.00)	16997 (100.00)	13948 (100.00)	8518 (100.00)
5	Gross return	145020 (100.00)	20183 (100.00)	50112 (100.00)	82436 (100.00)	38122 (100.00)	70163 (100.00)	28436 (100.00)	15562 (100.00)	71500 (100.00)	28427 (100.00)	23332 (100.00)	16302 (100.00)
6	Net return	63390	8703	16903	37282	15788	29676	11427	6811	32111	11430	9384	8094
7	B:C Ratio	1.78	1.76	1.51	1.83	1.71	1.73	1.67	1.78	1.82	1.67	1.67	1.90
	Farming system as a whole												
a	Total cost	342410											
b	Gross return	593561											
c	Net return	251151											
d	B:C Ratio	1.73											

Note: Figures in parenthesis are percentage to respective total.

Table 8: Cost and Returns of Different Enterprises in IFS-III (Rupees/farm)

Sl. No	Particulars	Mango	Coconut	Banana	Sapota	Grapes	Chilli	Maize	Onion	Dairy	Goat farming	Poultry	Vermi compost
1	Amortized established cost	32168 (34.66)	8625 (65.27)	9633 (34.530	21813 (28.85)	24318 (11.330)	-	-	-	-	-	-	-
2	Total variable cost	38482 (41.46)	3163 (23.93)	15828 (56.74)	35637 (47.15)	100762 (46.93)	21433 (89.95)	15830 (88.40)	17435 (87.74)	28655 (77.64)	8364 (79.65)	12256 (88.69)	7183 (72.31)
3	Total fixed cost	22163 (23.88)	1427 (10.80)	2436 (08.73)	18146 (24.00)	89640 (41.74)	2396 (10.05)	2078 (11.60)	2436 (12.26)	8254 (22.36)	2137 (20.35)	1563 (11.31)	2750 (27.68)
4	Total cost	92813 (100.00)	13215 (100.00)	27897 (100.00)	75596 (100.00)	214720 (100.00)	23829 (100.00)	17908 (100.00)	19871 (100.00)	36909 (100.00)	10501 (100.00)	13819 (100.00)	9933 (100.00)
5	Gross return	154334 (100.00)	18364 (100.00)	40176 (100.00)	106348 (100.00)	328638 (100.00)	36725 (100.00)	26602 (100.00)	28437 (100.00)	58414 (100.00)	16432 (100.00)	19800 (100.00)	18146 (100.00)
6	Net return	61521	5149	12279	30752	113918	12896	8694	8566	21505	5931	5981	9372
7	B:C Ratio	1.66	1.39	1.44	1.41	1.53	1.54	1.49	1.43	1.58	1.56	1.43	1.82
	Farming system as a whole												
a	Total cost	564263											
b	Gross return	860590											
c	Net return	296327											
d	B:C Ratio	1.53											

Note: Figures in parenthesis are percentage to respective total.

Table 9: Cost and Returns of Different Enterprises in IFS-IV (Rupees/farm)

Sl. No	Particulars	Mango	Drumstick	pomegranate	Sapota	Grapes	Chilli	Maize	Onion	Dairy	Poultry	Goat farming	Vermi compost
1	Amortized established cost	39115 (31.46)	10321 (42.79)	19812 (20.70)	28136 (34.09)	28118 (16.86)	-	-	-	-	-	-	-
2	Total variable cost	58823 (47.32)	12433 (51.54)	50771 (53.04)	36078 (43.72)	82532 (49.47)	25141 (89.66)	18422 (88.55)	21136 (86.97)	21186 (76.62)	12137 (88.28)	9634 (83.91)	8162 (72.31)
3	Total fixed cost	26371 (21.22)	1367 (05.67)	25136 (26.26)	18310 (22.19)	56178 (33.67)	2898 (10.34)	2381 (11.45)	3168 (13.03)	6466 (23.38)	1611 (11.72)	1847 (16.09)	3125 (27.68)
4	Total cost	124309 (100.00)	24121 (100.00)	95719 (100.00)	82524 (100.00)	166828 (100.00)	28039 (100.00)	20803 (100.00)	24304 (100.00)	27652 (100.00)	13748 (100.00)	11481 (100.00)	11287 (100.00)
5	Gross return	216801 (100.00)	35395 (100.00)	161537 (100.00)	135682 (100.00)	254836 (100.00)	45187 (100.00)	32328 (100.00)	38231 (100.00)	46207 (100.00)	22962 (100.00)	18513 (100.00)	21571 (100.00)
6	Net return	92492	11274	65818	53158	88008	17148	11525	13927	18555	9214	7032	10650
7	B:C Ratio	1.74	1.47	1.69	1.64	1.53	1.61	1.55	1.57	1.67	1.67	1.61	1.91
	Farming system as a whole												
a	Total cost	634025											
b	Gross return	1031499											
c	Net return	397474											
d	B:C Ratio	1.63											

Note: Figures in parenthesis are percentage to respective total.

Table 10: Per hectare cost and returns of different crops grown in Non-IFS

Sl. No.	Particulars	Sugarcane	Maize	Turmeric	Tomato	Jowar
1	Total variable cost	165865.44	47547.50	221423.15	265836.22	145192.47
2	Total fixed cost	31670.34	30689.75	237433.69	175698.51	17845.75
3	Total cost	197535.78	78237.25	458856.84	441534.73	163038.22
4	Gross returns	266760.00	75480.73	701030.46	451078.81	39147.03
5	Net returns	69224.22	-2756.52	242173.62	9544.08	-123891.19
6	B:c ratio	1.35	0.96	1.53	1.02	0.24

Table 11: Cost and returns of different enterprises in both IFS and non IFS farming system (*Per ha*)

Sl. no.	Particulars	With IFS	Without IFS
1	Total variable cost	97612.36	169172.96
2	Total fixed cost	65449.35	98667.61
3	Total cost	163060.14	267840.56
4	Gross returns	262602.18	286939.41
5	Net returns	99539.43	19098.84
6	B: C Ratio	1.61	1.07
7	Table value of t-test	1.68	
8	Calculated value of t-test	4.72	

Table 12: Constraints under both IFS and non IFS farming systems

Sl no.	Particulars	IFS		Non-IFS	
		Rank	Mean score	Rank	Mean score
I	**Production constraints**				
1	Non availability of quality planting materials/breeds/species	II	58.19	I	69.52
2	Scarcity of labour	I	65.83	IV	29.46
3	Lack of the technical knowledge regarding farming system	IV	36.47	II	57.15
4	Lack of knowledge on balanced use of fertilizers	III	43.26	III	42.38
II	**Financial constraints**				
1	Non-availability of support prices/ subsidies	III	39.68	IV	29.18
2	Lack of timely availability of credit	I	68.12	II	57.91
3	High initial cost of production	II	53.59	I	65.34
4	High rate of interest on borrowings	IV	27.55	III	33.28
III	**Marketing constraints**				
1	Lack of transportation and marketing facilities	II	59.56	III	40.37
2	Lack of marketing facilities at local level and lack of exclusive markets	III	38.28	IV	31.89
3	Lot of fluctuations in the prices	I	63.14	II	59.12
4	Lack of storage facilities for perishable farm produce	IV	29.37	I	65.65

Table 13: Opinion regarding IFS system expressed by IFS respondents.

Sl no.	Particulars	Rank	Mean score
1	IFS increases productivity by way of increase in economic gain per unit area	VIII	32.48
2	IFS helps in efficient recycling of the farm bio-mass and animal waste	VI	45.69
3	Supply of balanced, nutritious and quality food to family	III	65.36
4	Planting trees on bund will reduce the degradation of forest	VII	38.16
5	IFS improves the standard of living of farmers and provides full family income and employment throughout the year	I	72.86
6	Sustainable soil fertility and productivity by way of organic waste recycling and improves the soil health	V	51.22
7	IFS helps to reduce the price risk	II	68.12
8	Stability of income and welfare of the farmers	IV	52.45
9	IFS creates good ecology and environment	IX	27.15
10	Adoption of complimentary enterprises under IFS increases the input use efficiency	X	25.63

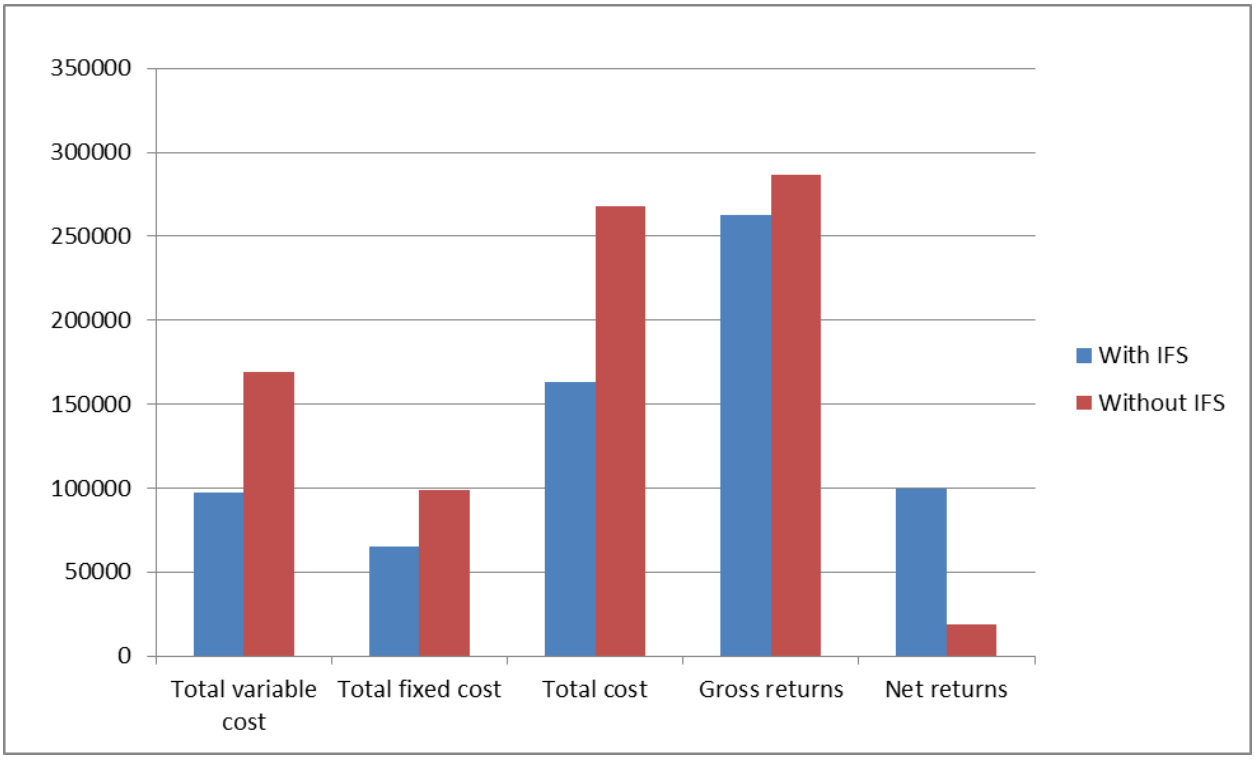

Fig 1: Cost and returns of different enterprises in both IFS and non IFS farming system

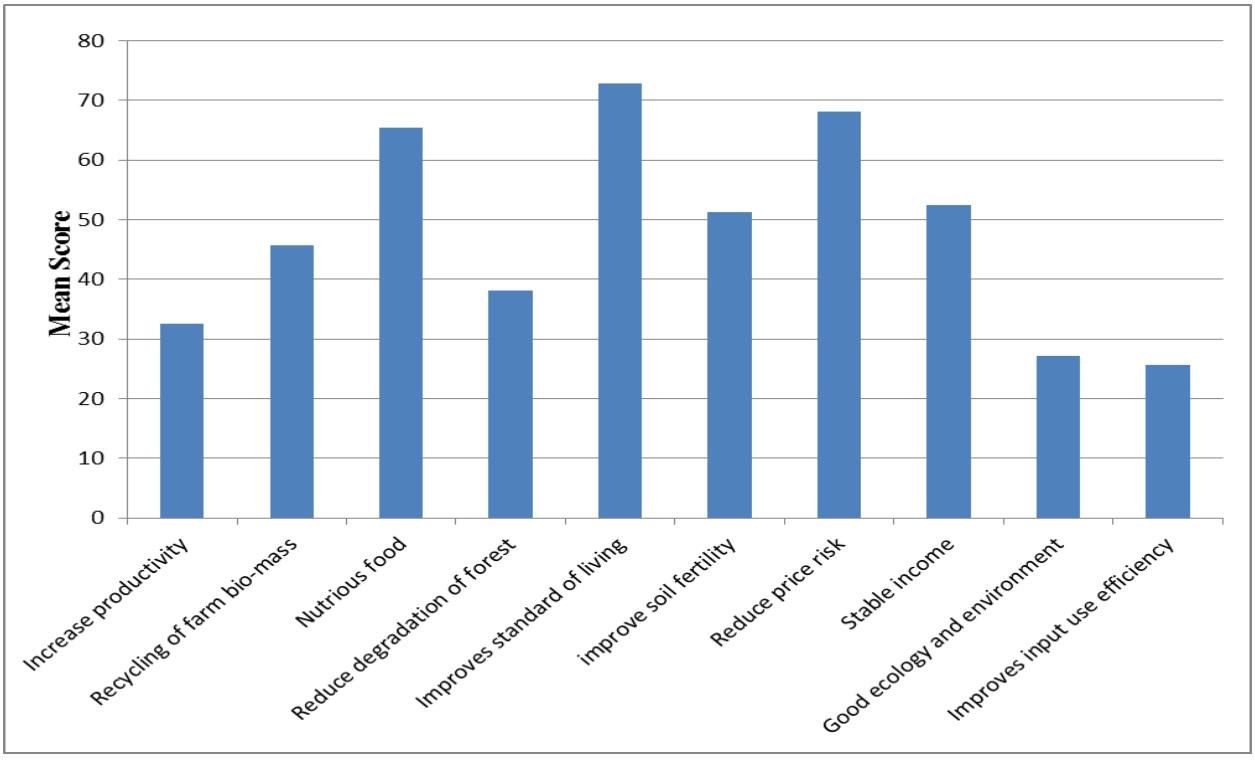

Fig 2: Opinion regarding IFS system expressed by IFS followers

Plate 1: Horticulture based integrated farming system followed by farmers in the study area.

Acknowledgment
I am publishing my research paper "Impact of Horticulture Based Integrated Farming System on Farmer's Income and Welfare in Northern Karnataka". The necessary data and information was taken to write this research paper from the project conducted by me on "Economic Analysis of Integrated Farming System in Belagavi and Bagalkot district 2016-17". Sponsored by Karnataka Agriculture Price Commission. I wish my sincere gratitude to Karnataka Agriculture Price Commission for providing opportunity to conduct study on Integrated Farming System.

Conclusion
It can be concluded from above discussion that the cost and returns of different farming systems obtained in the present study suggested that practicing horticulture based integrated farming system is relatively more profitable in the study area. Thus, sound economic logic exists for persuading the farmers to adopt integrated farming system to enhance their income. Hence, adequate attention should be paid to promote IFS practicing programmes. The Government should provide the necessary supplies at subsidized rates to the farming community so that they can be practice on a large scale and commercially.

References
1. Alagumani T, Anjugam M. Impact of dairy enterprises on income and employment in Madhurai district, Tamil Nadu. Proc. of 7th Annu. Conf. of Agricultural Economics Research Association on Livestock in Different Farming Systems, held at Tamil Nadu Veterinary and Animal Science, University Chennai, 2000, 30.
2. Arjun Prasad, Sam MJ. Multiple cropping in Tungabhadra dam region of Karnataka. Ann. Agric. Res., 1990; 11(2):149-154.
3. Biggs SD. A Farming Systems approach: some unanswered questions. Agril. Adm. Extn., 1985; 18:1-12.
4. Channabasavanna AS, Biradar DP. Relative Performance of Different Rice-Fish Poultry Integrated Farming System Models with respect to System Productivity and Economics. Agricultural Research Station Siraguppa – 583 121, Karnataka, Karnataka J. Agric. Sci. 2007; 20(4):706-709.
5. Kandasamy OS. An economic analysis of integrated Farming System in Dharmapuri district of Tamil Nadu. *Farming System*, 1998; 14(1, 2):29-33.
6. Younus MD. Awareness and perception of integrated farming system by SC/ST farmers. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India, 2013,
7. Nagaraja GN, Yellappa E. Economic impact of integrated farming system demonstrations on participating farmers, Univ. Agri. Sci., Bangalore, 32-34.
8. Raghupati Bidari. An economic analysis of horticulture based farming systems in Dharwad district of Karnataka. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India, 2014.
9. Shilpa P Chowti. An economic analysis of diversity in cultivation of maize hybrids in Haveri district. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka India, 2014.
10. Vivekananda. Problems and prospects of agricultural development in Karnataka occasional paper-9 NABARD, 1999.