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AN IMPACT ASSESSMENT OF UNDER DIFFERENT FARMING SYSTEMS IN CHICKABALLAPURA DISTRICT OF KARNATAKA

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ABSTRACT
To meet the multiple objectives of poverty reduction, food security, competitiveness and sustainability, several researchers have recommended the farming systems approach to research and development. A farming system is the result of complex interactions among a number of inter-dependent components, where an individual farmer allocates certain quantities and qualities of four factors of production, namely land, labour, capital and management to which he has access (Mahapatra, 1994). Farming systems research is considered a powerful tool for natural and human resource management in developing countries such as India. This is a multidisciplinary whole-farm approach and very effective in solving the problems of small and marginal farmers. The approach aims at increasing income and employment from small-holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself (Behera and Mahapatra, 1999; Singh *et al*., 2006).

INTRODUCTION

The Indian economy is predominantly rural and agricultural, and the declining trend in size of land holding poses a serious challenge to the sustainability and profitability of farming. In view of the decline in per capita availability of land from 0.5 ha in 1950-51 to 0.15 ha by the turn of the century and a projected further decline to less than 0.1 ha by 2020, it is imperative to develop strategies and agricultural technologies that enable adequate employment and income generation, especially for small and marginal farmers who constitute more than 80% of the farming community. The crop and cropping system based perspective of research needs to make way for farming systems based research conducted in a holistic manner for the sound management of available resources by small farmers. Under the gradual shrinking of land holding, it is necessary to integrate land based enterprises like fishery, poultry, apiary, field and horticultural crops, etc. within the bio-physical and socio-economic environment of the farmers to make farming more profitable and dependable (Behera *et al*., 2004).

Importance of Integrated Farming System Models

Sustainable development in agriculture must include integrated farming systems with efficient soil, water, crop and pest management practices, which are environmentally sound and cost effective. The future agricultural system should reorient from the single commodity system to food diversification approach for sustaining food production and income. Integrated farming systems including agriculture, horticulture, dairy, sericulture, sheep rearing, etc., therefore, assume greater importance for sound management of farm resources to enhance farm productivity, which will reduce environmental degradation and improve the quality of life of resource poor farmers and to maintain agricultural sustainability in the eastern dry zone of Karnataka.

Objective of Study

The basic objective of the study is to access the impact of farming systems on economic empowerment of resource poor farmers. Keeping this in view, following are the specific objectives of the study

1. To analyse economic condition of Scheduled Caste farmers prior to introduction of Integrated Farming Systems.
2. To assess the impact of Integrated Farming Systems approach on the economics condition of Scheduled Caste farm families.

Hypotheses

The following hypotheses were formulated to indentify and assess farming systems farmers' adaptability of the technologies and outcomes of on-farm research activities in the project area in comparison to those without project:

1. The farming systems adopted by farmers in the post project period are different from those adopted before the project period.
2. The contribution of the farming systems with technologies towards farm productivity have changed after the project period.

METHODOLOGY

There are various types of farming systems in Chickaballapur district of Karnataka. Till now, no inclusive study has been made to know the livelihood improvement of resource poor farm families and economic assessment of the various farming systems in Karnataka. Hence, district is purposively selected for the study. The findings of the study would throw light on the process of innovation of agriculture. This study also attempts to study the extent of use of benefits from developmental

programmes. The present study has been conducted by the researcher inspite of being constrained by limited time and other resources. As a result, the study was confined to 270 respondents in nine villages only. In addition to this the ex-post-facto design of the study left scope for bias in recalling of information by the respondents.

Analytical tools and techniques used

The data comprised both primary and secondary data, were given appropriate coding both descriptive and quantitative analysis were adapted this data.

1. Tabular presentation with percentages averages, and ratios
2. 2 .Production function analysis

Production function analysis

To study the resource productivity and allocative efficiency in different farming systems, a Cobb-Douglas type of production function was estimated. Cobb-Douglas type of production function has the greatest use in diagnostic analysis, reflecting the marginal productivities at mean levels of returns. The production function analysis was carried out to determine the effect of variables like area under various crops, sericulture and number of mulching cross breed cows on annual net income of households. Cobb-Douglas type production function was used after studying the scatter diagram. The form of production function employed is given below:

Y = a X1 b1X2 b2 X3 b3 X4 b4 X5 b5 X6 b6 eu

Where Y = Net income per annum (in Rs.)

X1 = Area under Field crops (in ha)
X2 = Area under Vegetable crops (in ha)
X3 = Area under Perennial crops (in ha)
X4 = Number of dairy mulching animals per household
X5 = Number of DFLS reared per year
X6 = Size of the sheep flock (Number per household)
a = the regression constant

b_1 to b_6 are the elasticity's of respective variables or the regression coefficients of the respective independent variables. u = the disturbance term or error term.

The production function was used separately for the major farming systems considering the variables of interest in each farming system. The function was estimated after making log transformation as:

Log y= in a + b1 lnX_1 +b_2 lnX_2+b_3 lnX_3+b_4 lnX_4+b_5 lnX_5+b_6 lnX_6+ u

Significance of regression coefficients (bi) was tested by following t test.

$$t = \frac{bi}{S.E}(bi)$$

Where, bi = regression coefficient

S.E (bi) = the standard error of regression coefficient

RESULTS

The data collected from the respondents were analyzed keeping in view the objectives of the study and the results and discussion are presented under the following.

TABLE 1: Sample farm family composition across villages

Sl. No	Villages	Total Farm Families	Per Farm Family		
			Size	Male	Female
1	Honnappana halli	30	2.80	2.20	0.60
2	Addikoppa	30	3.10	2.27	0.83
3	Bandarahalli	30	2.63	2.07	0.57
4	Chilenahalli	30	2.53	1.97	0.57
5	Chinnanagenahalli	30	2.87	2.03	0.83
6	Gidganahalli	30	2.68	2.15	0.53
7	Goudgere	30	2.37	1.63	0.73
8	Kannaganagoppa	30	2.73	2.20	0.53
9	Upparahalli	30	2.77	1.97	0.80
	Grand Total	270			

Source: Filed survey –year -2005-16

The village wise distribution pattern of sample respondents presented in table 1 indicated that, Honnappana Halli village (30 no) with an average family size male was 2. and female was 0.60 per farm families was selected similarly Addikoppa,(30 no) with an average family size was 2.27 male and 0.83 per farm families, in Bandarahalli (30 no) with an average farm families, Chilenahalli (30no) farm families Chinnanagenahalli (30 no) farm families Gidganahalli (30 no) farm families Goudgere (30 no) farm families Kannaganagoppa (30 no) farm families and Upparahalli (30 no) farm famailes the total farm families was selected in sample area 270 farm families respectively. The average family size in Honnappana Halli (2.80) per farm family, similarly Addikoppa (3.10) per farm family, in Bandarahalli (2.63), Chilenahalli (2.53) per farm family Chinnanagenahalli (2.87) per farm family, Gidganahalli 2.68 per farm family Goudgere (2.37) per farm family in Kannaganagoppa (2.73) per farm family and Upparahalli (2.77) per farm family respectively.

TABLE 2: Land holdings across villages

Sl. No.	Villages	Total land (Acres)			Average land per farm		
		Total	Irrigated	Dry	Total	irrigated	Dry
1	Honnappana Halli	67.05	27.50	39.55	2.24	0.92	1.32
2	Addikoppa	68.60	22.75	45.85	2.29	0.76	1.53
3	Bandarahalli	57.78	21.00	36.78	1.93	0.70	1.23
4	Chilenahalli	62.80	16.50	46.30	2.09	0.55	1.54
5	Chinnanagenahalli	64.19	14.00	50.19	2.14	0.47	1.67
6	Gidganahalli	138.20	38.50	99.70	2.30	0.64	1.66
7	Goudgere	66.02	17.50	48.52	2.20	0.58	1.62
8	Kannaganagoppa	61.15	23.00	38.15	2.04	0.77	1.27
9	Upparahalli	63.75	26.75	37.00	2.13	0.89	1.23
	Grand Total	649.54	207.50	442.04	2.17	0.69	1.47

Source: Field survey data 2015-16

The land holding pattern of households presented in table 2. revealed that, Honnappana halli village the average size of dry land holding was 1.32 acres followed by irrigation land 0.92 acres respectively. In case of Addikoppa village the average size of dry land holding was 1.53 acres followed by irrigation land 0.76 acres respectively, in case of Bandarahalli village the average size of dry land holding was 1.23 acres followed by irrigation land 0.70 acres respectively, in case of Chilenahalli village the average size of dry land holding was 1.54 acres followed by irrigation land 0.55 acres respectively, in case of Chinnanagenahalli village the average size of dry land holding was 1.67 acres followed by irrigation land 0.47 acres respectively, in case of Gidganahalli village the average size of dry land holding was 1.66 acres followed by irrigation land 0.64 acres respectively, in case of Goudgere village the average size of dry land holding was 1.62 acres followed by irrigation land 0.58 acres respectively. in case of Kannaganagoppa village the average size of dry land holding was 1.27 acres followed by irrigation land 0.77 acres respectively, Upparahalli village the average size of dry land holding was 1.23 acres followed by irrigation land 0.69 acres respectively.

TABLE 3: Classification of the sample farmers into different existing farming systems

Type of farm household	C+D	C+S+D	C+D+SH	C+D+SH+PG	C+D+SH+S	Total
Small Farmers (≤ 1ha)	20 (36)	20 (36)	20 (40)	20 (40)	15 (25)	95.00
Medium farmers (1-2 ha)	15 (27)	20 (30)	20 (40)	15 (30)	25 (42)	95.00
Large farmers (2-0-5-0 ha)	20 (30)	15 (27)	10(20)	15 (30)	20 (33)	80.00
Total	55(100)	55(100)	50(100)	50(100)	60(100)	270.00

In table 3 It was found that, 36 per cent of farmers belong to small farmers in case of crop+ Dairy farmers and in case of crop + Dairy + sericulture it was found that, 36 percent in case crop+ Dairy+ sheep rearing 40 per cent in case of crop+ Dairy+ sheep+ piggery 40 per cent and in case of crop+ Dairy+ sheep+ sericulture 25 percent respectively. In case of medium farmers (1-2 ha.) it was found that 27 per cent in crop+ Dairy, in case of Crop Dairy + in case of crop + Dairy + sericulture it was found that, 30 percent in case crop+ dairy+ sheep rearing 40 per cent in case of crop+ Dairy+ sheep+ piggery 30 per cent and in case of crop+ Dairy+ sheep+ sericulture 42 percent respectively. In case of large farmers (above 2 ha.) it was found that 30 per cent in crop+ Dairy, in case of crop + dairy + sericulture it was found that, 27 percent in case crop+ Dairy+ sheep rearing 20 per cent in case of crop+ Dairy+ sheep+ piggery 30 per cent and in case of crop+ Dairy+ sheep+ sericulture 33 percent respectively.

TABLE 4: Different farming system -wise Regression results

Sl. No.		C+D	C+S+D	C+D+SH	C+D+SH+PG	C+D+SH+S
1	No of observation	55	55	50	50	60
2	Intercept	08.51 (79.01)	08.61 (18.47)	08.86 (29.00)	09.43 (21.30)	10 (23.12)
3	Area under Field crops (ha)	0.006 # (0.081)	0.002# *(0.08)*	0.08# (2.16)	0.82** (3.13)	0.92** (4.85)
4	Area under Vegetable (crops ha)	0.26 (13.00)	0.05** (5.10)	0.19** (6.13)	-	-
5	Area under Perennial crops (ha)	0.02# (0.29)	0.05# (0.65)	o.15* (3.10)	0.19** (6.97)	-
6	Number of milching dairy animals	0.60** (4.13)		0.32 (3.62)	-	-
7	Number of Disease Free laying's reared		0.83** (13.64)	0.59* (13.30)	-	-
8	Size of the flock (sheep)				0.45** (3.17)	-
9	[illegible]	0.92	0.95	0.94	0.93	-
10	[illegible]djusted)	0.91	0.94	0.93	0.92	-
11	F ratio	69.45	93.81	62.34	62.06	-

Note: Figures in parentheses indicate t-values of the coefficients
** Significant at 1 per cent, * Significant at 5 per cent and # Non significant
C+D: Crop+Dairy, C+D+S: Crop+Dairy +Sericulture C+D+SH: Crop +Dairy +Sheep , C+D+SH+PG Crop+Dairy+Sheep+Piggery and . C+D+SH+S: Crop+ Dairy+ Sheep+ Sericulture.

The ordinary least square of Cobb- Douglas production function with respect to under different farming system describes in table 4 Co efficient was highly significant for the Crop+ Diary + Sericulture farming the elasticity of production functions representing one percent increasing in case of area under vegetable crops increased net income ranging from 0.19, in case of crop+ Sericulture farming net income ranging from 0.05 respectively.

The elasticity for area under perennial crops co efficient was significant for the crop+ sheep and crop+ Dairy + Sericulture farming the elasticity of production function representing one percent increasing in case of perennial crops increased net income ranging from 0.19 in case of crop+ Dairy + Sericulture similarly crop+ sericulture net income ranging from 0.05 respectively. The non significant co efficient of area under field crops in Crop+ Dairy, crop+ Sericulture and Crop + Dairy + Sericulture farming system representing that the impact of field crops of farm income is less. The elasticity of coefficient was found highly significant disease free laying's (DLF's) reared in case of Crop+ Sericulture +Dairy (0.83) and crop+ Dairy + Sheep (0.59) respectively. The elasticity of coefficient was found significant Area under Field crops in case of Crop+ Dairy+ Sheep+ Sericulture (0.92) in case of Crop + Dairy+ Sheep+ Piggery (0.82) respectively. In respect to R^2 was more than 0.9 which means the different farming model is good fit, with high F ratios 94.00 respectively.

Cost and return of principal crops and subsidiary enterprises practiced by different combination of farming systems is presented in table 5. Dairy is one of the major subsidiary enterprises practiced by Crop+Dairy the net returns per crossbreed cow was worked out on month basis which was maximum in Crop+Dairy Rs.12345, the net returns per rupee was also in Crop Dairy (Rs.0.12) and Crop+Dairy+Sericulture households. The gross income was Rs.98220, the net returns per rupee was also maximum 0.93, similarly Crop production + Dairy enterprises+ Sheep rearing the gross income was Rs123658, the net returns per rupee was 0.11 similarly, C+D+SH+PG the gross income was Rs**.**134623, the net returns per rupee was 0.14, and C+D+SH +S households the net income was Rs.145236, the net returns per rupee of investment of 0.13 respectively.

TABLE 5: Economics of subsidiary enterprises under major farming systems

Farming Systems	Gross returns	Total cost	Net returns	Net returns per rupee of cost
C+D	12345	5567	6778	0.12
C+S+D	98220	50435	47785	0.93
C+D+SH	123658	57543	66115	0.11
C+D+SH+PG	134623	56234	78389	0.14
C+D+SH +S	145236	63423	81813	0.13

Note: C+D: Crop+Dairy, C+D+S: Crop+Dairy +Sericulture C+D+SH: Crop +Dairy +Sheep , C+D+SH+PG Crop+Dairy+Sheep+Piggery and . C+D+SH+S: Crop+ Dairy+ Sheep+ Sericulture

CONCLUSION

1. The results of the study revealed that, the IFS programme has made positive and significant impact on increasing their annual income. Hence, the implementation of Integrated Farming System programme needs to be continued and extended in other areas.
2. The dairy and the sericulture components contributed higher proportion to the total income in the existing farming systems. Dairy and sericulture enterprise are complementary to each other and found to sustain farm income.
3. Most of the farmers aimed at meeting their food grain needs and fodder requirement of livestock through their own farm production. Generally farmers choose one or two enterprise as their principal or main enterprise around which they develop their farming system – an enterprise that has high and sustained marginal returns.

Policy Implications

1. The Crop+ Dairy+ Sericulture +Sheep +Piggery farming system needs to be popularized among farmers through extension programmes and linking between of the developmental departments and research institute to strengthen the livelihood security of farming families.
2. Low income group of households under rainfed farming system revealed the need of strong linkages with the highly profitable enterprise like dairy, piggery farming so it is suggested to promote dairy farming among all classes of the rural population.

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