AGRICULTURAL SITUATION IN INDIA

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CONTENTS

PART I

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NOTE TO CONTRIBUTORS

Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Co-operation's monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. The articles, not exceeding five thousand words, may be sent in duplicate, typed in double space on one side of fullscape paper in Times New Roman font size 12, addressed to the Economic & Statistical Adviser, Room No.145, Krishi Bhawan, New Delhi-11 0001, alongwith a declaration by the author(s) that the article has neither been published nor submitted for publication elsewhere. The author(s) should furnish their e-mail address, Phone No. and their permanent address only on the forwarding letter so as to maintain anonymity of the author while seeking comments of the referees on the suitability of the article for publication.

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PART II

STATISTICAL TABLES

Abbreviations used

N.A. —Not Available.
N.Q. —Not Quoted.
N.T. —No Transactions.
N.S. —No Supply/No Stock.
R. —Revised.
M.C. —Market Closed.
N.R. —Not Reported.
Neg. —Negligible.
Kg. —Kilogram.
Q. —Quintal.
(P) —Provisional.
Plus (+) indicates surplus or increase.
Minus (–) indicates deficit or decrease.

A. General Survey

(i) Trends in Foodgrain Prices

During the month of November, 2012 the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains increased by 0.62 percent from 211.2 in October, 2012 to 212.5 in November, 2012 .

The Wholesale Price Index Number of Cereals showed an increase of 0.79 percent from 201.6 to 203.2 and Pulses showed a decrease of 3.57 percent from 265.8 to 256.3.

The Wholesale Price Index Number of Wheat increased by 2.22 percent whereas that of Rice declined by 0.15 percent respectively during the same period.

(ii) Weather, Rainfall and Reservoir situation during December, 2012

- Cumulative Post-Monsoon Rainfall for the country as a whole during'the period 01st October to 26th December, 2012 is 21 % less than LPA. Rainfall in the four broad geographical divisions of the country during the above period was (-) 59% in North West India, (-) 29% in Central India, (-) 6% in South peninsula and (-) 17% in East & North East India.
- Out of a total of 36 meteorological subdivisions, 16 subdivisions constituting 40% of the total area of the country received excess/normal rainfall and the remaining 20 subdivisions constituting 60% of the total area of the country received deficient/scanty rainfall.
- Central Water Commission monitors 84 major reservoirs in the country which have a total live capacity of 154.42 BCM at Full Reservoir Level (FRL). Current live storage in these reservoirs as on 27th December, 2012 was 91.43 BCM as against 98.85 BCM on 27.12.2011 (last year) and, 85.78 BCM of normal storage (average storage of the last 10 years). Current year's storage is 92% of the last year's and 107% of the normal storage. Major States reporting lower than normal storage are Jharkhand, West Bengal, Tripura, Maharashtra, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.
- As per latest information available on sowing of crops, around 89% of the normal area under Rabi crops have been sown upto 28.12.2012. Area sown under all rabi crops taken together has been reported to be 542.26 lakh hectares at All India level as compared to 547.01 lakh hectares in the corresponding period of 2011-12. Area reported was higher by 1.3 lakh ha. under Jowar, 2.0 lakh ha. under Gram, 1.2 lakh ha. under Rapeseed & Mustard and 1.4 lakh ha. under Sunflower. Area coverage was lower by 4.0 lakh ha. under Wheat, 1.2 lakh ha. under Rice, 2.0 lakh ha. under Urad and 1.2 lakh ha. under Linseed.
- A statement indicating comparative position of area coverage under major Rabi crops during 2012-13 (upto 28.12.2012) and the corresponding period of last year is given in the following table.

ALL INDIA CROP SITUATION - RABI (2011-12) AS ON 28-12-2012

Crop Name	Normal Area	Average Area as on date	Area sown reported (in lakh hectares)			Absolute Change.over (+/–1)	
			28-12-2012	% of Normal	28-12-2011	Average as on date	Last Year
Wheat	282.62	262.76	272.79	96.5	276.81	10.0	–4.0
Rice	44.99	4.02	1.87	4.2	3.02	–2.2	–1.2
Jowar	44.99	42.90	38.11	84.7	36.85	–4.8	1.3
Maize	11.36	9.59	10.10	88.9	10.35	0.5	–0.2
Barley	6.57	7.24	7.28	110.9	7.28	0.0	0.0

ALL INDIA CROP SITUATION - RABI (2011-12) AS ON 28-12-2012

Crop Name	Normal Area	Average Area as on date	Area sown reported (in lakh hectares)			Absolute Change.over (+/-)	
			28-12-2012	% of Normal	28-12-2011	Average as on date	Last Year
Total Coarse Cereals	62.92	60.19	56.22	89.3	55.16	–4.0	1.1
Total Cereals	390.53	326.97	330.88	84.7	334.99	3.9	–4.1
Gram	80.57	81.55	87.77	108.9	85.77	6.2	2.0
Lentil	14.46	14.33	14.53	100.5	14.77	0.2	–0.2
Peas	7.15	7.16	7.52	105.2	8.02	0.4	–0.5
Kulthi (Horse Gram)	2.36	4.56	4.84	205.4	4.87	0.3	0.0
Urad	7.46	5.56	5.45	73.0	7.43	–0.1	–2.0
Moong	6.40	3.03	3.09	48.3	3.48	0.1	–0.4
Lathyrus	5.46	4.19	3.52	64.5	4.08	0.7	–0.6
Others	3.61	5.46	5.80	160.6	5.73	0.3	0.1
Total Pulses	127.46	125.84	132.52	104.0	134.14	6.7	–1.6
Total Foodgrains	518.00	452.80	463.39	89.5	469.13	10.6	–5.7
Rapeseed & Mustard	62.80	64.13	65.01	103.5	63.83	0.9	1.2
Groundnut	8.87	4.06	4.03	45.4	3.87	0.0	0.2
Safflower	3;05	2.48	1.34	44.1	1.87	–1.1	–0.5
Sunflower	10.26	6.56	4.78	46.6	3.37	–1.8	1.4
Sesamum	2.56	0.59	0.48	18.9	0.42	–0.1	0.1
Linseed	4.03	4.17	2.72	67.6	3.91	–1.4	–1.2
Others	0.00	0.84	0.50	#DIV/0I	0.61	–0.3	.0.1
Total Oilseed (Nine)	91.56	82.83	78.86	86.1	77.88	–4.0	1.0
All. Crops	**609.55**	**535.64**	**542.26**	**89.0**	**547.01**	**6.6**	**–4.8**

Source : Crops and TMOP Divisions DAC

Agriculture

All India production of foodgrains: As per the 1st advance estimates (Kharif only) released by Ministry of Agriculture on 24-09-2012, production of foodgrains during 2012-13 is estimated at 117.18 million tonnes compared to 123.88 million.tonnes (1st advance estimates) in 2011-12.

Procurement: Procurement of rice as on 3rd December, 2012 was 35.04 million tonnes of (Kharif Marketing Season) and 12.38 Million tonnes of (Rabi Marketing Season) as against 34.04 million tonnes and 11.58 million tonnes procured last year in the corresponding period respectively. This represents an increase of 2.94 percent in Kharif Marketing Season and increase of 6.91 percent in Rabi Markeing Season. Wheat procurement during Rabi Marketing Season 2012-13 is 38.15 million tonnes as compared to 28.15 million tonnes during the corresponding period last year.

TABLE 1— PROCUREMENT IN MILLION TONNES

	2009-10	2010-11	2011-12	2012-13
Rice	32.03	34.20	35.04	14.75*
Wheat	25.38	22.51	28.34	38.15**
Total	**57.41**	**56.71**	**63.38**	**52.90**

* Position as on 5-7-2012.** Position as on 02-08-2012

Off-take: Off-take of rice during the month of November, 2012 was 28.04 lakh tonnes. This comprises 21.57 lakh tonnes under TPDS and 6.47 lakh tonnes under other schemes during November 2012. In respect of wheat, the total off take was 28.40 lakh tonnes comprising of 15.22 lakh tonnes under TPDS and 13.18 lakh tonnes under other schemes.

Stocks: Stocks of foodgrains (rice and wheat) held by FCI as on January 1, 2013 were 66.60 million tonnes, which is higher by 20.24 per cent over the level of 55.39 million tonnes as on January 1, 2012.

TABLE 2—OFF-TAKE AND STOCKS OF FOODGRAINS (MILLION TONNES)

	Off-take			Stocks	
	2010-11	2011-12(P)	2012-13(P) up to Nov. 2012)	Jan. 1, 2012	Jan. 1, 2013
Rice	29.93	32.12	21.15	29.72	32.22
Wheat	23.07	24.26	19.67	25.67	34.38
Total	**53.00**	**56.38**	**40.82**	**55.39**	**66.60**

P=Provisional

Growth of Economy

As per the latest estimates of the Central Statistics Office (CSO), the growth in real Gross Domestic Product (GDP) is placed at 5.3 per cent in the second quarter of 2012-13 with agriculture, industry and services registering growth rates of 1.2 per cent, 2.8 per cent and 7.2 per cent respectively. As per the Revised Estimates (RE), the, growth in GDP at factor cost at constant (2004-05) prices was estimated at 6.5 per cent in 2011-12 as compared to 8.4 per-cent in 2010-11 (Quick Estimate). At disaggregated level, this (RE 2011-12) comprises growth of 2.8 per cent in agriculture and allied activities, 3.4 per cent in industry and 8.9 per cent in services as compared to a growth of 7.0 per cent, 7.2 per cent and 9.3 per cent respectively during 2010-11.

TABLE 3— GROWTH OF GDP AT FACTOR COST BY ECONOMIC ACTIVITY (at 2004-05 Prices)

Industry	Growth			Percentage Share in GDP		
	2009-10	2010-11 QE	2011-12 RE	2009-10	2010-11 QE	2011-12 RE
1. Agriculture, forestry and fishing	0.1	7.0	2.8	14.7	14.5	14.0
2. Industry	**8.4**	**7.2**	**3.4**	**28.1**	**27.8**	**27.0**
a. Mining and quarrying	6.3	5.0	–0.9	2.3	2.2	2.1
b. Manufacturing	9.7	7.6	2.5	16.0	15.8	15.3
c. Electricity, gas and water supply	6.3	3.0	7.9	2.0	1.9	1.9
d. Construction	7.0	8.0	5.3	7.9	7.9	7.8
3. Services	**10.5**	**9.3**	**8.9**	**57.2**	**57.7**	**59.0**
a. Trade, hotels, transport and communication	10.3	11.1	9.9	26.6	27.2	28.1
b. Financing, insurance, real estate and business services	9.4	10.4	9.6	17.1	17.4	17.9
c. Community, social and personal services	12.0	4.5	5.8	13.5	13.1	13.0
4. GDP at factor cost	**8.4**	**8.4**	**6.5**	**100.0**	**100.0**	**100.0**

(QE): Quick Estimates; (RE): Revised Estimates

TABLE 4—QUARTERLY ESTIMATE OF GDP (Year-on-year in per cent)

Industry	2010-11				2011-12				2012-13	
	Ql	Q2	Q3	Q4	Ql	Q2	Q3	Q4	Ql	Q2
1. Agriculture, forestry & fishing	**3.1**	**4.9**	**11.0**	**7.5**	**3.7**	**3.1**	**2.8**	**1.7**	**2.9**	**1.2**
Industry	**8.3**	**5.7**	**7.6**	**7.0**	**5.6**	**3.7**	**2.5**	**1.9**	**3.6**	**2.8**
2. Mining & quarrying	6.9	7.3	6.1	0.6	–0.2	–5.4	–2.8	4.3	0.1	1.9
3. Manufacturing	9.1	6.1	7.8	7.3	7.3	2.9	0.6	-0.3	0.2	0.8
4. Electricity, gas & water supply	2.9	0.3	3.8	5.1	8.0	9.8	9.0	4.9	6.3	3.4
5. Construction	8.4	6.0	8.7	8.9	3.5	6.3	6.6	4.8	10.9	6.7
Services	**10.0**	**9.1**	**7.7**	**10.6**	**10.2**	**8.8**	**8.9**	**7.9**	**6.9**	**7.2**
6. Trade, hotels, transport & communication	12.6	10.6	9.7	11.6	13.8	9.5	10.0	7.0	4.0	5.5
7. Financing, insurance, real estate & Bus Services	10.0	10.4	11.2	10.0	9.4	9.9	9.1	10.0	10.8	9.4
8. Community, social & personal services	4.4	4.5	–0.8	9.5	3.2	6.1	6.4	7.1	7.9	7.5
9. GDP at factor cost (total I to 8)	**8.5**	**7.6**	**8.2**	**9.2**	**8.0**	**6.7**	**6.11**	**5.3**	**5.5**	**5.3**

Source: CSO

Profitability in Wheat Cultivation of Marginal and Small Farmers of Plain and Hill Regions of Uttarakhand

Rojani Mishra[1], A.N.Shukla[2], S.K. Srivastava[3] & S. P. Singh[4]

I

Introduction

Advent of new farm technology in the country in mid 1960s which includes use of modern inputs such as high yielding and short duration varieties of crops, chemical fertilizers, insecticides, pesticides and increased use of irrigation water and farm mechanization resulted in considerable increase in agricultural production and income of the farmers. However, the adoption of new farm technology has not been uniform in different parts of the country due to various socio-economic reasons. Hilly region of Uttarakhand also lagged behind in the process of adoption of new farm technology for the want of region specific technology, inadequate inputs, supply market and transport infrastructure, inadequate agricultural extension services, poor economic conditions and low risk bearing ability of the farmers and above all a very small size of the holding.

During 2010-11, wheat was grown on 379196 hectares in Uttarakhand with average productivity of 2316 kg/ha (Indian Economic Survey, 2010-11)[1]. High cost of production is considered to be one of the most important constraints in the adoption of new farm technology in the hilly area of the state. It also influences the profitability of the crops. The empirical knowledge about the cost of production and its analysis is, therefore, essential for the development of policies and strategies to overcome the problem of poor adoption and profitability of crops. Further, it is also needed in fixing remunerative prices of the crops through the mechanism of Minimum Support Price (MSP)/ Procurement Price and Statutory Minimum Price (SMP).

According to Harrison (1973)[2] in general small farms adopted the new varieties rapidly and used complementary inputs as intensively as larger farmers. Similarly, Yadav and Gangwar (1986)[3] compared the size and distribution of farm income of farmers cultivating traditional and new rice varieties and measured the impact of new rice technology on farm income distribution. They found that although gains from new technology were equally distributed among all income groups of farmers, inequalities in income distribution were lower for local rice than HYV growers. Nagraj *et. al.* (1997)[4] worked out location-wise and size- group-wise economics of rice production in Karnataka. The result indicated that larger units of human labour and machine labours were used in the middle size-group of the farms. Further, the functional analysis revealed that land and plant protection chemicals and human labour were major factors influencing the gross returns in paddy cultivation.

II

METHODOLOGY

The study was based on primary data collected from total 249 farmers from the districts of hills (Almora and Tehri Garhwal) and plains (US Nagar and Haridwar) representing both kumaon and Gahrwal divisions of Uttarakhand for the year 2011-12. Stratified random sampling technique was used. Two blocks from each district were selected randomly. In next stage 3 villages from each selected block of plain districts were selected randomly. Then 10 per cent farmers were selected on the basis of probability proportional to their size classified as small (0-1 ha), medium (1-2 ha) and large (<. 2 ha) However, in case of hill districts, one village from each category i.e. high hills (>1600 m amsl), mid hills (1000-1600m amsl) and low hills (<1000 m amsl) was selected randomly from each block. Then, 10 farmers were selected randomly from each village representing each category of size. In hill districts, there is a presence of marginal farmers only. Thus, 129 farmers from plain area and 120 farmers from hill area of the state were selected making the total sample size of 249 farmers.

In order to study the profitability aspect of farmers, cost of cultivation and cost of production had been calculated using CACP (Commission on Agricultural Costs and Prices) concepts. The calculation of cost of production had been done using the cost concepts Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2, Cost C_2^* and Cost D as defined by the **Commission on Agricultural Costs and Prices (CACP)**[5].

The inputs/services used in the production and the output have been valued on their actual prices paid/received by the farmers. The apportionment of the cost between main

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product and by-product has been done in proportion to the returns obtained therefrom. Gross returns included total value of main product and total value of by-product of the crop. The net returns on per acre basis all the expenses were deducted from gross returns.

Cost A_1: All actual expenses in cash and kind incurred in production by the producer. The items covered in Cost A_1 are the expenditure incurred on,

1. Hired human labour.
2. Hired bullock labour.
3. Owned bullock labour.
4. Hired machine power
5. Home produced/purchased seed.
6. Plant protection chemicals
7. Home produced/purchased manure.
8. Fertilizer
9. Irrigation.
10. Depreciation on farm machinery, equipments and building.
11. Land revenue, land development tax and other taxes.
12. Interest on working capital
13. Miscellaneous expenses.

Cost A_2: Cost A_1 + rent paid for leased-in land.

Cost B_1: Cost A_1 + interest on the value of owned capital assets (excluding land).

Cost B_2: Cost B_1 + rental value of owned land (Net of land revenue) and rent paid for leased-in land.

Cost C_1: Cost B_1 + Imputed value of family labour.

Cost C_2: Cost B_2 + Imputed value of family labour.

Cost C_2 * : Cost C_2 estimated by taking into account statutory minimum wage rate or actual wage rate, whichever is higher.

Cost D: Cost C_2* + 10 per cent of Cost C_2 * (on account of managerial functions performed by farmer).

Total Cost of Production

It includes operational costs, material costs and other costs in crop production. In operational costs, the cost of hiring human labour, machine power, bullock charges have been estimated by prevailing rate at a particular period of time in the study area. Hired labour charge a actual wage paid in cash and kind of payments was also converted into monetary terms at the prevailing price. Imputed value of family labour was also calculated using prevailing wage rate in the study area. In case of bullock , tractor and other machinery and hiring charges were applied to all this cost who don't own these and cost of fuel, repairing and maintenance cost were calculated.

In case of material costs, cost of seeds, manure, chemicals, fertilizers, irrigation charges were calculated at prevailing price at the time of application on per hectare basis for altitude-wise and different categories of farmers. Other cost includes land revenue, interests on fixed assets, interest on working capital, depreciation and rental value of land. Simple interest was calculated on working capital at a flat rate of 7.5 per cent per annum as it prevailed at the time of investigation. Rental value of land prevailed in the study area during study period was taken.

III

RESULT AND DISCUSSION

Profitability means ability to make net returns over all type of costs. The relative profitability of an enterprise, among the farmers guides the farmers to decide about its level and also affects its sustainability. Wheat was the main food crop in the study area. Generally, wheat was cultivated under irrigated and rainfed conditions in the study area. It was found that farmers in hills of Uttrakhand are largely dominated as marginal farmers. Due to unavailability of irrigation system in high-hill wheat was found cultivated in valley and mid-hill areas of Uttarakhand while in case of unirrigated condition it was found cultivated in all altitudes (valley, mid-hill and high-hill). It was revealed from table 1 (a) that operational cost was higher on farms of marginal farmers of mid-hill and valley for iriigated and rainfed conditions, respectively. On an average the farmers of the area had to spend Rs. 17622.81 and Rs. 15416.67 for cultivating wheat crop per hectare of land in irrigated and unirrigated conditions, respectively. A lion share of total operational cost was found to be incurred on human labour in both conditions of wheat cultivation at all altitudes of hill region.

Seeds, manure and fertilizers are major constituents of material cost except absence of fertilizer use in rainfed conditions especially in mid-hills and high-hills. In fact farmers in hill region did not use any plant protection chemical in crop. The overall average material cost was Rs 4238.60 and Rs 5633.57 in irrigated and rainfed condition of wheat cultivation, respectively in hill region. It was observed that marginal farmers of different altitude had given importance to fertilizer and manures, because on an average wheat cultivated in irrigated and unirrigated condition had spend about 15 per cent and 20 per cent of total cost (Cost D). It was found that per hectare expenditure on material costs were varied according to the farms situated in different altitudes in the study area. Further, it was found that the rental value of land was 13-14 per cent of the total cost (Cost D). Similarly, total

other costs ranged from 16 to 17 per cent of the total cost (Cost D).

It was noticed in table 1 (b) that the marginal farmers of mid-hill (irrigated condition) and high-hill (rainfed condition) cultivating wheat had highest cost A1 in the study area. Cost A1 was also observed to increase with increase in altitude of region. Cost B1 and Cost B2 also showed the increasing trend, in other word positive relationship was observed between magnitudes of per hectare cost and altitude-wise farms. As far as Cost C1 and Cost C2 were concerned, it was found that in terms of per hectare these two costs were sharing a larger proportion to the total cost (Cost D).

The table 1(c) revealed that per hectare productivity of wheat crop in both the condition of irrigated and rainfed was about 18 quintals and 16 quintals, respectively in the farms of valley area of hilly region. Table further reveals that per hectare gross returns for wheat crop in valley was highest followed by mid-hill and high-hill in both the conditions. Considering per quintal cost of production of wheat crop it was found that the marginal farmers were found spending relatively large amount of money for producing one quintal of wheat in unirrigated or rainfed condition. Similarly, as the altitude increases, cost of production of one quintal wheat also increases which showed that cost of producing wheat is costly in high-hills.

However, considering per quintal cost of production of wheat in hill then the marginal farmers of mid-hill (irrigated wheat) and high-hill (unirrigated) were spending relatively large amount of money for producing one quintal of wheat than farmers of valley area. It was further revealed that farmers cultivating wheat under irrigated area on an average were spending Rs. 1741.05 (at Cost D) for producing one quintal of wheat and getting Rs. 1402.01 for main produce. It implies that farmers were getting the benefit of Rs. 339.04 per quintal of main produce of wheat crop under irrigated condition in the hill area. Similarly, wheat cultivation under rainfed area on an average were spending Rs. 2000.03 (at Cost D) for producing one quintal of wheat and getting Rs. 1426.44 for main produce. This implies that farmers were getting the benefit of Rs. 573.59 per quintal of main produce of wheat crop under rainfed condition in the hill area of Uttarakhand. Thus it can be concluded that cultivation of wheat is more profitable under rainfed condition in hilly area of Uttarakhand.

In plain areas of Uttarakhand, wheat is cultivated as rabi crop followed by paddy and sugarcane crops. Table 2 (a) depicts the cost of cultivation of wheat in the study area. The overall average expenditure worked out for human labour was Rs 2352.51 and Rs 1613.78 for owned and hired, respectively. If total expenditure on human labour of different categories of farmers is compared, then it had been found that small farmers used less hired labour than medium and large farmers. It can be seen that as the farm size increase expenditure on owned labour decrease. However, increase in farm size lead to increase in number of hired labours.

It was further observed from the table that among the material costs expenditure on manure shared lowest amount, on overall basis, which was only 0.85 per cent of the total cost (Cost D) in wheat cultivation. The farmers of the study area had made very less expenditure on irrigation. It was estimated that on an average 34.92 per cent of total cost (Cost D) was shared by rental value of land. However, total of other costs ranged from 50 per cent on large farm to 53 per cent on medium farms.

Cost A1 which is also called as out of pocket expenses (cash expenses) was found to be Rs 17936.85 for overall size group of farms Table 2 (b). Cost A1, Cost A2, Cost B1, Cost B2, Cost C1 and Cost C2 were highest for the medium farm size in plains of Uttarakhand. Per hectare cost D is the total cost of cultivation of wheat crop which includes the managerial cost of farmers also. Medium farmers of plain were found to spend highest on wheat cultivation (Rs. 45272.19) compared to small farmers (Rs. 43209.69) and large farmers (Rs 40956.85). The average cost of cultivating on one hectare of wheat was Rs. 42960.61 on overall basis.

The table 2 (c) shows the cost of production and returns from wheat crop of different farm size in plain areas of Uttarakhand. The table reveals that per hectare productivity of wheat was marginally higher (6 quintals) on large farms compared to small farms. However, considering per quintal cost of production of wheat in plain then the small farmers were spending relatively large amount of money for producing one quintal of wheat than other categories of farmers. It was further revealed that wheat cultivation was beneficial for farmers of plain area, because on an average the farmers of the area were spending Rs. 863.09 (at Cost D) for producing one quintal of wheat and getting Rs. 1265.79 for main produce. It implies that farmers were getting the benefit of Rs. 402.70 per quintal of main produce of wheat crop in the plain area of Uttarakhand.

Thus it can be concluded that although the cost of cultivation and cost of production was lowest in large farms, they were getting higher returns compared to other categories of farmers in the plain area. In case of small farm, they had less cost of cultivation accompanied by more cost of production with lowest returns and in medium farm, they had largest cost of cultivation but low cost of production with high returns.

IV

SUMMARY AND CONCLUSION

The study revealed that the major source of earning of farmer in the study area was agriculture. Generally, wheat was found cultivated in both irrigated and rainfed conditions. Wheat cultivated under rainfed condition was seen almost in all altitude from valley to high-hills whereas under irrigated condition mainly in valley and in some part of mid-hills. In case of plains of Uttarakhand, wheat is mainly grown under irrigated condition.

The cost of cultivation (Rs/ha) of wheat under irrigated condition was more than that under rainfed condition, whereas the cost of production of wheat under irrigated condition was less than that under rainfed condition in hills of Uttarakhand. On an average farmers of hill area had to spend Rs. 1741.05 and Rs 2000.03 for producing one quintal of wheat under irrigated and rainfed conditions, respectively which were more than the average price received by the farmers. Thus, it can be concluded that cultivating wheat under both conditions were not profitable for the farmers of hilly area across the altitude-wise farm size.

Similarly, the cost of cultivation (Rs/ha) of wheat on medium size farm was highest, whereas, cost of production was highest for small farm size in plain area. On an average farmer of plain had to spend Rs. 863.09 for producing one quintal of wheat which was less than the average price received by the farmers of plain. This can be concluded that cultivating wheat in plain area was profitable for the farmers of plain area across the different farm size groups.

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TABLE 1 (a)—COST OF CULTIVATION OF WHEAT CROP ON MARGINAL FARMERS OF HILLS OF UTTARAKHAND

(Rs./HA)

Particulars	Wheat (Irrigated)			Wheat (Unirrigated)			
	Valley	Mid-hill	Overall	Valley	Mid-hill	High-hill	Overall
A Operational Cost							
1. Human labour							
i. Owned	12673.27 (44.24)	12771.08 (42.29)	12701.75 (43.50)	12517.24 (43.62)	10535.71 (41.91)	11184.55 (34.12)	11262.40 (39.67)
ii. Hired	0.00	0.00	0.00	0.00	0.00	0.00	0.00..
2. Bullock labour	4764.85 (16.63)	5301.20 (17.56)	4921.05 (16.85)	4867.82 (16.97)	3562.50 (14.17)	4371.73 (13.34)	4154.26 (14.63)
3. Machine hours	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub Total	**17438.12 (60.88)**	**18072.29 (59.85)**	**17622.81 (60.35)**	**17385.06 (60.59)**	**14098.21 (56.08)**	**15556.28 (47.46)**	**15416.67 (54.30)**
B Material Cost							
1. Seed	1739.36 (6.07)	1881.93 (6.23)	1780.88 (6.10)	1660.92 (5.79)	1576.61 (6.27)	1485.86 (4.53)	1572.48 (5.54)
2. Manure	1637.38 (5.72)	1903.61 (6.30)	1714.91 (5.87)	2156.61 (7.52)	2567.14 (10.21)	7876.96 (24.03)	4028.76 (14.19)

TABLE 1 (a)—COST OF CULTIVATION OF WHEAT CROP ON MARGINAL FARMERS OF HILLS OF UTTARAKHAND—*Contd.*

(Rs./HA)

Particulars	Wheat (Irrigated)			Wheat (Unirrigated)			
	Valley	Mid-hill	Overall	Valley	Mid-hill	High-hill	Overall
3. Fertilizer	720.79 (2.52)	796.39 (2.64)	742.81 (2.54)	119.83 (0.42)	0.00	0.00	32.33 (0.11)
4. Plant protections & chemicals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5. Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub total	**4097.52 (14.30)**	**4581.93 (15.17)**	**4238.60 (14.52)**	**3937.36 (13.72)**	**4143.75 (16.48)**	**9362.83 (28.56)**	**5633.57 (19.84)**
C Other Costs							
1. Interest on working capital	166.17 (0.58)	185.31 (0.61)	171.74 (0.59)	165.10 (0.58)	144.49 (0.57)	257.52 (0.79)	183.52 (0.65)
2. Depreciation	208.00 (0.73)	354.00 (1.17)	302.00 (1.03)	357.00 (1.24)	294.00 (1.17)	407.00 (1.24)	368.00 (1.30)
3. Land Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Rental value of land	4000.00 (13.96)	4000.00 (13.25)	4000.00 (13.70)	4000.00 (13.94)	4000.00 (15.91)	4000.00 (12.20)	4000.00 (14.09)
5. Interest on Owned Fixed Capital Asset	131.00 (0.46)	257.00 (0.85)	211.00 (0.72)	240.00 (0.84)	175.00 (0.70)	216.00 (0.66)	209.00 (0.74)
Sub-total	**4505.17 (15.73)**	**4796.31 (15.88)**	**4684.74 (16.04)**	**4762.10 (16.60)**	**4613.49 (18.35)**	**4880.52 (14.89)**	**4760.52 (16.77)**

Note : Figure in parentheses indicates percentage of total cost (Cost D)

TABLE 1 (b)—COST CONCEPT WISE COST OF CULTIVATION OF WHEAT CROP IN HILLS OF UTTARAKHAND

S. No. Cost of Cultivation	Wheat (Irrigated)			Wheat (Unirrigated)			
	Valley	Mid-hill	Overall	Valley	Mid-hill	High-hill	Overall
a. Cost A l	9236.55 (32.24)	10422.44 (34.52)	9633.39 (32.99)	9327.27 (32.51)	8144.74 (32.40)	14399.08 (43.93)	10339.35 (36.42)
b. Cost A 2	9236.55 (32.24)	10422.44 (34.52)	9633.39 (32.99)	9327.27 (32.51)	8144.74 (32.40)	14399.08 (43.93)	10339.35 (36.42)
c. Cost B l	9367.55 (32.70)	10679.44 (35.37)	9844.39 (33.71)	9567.27 (33.34)	8319.74 (33.09)	14615.08 (44.59)	10548.35 (37.15)
d. Cost B 2	13367.55 (46.67)	14679.44 (48.61)	13844.39 (47.41)	13567.27 (47.28)	12319.74 (49.00)	18615.08 (56.79)	14548.35 (51.24)
e. Cost C l	22040.81 (76.94)	23450.53 (77.66)	22546.15 (77.21)	22084.51 (76.97)	18855.46 (75.00)	25799.63 (78.71)	21810.75 (76.82)
f. Cost C 2	26040.81 (90.91)	27450.53 (90.91)	26546.15 (90.91)	26084.51 (90.91)	22855.46 (90.91)	29799.63 (90.91)	25810.75 (90.91)
g. Cost C 2*	26040.81 (90.91)	27450.53 (90.91)	26546.15 (90.91)	26084.51 (90.91)	22855.46 (90.91)	29799.63 (90.91)	25810.75 (90.91)
h. Cost D	28644.89 (100.00)	30195.58 (100.00)	29200.76 (100.00)	28692.96 (100.00)	25141.00 (100.00)	32779.60 (100.00)	28391.83 (100.00)

Note: Figure in parentheses indicates percentage of total cost (Cost D).

TABLE 1 (C): COST OF PRODUCTION AND RETURNS FROM WHEAT CROP IN HILLS OF UTTARAKHAND

S. No.	Particulars	Wheat (Irrigated) Valley	Mid-hill	Overall	Wheat (Unirrigated) Valley	Mid-hill	High-hill	Overall
1	Yield of main product (Q/ha)	17.85	14.16	16.77	15.99	13.52	13.55	14.19
2	Yield of by product (Q/ha)	19.37	15.60	18.27	17.67	14.49	13.12	14.94
3	Selling price of main product (Rs/Q)	1392.59	1430.89	1402.01	1420.75	1433.64	1422.02	1426.44
4.	Selling price of by-product (Rs/qt)	209.75	213.44	210.67	211.05	209.68	235.10	216.72
Gross Returns (Rs/ha)		**28915.59**	**23586.75**	**27363.68**	**26449.57**	**22418.13**	**22347.71**	**23484.83**
Net Returns (Rs/ha) at								
a.	Cost Al	19679.05	13164.31	17730.29	17122.30	14273.38	7948.63	13145.47
b.	Cost A2	19679.05	13164.31	17730.29	17122.30	14273.38	7948.63	13145.47
c.	Cost Bl	19548.05	12907.31	17519.29	16882.30	14098.38	7732.63	12936.47
d.	Cost B2	15548.05	8907.31	13519.29	12882.30	10098.38	3732.63	8936.47
e.	Cost C1	6874.78	136.22	4817.54	4365.06	3562.67	–3451.92	1674.07
f.	Cost C2	2874.78	–3863.78	817.54	365.06	–437.33	–7451.92	–2325.93
g.	Cost C2*	2874.78	–3863.78	817.54	365.06	–437.33	–7451.92	–2325.93
h.	Cost D	270.70	–6608.83	–1837.08	–2243.39	–2722.88	–10431.89	–4907.00
Cost of Production at Cost D (Rs/qt)		**1605.07**	**2132.96**	**1741.05**	**1794.28**	**1859.84**	**2419.67**	**2000.30**

TABLE 2 (a)—COST OF CULTIVATION OF WHEAT CROP ON PLAINS OF UTTARAKHAND

(Rs/ha)

S. No.	Particulars	Size of Farm Small	Medium	Large	Overall
A	**Operational Cost**				
1.	Human labour				
i.	Owned	2697.95 (6.24)	2129.55 (4.70)	1913.98 (4.67)	2352.51 (5.48)
ii.	Hired	988.17 (2.29)	2273.64 (5.02)	2550.00 (6.23)	1613.78 (3.76)
2	Bullock labour	0.00	0.00	0.00	0.00
3.	Machine hours	6256.42 (14.48)	5395.57 {11.92}	4775.03 {11.66}	5745.34 {13.37}
	Sub Total	**9942.53 (23.01)**	**9798.75 (21.64)**	**9239.01 (22.56)**	**9711.62 (22.61)**

TABLE 2 (a)—COST OF CULTIVATION OF WHEAT CROP ON PLAINS OF UTTARAKHAND—*Contd.*

(Rs/ha)

S. No.	Particulars	Size of Farm			
		Small	Medium	Large	Overall
B	**Material Cost**				
1.	Seed	1978.94 (4.58)	1688.27 (3.73)	2436.27 (5.95)	2008.94 (4.68)
2.	Manure	378.27 (0.88)	427.27 (0.94)	266.45 (0.65)	365.87 (0.85)
3.	Fertilizer	3556.94 (8.23)	3869.55 (8.55)	3195.15 (7.80)	3552.19 (8.27)
4.	Plant protections & chemicals	761.21 (1.76)	556.82 {1.23}	1242.80 (3.03)	816.15 (1.90)
5.	Irrigation	843.83 (1.95)	737.59 {1.63}	412.85 (1.01)	728.26 {1.70}
	Sub-total	**7519.18 (17.40)**	**7279.50 (16.08)**	**7553.51 (18.44)**	**7471.40 (17.39)**
C	**Other Costs**				
1.	Interest on working capital	276.82 (0.64)	280.29 (0.62)	278.97 (0.68)	. 278.07 (0.65)
2.	Depreciation	2862.00 (6.62)	3640.00 (8.04)	2184.00 {5.33}	2812.00 (6.55)
3.	Land Revenue	16.26 (0.04)	16.26 (0.04)	16.26 (0.04)	16.26 (0.04)
4.	Rental value of land	15000.00 (34.71)	15000.00 (33.13)	15000.00 (36.62)	15000.00 (34.92)
5.	Interest on Owned Fixed Capital Asset	3681.00 (8.52)	5158.00 (11.39)	2978.00 (7.27)	3782.00 (8.80)
	Sub-total	**21836.08 (50. 54)**	**24094.55 (53.22)**	**20457.23 (49.95)**	**21888.33 (50.95)**

Note: Figure in parentheses indicates percentage of total cost (Cost D)

TABLE 2 (b)—COST CONCEPT WISE COST OF CUTLIVATION OF WHEAT CROP IN PLAINS OF UTTARAKHAND

(Rs/ha)

S. No.	Cost of Cultivation	Size of Farm			
		Small	Medium	Large	Overall
a.	Cost A1	17918.85 (41.47)	18885.25 (41.71)	17357.78 (42.38)	17936.85 (41.75)
b.	Cost A2	17918.85 (41.47)	18885.25 (41.71)	17357.78 (42.38)	17936.85 (41.75)
c.	Cost Bl	21599.85 (49.99)	24043.25 (53.11)	20335.78 (49.65)	21718.85 (50.56)

TABLE 2 (b)—Cost Concept Wise Cost of Cultivation of Wheat Crop in Plains of Uttarakhand—*Contd.*

(Rs/ha)

S. No.	Cost of Cultivation	Size of Farm			
		Small	Medium	Large	Overall
d.	Cost B2	36583.59	39026.99	35319.52	36702.59
		(84.67)	(86.11)	(86.24)	(85.43)
e.	Cost C1	24297.80	26172.80	22249.76	24071.36
		(56.23)	(57.81)	(54.32)	(56.03)
f.	Cost C2	39281.54	41156.54	37233.50	39055.10
		(90.91)	(90.91)	(90.91)	(90.91)
g.	Cost C2*	39281.54	41156.54	37233.50	39055.10
		(90.91)	(90.91)	(90.91)	(90.91)
h.	Cost D	43209.69	45272.19	40956.85	42960.61
		(100.00)	(100.00)	(100.00)	(100.00)

Note: Figure in parentheses indicates percentage of total cost (Cost D)

TABLE 2 (c)—Cost of Production and Returns from Wheat Crop in Plains of Uttarakhand—*Contd.*

(Rs/ha)

S. No	Particulars	Size of Farm			
		Small	Medium	Large	Overall
1	Yield of main product (Q/ha)	47.91	50.50	53.91	49.78
2	Yield of by product (Q/ha)	46.05	50.32	53.98	48.71
3	Selling price of main product (Rs/Q)	1260.44	1271.14	1272.93	1265.79
4	Unit cost of main product, cost D(Rs/Q)	218.41	209.15	215.71	215.58
Gross Returns (Rs/ha)		**70347.67**	**74610.45**	**80201.27**	**73411.14**
Net Returns (Rs/ha) at					
a.	Cost Al	52428.81	55725.20	62843.50	55474.29
b.	Cost A2	52428.81	55725.20	62843.50	55474.29
c.	Cost B1	48747.81	50567.20	59865.50	51692.29
d.	Cost B2	33764.07	35583.46	44881.76	36708.55
e.	Cost Cl	46049.87	48437.66	57951.52	49339.78
f.	Cost C2	31066.13	33453.92	42967.78	34356.04
g.	Cost C2*	31066.13	33453.92	42967.78	34356.04
h.	Cost D	27137.97	29338.26	39244.43	30450.53
Cost of Production at Cost. D (Rs/qt)		**901.82**	**896.48**	**759.78**	**863.09**

Patterns of Modern Rice Varieties Adoption and Constraints in their Diffusion: a Micro Economic Evidence from Eastern Uttar Pradesh

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Abstract:

Based on the farm surveys socioeconomic data of 200 households, the factors that conditioned the adoption and spread of modern varieties (MV) in rainfed areas of Eastern Uttar Pradesh are analyzed in this paper. An analysis of landholding and land-use characteristics of the households was done to establish the existing differences in resource endowment and rice production systems. Examination of adoption behavior explores by using Probit and Tobit model estimate across farm size groups to determine differential factors influencing adoption of modern variety (MV). Despite the high adoption rates for MVs, yields are still low and it was only 2.84 t/ha, which is far below the yield that can potentially be realized, pointing the problem to crop management practices in the area. MV yields are however consistently 50 percent higher than those for TVs across all farm sizes but the average yield of large farmers for both MV and TV and for all land types were found to be higher, indicating that large farmers have better land quality and/or higher input use, if not only better crop management practices. A research approach that moves from the usual adoption study should thus be pursued to identify the nature and cause of low productivity in the area.

Recently-released MVs are finding their way to farmers' fields. Mahsuri and mahsuri-type varieties emerged as the most popularly adopted of modern rice varieties. Analysis showed it to be relatively more profitable compared to other MV varieties, proving that breeding for quality makes a difference by as much as 23 percent gain in returns arising mainly from the price advantage of Mahsuri. With this development, it would be worthwhile to look into the extension mechanisms used in promoting the adoption of Mahsuri.

Keywords: *Adoption, Stress-prone, Mahsuri-type, Endowment, Modern Varieties*

1. Introduction:

Rice is one of the more important crops in Uttar Pradesh and the eastern part of the state (EUP) comprises 60% of the state's rice area. Sharing 40 percent of the already populous 166 million people of the state, EUP has a high incidence of poverty, with 57 percent of the population living below the poverty line (NIRD,1999). Improving productivity of rice in eastern Uttar Pradesh is thus deemed crucial not only in addressing food security for the growing population but also in helping alleviate poverty for 85 percent of the EUP population living in rural areas.

Over the years, the expansion of irrigation has led to the growth of productivity in the region (Sisodia et.al, 2001). The increase in irrigated area was accompanied by the expansion of area under high-yielding varieties and an increase in the use of fertilizers. High-yielding varieties of rice spread even in areas that are rainfed. During 1970-2000, rice productivity increased at the rate of 4.31% per annum. This yield was achieved simultaneously with increased stability of production (Appendix 1).

Despite this general trend, there is considerable spatial variation in the extent of adoption of modern varieties. Even where MVs are widespread, the average yield has remained much lower than what is achievable. Hence, it is important to identify the factors that still constrain the spread of modern varieties in some locations and why the average yield has continued to remain low. The objective of the paper is to explore answers to these two questions through analysis of farm-level data in the district Basti in Eastern Uttar Pradesh.

The study area, Basti district, is located in the North Eastern Plain zone. Soils of this zone are mainly of alluvial nature. The average annual rainfall of this zone is 1470 mm, with rainfall decreasing along the western direction. Southern parts of Basti and other districts of Bahraich and Gonda suffer from floods originating from Ghaghra and Rapti rivers. Vast areas remain inundated for considerable periods.

It would be much notable from the appendix 2 that as Basti is among the least irrigated and relatively the lesser HYV adopter of the districts in EUP, it also reports one of the lower rice yields (2.66 t/ha). Basti is thus evidence of a fragile rice ecosystem in eastern India where efforts at promoting the adoption of modern rice varieties do not yield expected desirable results. The adoption of technology of MVs does seem to be the straightforward

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solution to boosting rice productivity and supply in EUP but much has yet to be understood as to how farmers make their technology adoption decisions. A closer examination of the adoption behavior of rice farmers in the light of varied physical environments and nature of farming system would shed more light into what possible interventions can elicit farmer responses that lead to productivity goals.

2. Research design and data source:

The study utilizes farm-level data generated from a survey conducted in 2006-07 in four villages of Basti[1]. Two of the selected villages, Mundadeehabeg and Rasulpur, have a higher proportion of irrigated land than the other two, Saithwalia and Sisai. The first group of villages also has more lowlands relative to the second group of villages.

Two hundred respondent farmers, 50 farmers from each village, were selected using stratified random sampling. Information on rice production practices and other farm household activities were gathered through interview method using a pre-tested questionnaire.

Comparative analyses of landholding and land-use characteristics of the respondent households were done to establish the existing differences in resource endowment and production systems. Among the characteristics examined was the distribution of landholdings into three topographical types: upland, medium land and lowland. Major crops grown during kharif and rabi seasons were also identified.

An examination of adoption behavior across farm size groups was also done to determine differential preferences for certain varietal traits, given the endowment condition faced by the farmer. MV and TV adoption trends were compared while also taking into account the duration period characteristics of the adopted varieties. A very helpful tool in the analysis was the matrix of modern rice varieties in Eastern Uttar Pradesh (Sharma, S.D. and U. Prasada Rao [eds.], 2004).

The average farm level rice yield, input use and income performance were also computed in studying the crop management practices of the three farm size groups and whether such practices were making a difference in productivity and profitability.

Determinants of adoption of modern varieties were identified through the probit model (Greene, 2000). The dependent variable in the probit model is the dichotomous adoption variable that takes value 1 for MV adopters and 0 for non-adopters at the plot level. The factors determining the decision to adopt modern varieties were identified using plot-level data. Regressors used for estimation were various household and plot characteristics. From the probit coefficients, marginal probabilities of adoption associated with various regressor variables were calculated. Parallel to this analysis tobit model was use to which estimated the effects of household and farm characteristics on the area allotted for MV adoption using farm-level data. Regression results were decomposed (Mcdonald and Moffit, 1980; Greene 2000) for marginal effects of the variables on the rice area planted to MVs. The above econometric analyses were also used to ascertain the different factors influencing adoption of mahsuri-type rice varieties in study area.

The probit model was specified as

$$Y^* = X\beta + u \quad \text{(i)}$$
$$Y = \{1 \text{ if } Y^* > 0, 0 \text{ otherwise}$$

Where Y* is the unobserved underlying stimulus index of the adoption of MVs and Y is the $(n \times 1)$ observable dependent variable, which is equal to 1 if the plot is planted to MVs and the share of Mahsuri-type variety and 0 otherwise, β is the $(k \times 1)$ vector of unknown parameters, X is the $(n \times k)$ vector of exogenous or predetermined variables, and u is the residual where $u \sim N(0,\sigma^2)$.

The tobit model is defined as

$$Y = X\beta + u, \text{ if } \beta X + u > 0; \quad \text{(ii)}$$
$$= 0, \text{ otherwise}$$

Where Y is the (n x1) vector of the dependent variable, which is expressed as theShare of total rice area of a household under modern varieties and the share of mahsuri-type rice varieties in total rice area depending on the type of analysis, β is the (k x 1) Vector of unknown parameters, X is the (n x k) vector of exogenous and predetermined variables, and u is the residual where $u \sim N(0,\sigma^2)$.

3. Results and discussion

The surveyed sample consist of 150 respondents in small-sized farms (<1 ha), 35 respondents in medium-sized farms (1-2 ha) and 15 respondents in large-sized farms (>2 ha). Data collected from four different villages were pooled for analysis purposes. The distribution of respondents is presented along with various demographic characteristics in Table 1.

3.1 Characteristics of landholding:

Average farm size in the villages surveyed is 0.82 hectare (Table 2). On the average, a farm holds about 3 parcels of land, with an average size of 0.28 hectare per parcel. The number of parcels is positively correlated

1 The villages are now part of a newly-created district Sant Kabirnagar.

with the farm size, with small and large farmers having an average of 3 and 5 parcels, respectively.

Most of farmers in the sample have their landholdings distributed over lowlands, medium lands and uplands (Table 3). Upland and lowlands are almost equal in proportion and account for over 95% of the total land-holding. The area under medium land is negligible (3%). Small farmers have a higher proportion of uplands in their land endowment while large farmers have higher proportion of lowlands.

Rice is the major crop grown during kharif season, occupying about 89 percent of the total cropped area (Table 4). Sugarcane is the next important crop after rice but it is grown mainly by the medium and large farmers. Minor crops in kharif season are bajra, urd, pigeon pea, fodder and vegetables. To meet subsistence needs of the family, a substantial area of fallow is also kept by the farmers during the rainy season to facilitate early planting of pulses, oilseed, vegetables and potato in next season.

Wheat is a major crop in rabi season, planted in about 78% of the total cropped area (wheat and wheat+mustard). The other crops like pulses, oilseed, spices, vegetables and fodder for animal are planted on relatively very smaller area. This crop allocation pattern indicates that the selected site very much falls under intensive rice-wheat production system. Production of rice and wheat are the major economic activities of farm households.

3.2 Adoption Pattern of Modern Varieties:

Modern varieties of rice are generally widely adopted in the study villages. Modern varieties are grown by 88% of the farmers and the area under MV is 67% (Table 5). The percentage area under MVs is similar across farm size categories indicating that small farmers have adopted MVs as much as large farmers.

Most farmers (54%) grow both MVs and TVs. Only about 13% farmers grow TVs exclusively whereas 34% of the farmers grow only MVs. Thus, most farmers who have adopted MVs have not completely given up growing TVs. This "mixed" adoption of MVs is widely observed in the study villages, although the number of farmers switching over fully to MVs seems to have increased over time. It is interesting to note that the percentage of farmers fully switching over to MVs is higher for smaller farm-size groups than for the large farm size group. Similarly, the percentage of farmers continuing to grow TV only is higher among the small farmers. Thus, proportionately more small farmers have either switched over fully to MVs or have stayed with TVs relative to other farm size categories. Such a behavior could result from differences in land endowment and this is examined later in the paper.

Another important difference across farm size classes is about the proportionate share of varieties of different durations. The share of longer duration varieties increases with the increase in farm size (Figure 1). This pattern closely resembles the proportionate shares of upland and lowland across the farm size groups. The small farm size group which has a higher proportion of uplands also has a higher proportion of area under short duration varieties. Under rainfed conditions, short duration varieties tend to be better adapted to moisture deficient environments of upper fields. Hence, small farmers who have a proportionately higher share of uplands must have a preference for short duration varieties. The reverse holds for large farmers who have proportionately more lowland areas (Singh et al. 1995).

Farmers in the study area grow 18 different modern varieties and 22 traditional varieties (Table 6). Among the more popular modern varieties is the Mahsuri group (Samba Mahsuri, Mahsuri and Swarna/Sona Mahsuri) which account for almost half of the area under MVs. Other popular modern varieties are Pant 12, which is planted to 12% of the MV area, Kashi and Hybrid, which are each planted to 11% of the MV area. Among the traditional varieties planted, Chaini, a short duration semi-dwarf traditional variety, occupies the largest area (30%). Other popular TV varieties are Bengal Juhi (14%), Kuwari Mahsuri (9%), Bengalia (8%) and Lalmati (8%).

A list of major MVs and TVs grown and their maturity periods (days) are presented in Table 7. The Mahsuri varieties are of long duration (>135 days) which are grown mostly in lowlands. The more popular traditional varieties, Chaini and Bengalia are short duration varieties grown mostly in uplands. Chaini is small-grained, suited to poor quality upland soils and is grown mostly by small farmers who have a larger endowment of upland fields. Lalmati and Kuwari Mahsuri are medium duration (120-135 days) varieties while Bengal Juhi is a long duration variety. The aroma and eating quality of Bengal Juhi, Kalanamak and Lalmati command higher demand and prices for these varieties. These varieties are much valued for use during special occasions such as social and religious functions (Singh et. al. 2003 & Singh et al. 2007).

The list of the modern rice varieties, together with the year of release and committees that released them, parentages involved in the crosses, maturity days and recommended suitable area for cultivation are given in appendix 3[2]. The earliest released variety is Hybrid in 2004-05 and oldest released is Kashi (1960). Five varieties of the varieties in the list, two medium and three long duration and released during 70's, are still being grown by farmers in the study area. Varieties released during 1980-90 such as Samba Mahsuri and Swarna are widely adopted in lowland. Some short and medium duration rice varieties

[2] Sharma, S. D. and U. Prasada Rao (eds.), 2004

such as Pant 10, 12 NDR 359 and 97 released during 1992-94 are invariably grown by all size of farms. Thus while some older varieties have stayed on, many newly released varieties are making inroads into the study villages.

Mahsuri varieties can be grouped into two types: the tall Mahsuri developed in Malaysia and introduced in India during late 1960s, and the semi-dwarf Mahsuri (Swarna, Samba and Sona Mahsuri) bred subsequently. The tall Mahsuri is one of the parents of the semi-dwarf Mahsuri. The semi-dwarf sturdy nature of Swarna and Samba mahsuri varieties prevents lodging thereby resulting to higher yields. Moreover, unlike the tall Mahsuri, the semi-dwarf Mahsuri is highly responsive to fertilization (Hossain and Jaim 2012). Hence, these varieties are replacing the tall Mahsuri in eastern UP in recent years. Overall, the Mahsuri group of varieties is becoming increasingly popular, especially in irrigated areas or in shallow rainfed lowlands. Due to better grain quality, these varieties command a price premium in the market.

Table 8 shows the distribution of cultivated rice area under Mahsuri, other non-mahsuri MVs and TVs. Mahsuri varieties occupy 30% of the total rice area, about 45% of the total MV area. It is more popular among medium to large farms, which mostly farm lowland and medium land. These environments are suitable for Mahsuri production, given the moisture requirement of the variety.

3.3 Yield and Income Performance:

The average yield of MVs is approximately 1.00 t/ha higher than that of TVs. This is robust and applies irrespective of the farm size or the land type (Table 9). The increase in yield of 1.0 t/ha represents approximately 50% increase relative to TVs.

Although the difference in MV and TV yields seems invariant across the farm size category, the average yield is almost always higher for large farmers relative to small farmers for both categories of varieties. This implies that either the quality of land operated by larger farmers is better and/or they employ a better crop management system. Input use data indicate that large farmers do use more fertilizers than small farmers (Table 10). Large farmers tend to be more intensive on the use of fertilizer than on the use of labor in farming while the opposite holds true for small farmers. Table 11 shows that as the rainfed ecosystem limit large farmers' flexibility in preparing the land for planting, they use less plowing/puddling than smaller farmers in order to maximize rainwater for planting. Furthermore, small farms depend more on its own labor while large farms mainly depend on hired labor. Use of the combine machine for harvesting and threshing is most popular among large farmers, resulting to much lower manual labor expended for such activities by large farms. Labor use between MV and TV across farm sizes (Table 12) shows very little difference in labor use between farms planted to modern and traditional varieties. Large farms however use 10 days per hectare less for MVs than for TVs. But since land type is the only land quality indicator for which information was collected in this study, it is not possible to identify which of the above factors contributes to higher yields of large farmers.

The higher yield of MV is the main factor driving higher returns, even though the cost is also higher relative to that of TV (Table 13). While adopting MVs increases the gross returns by 57%, cash costs increase by only 32%. The estimated net return above cash costs of MV is almost twice that of TV. Thus the adoption of MV seems more profitable (Barah and Pandey 2005). This must be the main reason for a high adoption rate of 67% found in the study villages. Why then has not MV spread to the remaining 33% of the rice area? Possible reasons for this will be explored later in the section on adoption.

Within MVs, Mahsuri group of varieties are becoming more popular overtime than the non-Mahsuri group. The economics of these two groups of varieties was examined by comparing their returns (Table 14). Mahsuri varieties have about 5% higher yield relative to non-Mahsuri varieties, but their prices are 23% higher resulting in a 28% higher gross returns. Although the costs are also higher (by about 14%), the net returns are higher by almost 50% relative to those of the non-Mahsuri group of varieties.

3.4 Factors Determining Adoption of Modern Varieties :

Table 15 presents the results of the Probit model estimated using plot-level data. Results indicate that land quality variable is an important determinant of adoption whether or not a particular field will be planted to MVs. Land type and the availability of irrigation are the two land quality variables specified in the adoption model. Fields that are irrigated and that do not belong to upland land type are more likely to be planted to MV than rainfed areas and upland fields. The marginal probability of adoption is 11% higher in irrigated fields than in rainfed fields, other things remaining the same. The coefficient of the dummy variable for uplands is statistically significant at 1% level, indicating that modern varieties are mostly not planted in uplands. Plots located in uplands have 21 percent less probability of having MVs, compared to those located in other land types. Keeping the field characteristic constant, households with higher educational status are more likely to adopt MVs. However, the marginal probability associated with this variable is quite small.

Using the household-level data, Tobit estimation was conducted to determine the marginal effects of various factors on the area planted to modern varieties of rice. For this, the proportionate area planted to MV by the household was used as dependent variable. The explanatory variables were proportionate area irrigated,

proportionate area under upland, and the household educational status. The estimates are listed in Table 16. Similar to Probit results, all three explanatory variables were found to have statistically significant effects. The estimated marginal coefficients indicate that a one percentage point increase in the proportion of uplands is associated with a 4 percentage point decrease in the proportion of area planted to MVs. Keeping other things constant, a one percentage point increase in irrigated area is associated with 1.3 percentage point increase in the area under MVs. Thus the marginal effect of land type is greater than that of irrigation. Both Probit and tobit estimation thus confirm that land quality variables are important determinants of cross sectional variations in the adoption of MVs. Farmers who have continued to adopt TVs or have planted proportionately smaller area to MVs may have done so mainly due to less favorable quality of the land they farm (Gauchan and Pandey 2012).

3.4.1. Mahsuri- a miracle variety:

Tall Mahsuri is a miracle variety for submergence prone area which was spread very fast during 70s and was covered almost all eastern Indian states before release. Mahsuri percolated from Malasia to Bangladesh and from Bangladesh to eastern-southern states of India -West Bengal, Assam Odisha, Andhra Pradesh and Madhya Pradesh including other nearby states. Due to better grain yield & quality, synchronous flowering and maturity, higher biomass production, desired maturity period (145-150days) which facilitate farmers for crop diversification and intensification in following season, strong market demand along premium price was being widely adopted in submergence prone area. Mahsuri also percolated in Northern states of Uttar Pradesh, Bihar etc. later and covered vast area of submergence-prone environment (Singh et al. 2005) in short span. There is a significant growth in yield and production was noticed during eighties & nineties. The growth of production was accelerated by irrigation expansion and increased coverage of MVs on farmers field where Mahsuri as inclusive. Mahsuri was included in rice breeding program during those decades and was released substantial number of rice varieties for submergence prone areas in which Mahsuri used as a parent.

Although Mahsuri group of varieties have higher yields and generate more returns, these varieties account for only about half the area under MVs. There may be farm and household characteristics constraining expansion of area under the Mahsuri group of varieties. The cross sectional pattern of adoption of Mahsuri group of varieties was analyzed using a smaller sample of households who are MV adopters. Some of MV adopters also grow TVs. For the purpose of this analysis, the growers of Mahsuri group of varieties were considered as "adopter" and others who did not grow Mahsuri group of varieties (excluding non-growers of MVs) as non-adopters. A standard probit model was estimated (Table 17). Only two variables turn out to be statistically significant. These are the dummy variable for lowland and the farm size. Mahsuris are long-duration varieties generally suited to lowland conditions. Hence, the effect of land type (when specified as dummy for lowland) was found to be positive. Farm size is also found to have a positive influence on the adoption of Mahsuri group of varieties. The marginal effect of land type is however, much bigger than that of the farm size variable. The results indicate that Mahsuri group of varieties is more likely to be grown by farmers with more lowland fields and also by farmers with larger farm sizes. Results of the Tobit specification are consistent with the findings of the probit model (Table 18).

3.5 Conclusion and Policy Implications

Modern varieties of rice were already being adopted in majority of the rice area but TV adoption remained to be a practice especially among small farmers. Biophysical factors like land type and the associated factor of irrigation availability proved to be the major determinants of farmers' decision to adopt modern varieties, most of which are dependent on good moisture source. Fields that are irrigated and that do not belong to upland land type are more likely to be planted to MV than rainfed areas and upland fields. The persistent use of certain traditional varieties, despite the evident yield advantage of MVs, proved to be farmers' way of adapting to the environmental conditions unsuitable to currently available modern varieties and calls for the development of other MVs adapted to these less favorable environments. Farmer preferences may lean on crucial varietal traits that lessen production risks in such production ecosystem and ultimately assures better incomes, i.e., on top of their limited capacity to afford the technology that comes with adoption.

Recently-released MVs are finding their way to farmers' fields. Mahsuri and mahsuri-type varieties including swarna sub1 and samba sub1 varieties emerged as the most popularly adopted group of modern rice varieties. Analysis showed it to be relatively more profitable compared to other MV varieties, proving that breeding for quality makes a difference by as much as 23 percent gain in returns arising mainly from the price advantage of Mahsuri. With this development, it would be worthwhile to look into the extension mechanisms used in promoting the adoption of Mahsuri. Lessons that can be drawn from further study would be very important in efforts to promote MV adoption.

Despite the high adoption rates for MVs, yields are still low. At the current yield rate for MVs, the spread of MV to 100 percent area will raise the average yield level to only 2.84 t/ha, which is far below the yield that can potentially be realized, pointing the problem to crop management practices in the area. MV yields are however

consistently 50 per cent higher than those for TVs across all farm sizes but the average yield of large farmers for both MV and TV and for all land types were found to be higher, indicating that large farmers have better land quality and/ or higher input use, if not only better crop management practices. A research approach that moves from the usual adoption study should thus be pursued to identify the nature and cause of low productivity in the area.

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TABLE 1—GENERAL HOUSEHOLD CHARACTERISTICS

Characteristics	Farm Size Category			
	Small	Medium	Large	All
No. of households	150	35	15	200
Average household size	8	11	13	9
Average age of the household head (years)	50	57	51	52
Average no. of years in school of household head	5	8	11	6
Educational status of the household (%)				
Primary and Nursery	29	26	41	30
Highschool	17	22	21	18
University or Vocational Training	3	9	9	5
No formal education	51	43	29	47
All	**100**	**100**	**100**	**100**
Primary Occupation (%) Agriculture	60	49	60	58
Salaried job	22	32	15	24
Private business	17	19	25	18
All	**100**	**100**	**100**	**100**

*'No formal education' includes both adults and young children

*Used the total no. of persons in all households in each farm size category as denominator to calculate %

*Being students and housewives were not considered an occupation

*Household members below the age of 16 were also not considered part of the labor force

TABLE 2—DISTRIBUTION OF FARMERS BY LANDHOLDING AND BASIC CHARACTERISTICS

Characteristics	Small Farms	Medium Farms	Large Farms	All Farms
Average farm size (ha)	0.45	1.41	3.05	0.82
Average operational area (ha)	0.48	1.46	3.01	0.84
Average area leased in (ha)	0.03	0.07	0.00	0.04
Average leased-out area (ha)	0.00	0.03	0.04	0.01
Average no. of parcels per household	3	4	5	3
Average area of a parcel (ha)	0.19	0.37	0.61	0.28
Tenure (% of farmers)				
Land owner	89	97	100	91
Landowner cum-tenant	11	3	0	9

TABLE 3—AVERAGE FARM SIZE AND LANDHOLDING BY LAND TYPE

Land type	Small	Medium	Large	All
Average farm size (ha) % Area	0.45	1.41	3.05	0.82
Upland	56	60	35	51
Medium	5	2	0	3
Lowland	39	38	65	46

TABLE 4—PERCENTAGE AREA UNDER DIFFERENT CROPS BY SEASON

Season/Crop	Farm Size Category			
	Small	Medium	Large	All
Kharif season				
Rice	92	87	85	89
Sugarcane	1	2	6	3
Arhar	2	2	1	2
Other crops	1	1	0	0
Fallow	4	7	8	6
Rabi season				
Wheat	14	22	26	20
Wheat + mustard	64	55	52	58
Mustard and Pea	16	17	14	16
Other crops	3	3	2	3
Fallow	4	3	5	4

*Other crops include urd, fodder, vegetables, patson, bajra, potato, gram, gram/mustard, berseem, corriender, masoor, masoor/mustard, lahi/toria,gram/masoor, onion, garlic

*Mustard and pea (sole and intercrop)

TABLE 5—ADOPTION OF MODERN VARIETIES OF RICE

Variety types	% of Farmers				Area (%)			
	Small	Medium	Large	All	Small	Medium	Large	All
TV only	17	0	0	13	36	34	27	33
Both TV and MV	44	77	93	54				
MV only	39	23	7	34	64	66	73	67

TV - Traditional Varieties , MV – Modern Varieties

Figure 1. Percentage area allocation to rice by duration and farm size.

Note: Farmer classified varieties by maturity duration according to their own sense and knowledge as short/early duration (<120), medium duration (120-135) and long duration (>135 days). The maturity period is considered by the farmers' from seed-to-seed process of crop.

TABLE 6—PERCENT DISTRIBUTION OF AREA PLANTED TO COMMONLY GROWN VARIETIES OF RICE BY FARM SIZE

Variety	Small	Medium	Large	All
MVs				
Samba Mahsuri	19	32	40	29
Mahsuri	9	15	6	10
Swarna/Sona Mahsuri	5	11	4	7
Pant-12	18	9	8	12
Pant-10	10	5	2	6
Pant-4	1	1	-	1
Kashi	13	13	8	11
Hybrid	9	8	18	11
Sarjoo 52	6	3	11	7
NDR Varieties	2	-	2	1
Other MVs	8	4	2	5
All Modern Varieties	**100**	**100**	**100**	**100**

TABLE 6—PERCENT DISTRIBUTION OF AREA PLANTED TO COMMONLY GROWN VARIETIES OF RICE BY FARM SIZE

Variety	Small	Medium	Large	All
TVs				
Chaini	34	35	14	30
Bengal Juhi	3	11	44	14
Kuwari Mahsuri	11	5	8	9
Bengalia	13	2	6	8
Lalmati	4	10	15	8
90 Dinwa	3	17	—	7
Saraya	8	6	2	6
Kalanamak	3	3	5	4
Malasia	4	—	4	3
Chainisilk	4	—	—	2
Jarhan	3	—	—	2
Mungfalia	2	3	—	2
Ramkajra	3	1		2
Other TVs	4	8	2	5
All Traditional Varieties	**100**	**100**	**100**	**100**

TV - Traditional Varieties , MV – Modern Varieties

TABLE 7—DISTRIBUTION OF COMMONLY GROWN RICE VARIETIES BY MATURITY AND VARIETY CLASS

	MVs	TVs
Early Duration	Pant-10	Bengalia
(<120 days)	Pant-12	Orisawa
	NDR-97	Mungfalia
	NDR-80	Ramkajra
		Chaini
		Chainisilk
		Saraya
		90 Dinwa
		Dhankodwa
		Amjhuswa
		Malinia
		Satha
		Tulsi Prasad
Medium Duration		
(120-135 days)	Sarjoo-52	Lalmati
	Kashi	Kuwari Mahsuri
	Pant-4	
	Hybrid	
	Gujrat-70	
	Indrasan	
	PNR-381	
	NDR-359	

TABLE 7—DISTRIBUTION OF COMMONLY GROWN RICE VARIETIES BY MATURITY AND VARIETY CLASS—*Contd.*

	MVs	TVs
Long Duration (> 135 days)	Swarna/Sona Mahsuri Samba Mahsuri Mahsuri Basmati Rajendra Janaki	Bengal Juhi Kalanamak Jarhan Malasia Mala Daunsawa Manhar

TV - Traditional Varieties , MV – Modern Varieties

TABLE 8—PERCENTAGE AREA UNDER MAHSURI VARIETY

	Mahsuri		Non-Mahsuri		TV
Farm Size	% to total area	% to MV area	% to total area	% to MV area	% to total area
Small	21	33	43	67	36
Medium	38	58	28	42	34
Large	36	50	37	50	27
All	**30**	**45**	**37**	**55**	**33**

TV-Traditional Varieties , MV – Modern Varieties

TABLE 9—AVERAGE YIELD (T/HA) FOR RICE BY LAND TYPE AND VARIETY TYPE

	Land type						All land types	
	Upland		Medium land		Lowland			
Farm Size	MV	TV	MV	TV	MV	TV	MV	TV
Small	2.64	1.87	2.84	1.86	2.75	1.72	2.71	1.83
Medium	2.95	1.69			2.94	1.47	2.95	1.64
Large	3.20	2.42	2.40	0.00	3.28	1.83	3.24	2.11
ALL	2.78	1.86	2.82	1.86	2.89	1.69	2.84	1.82

TV - Traditional Varieties , MV – Modern Varieties

TABLE 10—COMPARATIVE NPK (KG/HA) USE ON RICE PRODUCTION

Variety type	Farm Size			
	Small	Medium	Large	All
MV	90	85	104	90
TV	51	47	68	52

TV - Traditional Varieties , MV – Modern Varieties

TABLE 11—INPUT USE FOR RICE PRODUCTION

Particulars/ Items	Units	Small	Medium	Large	All
No. of plots	No.	449	172	94	715
Area (ha)	Ha	67	44	38	150
Yield	t/ha	2.36	2.41	2.86	2.44
Material inputs					
Seed	(kg/ha)	54	50	50	53
Fertilizer	(kg/ha)	75	74	80	75
Manure	t/ha	0.09	0.03	0.07	0.08
Pesticides	(kg/ha)	7	4	7	6
Power for land preparation	(hr/ha)	30	22	16	27
Irrigation	(hr/ha)	4	3	6	4
Fuel for land preparation	(L/ha)	1	7	18	4
Labor inputs	days/ha				
Land Prep/Crop establishment		43	45	48	44
Fert/Chem Application		1	1	1	1
Weeding		21	19	19	21
Irrigation		0	0	0	0
Harvesting/Threshing		53	48	30	50
Total labor inputs		**119**	**113**	**98**	**116**
Machine labor inputs		**0**	**0**	**1**	**1**

TABLE 12—LABOR USE FOR RICE PRODUCTION BY VARIETY TYPE (DAYS/HA)

Particulars/ Activities	Small		Medium		Large		All	
	MV	TV	MV	TV	MV	TV	MV	TV
Land preparation	2	2	1	1	1	1	1	2
Crop establishment	42	40	47	41	45	48	44	41
Fertilizer/Manure Application	1	1	1	1	1	1	1	1
Hand weeding	23	18	22	15	20	16	23	17
Pesticide Application	0	0	1	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0	0
Harvesting/Threshing	50	58	47	46	28	39	47	54
Total	**118**	**120**	**118**	**104**	**95**	**105**	**116**	**116**

TV - Traditional Varieties , MV – Modern Varieties

TABLE 13—PAID-OUT COSTS AND RETURNS FOR RICE PRODUCTION BY VARIETY TYPE RS/HA)

Particulars	MV	TV
Area (aggregate)	99.78	49.74
No. of plots	435	280
Yield (t/ha)	2.84	1.82
Material inputs		
Seed	162	25
Fertilizer	1,150	658

TABLE 13—PAID-OUT COSTS AND RETURNS FOR RICE PRODUCTION BY VARIETY TYPE RS/HA)—*Contd.*

Particulars	MV	TV
Manure	2	6
Pesticides	133	60
Power for land preparation	1,640	1,416
Irrigation	127	107
Fuel for land preparation	96	52
Sub-total	3,309	2,324
Labor inputs		
Land Prep/Crop establishment	891	784
Fert/Chem Application	3	9
Handweeding	298	198
Irrigation	0	0
Harvesting/Threshing	552	606
Sub-total	1,744	1,597
Machine labor inputs	480	274
Total paid-out costs	5,533	4,195
Gross Revenues	12,164	7,736
Net returns-above- paid-out cost	6,631	3,541

TV - Traditional Varieties , MV – Modern Varieties

TABLE 14—COMPARATIVE COSTS AND RETURNS FOR MAHSURI AND NON-MAHSURI RICE PRODUCTION (RS/HA)

Particulars	Non-Mahsuri	Mahsuri
Yield (t/ha) Material inputs	2.78	2.94
Seed	205	87
Fertilizer	1,086	1,261
Manure	-	6
Pesticides	122	152
Power for land preparation	1,862	1,974
Irrigation	111	154
Fuel for land preparation	116	61
Sub-total	3,502	3,694
Labor inputs		
Pre-harvest labor Land Prep/Crop establishment	838	998
Fert/Chem Application	2	5
Handweeding	239	400
Irrigation	0	-
Harvesting/Threshing	495	660
Sub-total	1,575	2,064
Machine labor inputs	441	557
Total paid-out costs	5,518	6,315
Gross Revenues	10,926	14.151
Net returns-above-paid-out cost	5,408	7,836

TABLE 15—PROBIT MODEL ESTIMATES OF MODERN VARIETY ADOPTION (PLOT – LEVEL)

Variables	Coefficients	Standard error	Marginal probability	Elasticity of marginal probability
Dummy for upland[a]	-0.55768***	0.101	-0.2126	-0.3038
Dummy for irrigation[b]	2.90E-01***	0.099	0.1105	0.0932
EDYRS[c]	0.041***	0.009	0.0156	0.1657
Constant	2.07E-01*	0.10865	0.207	0.1356
Sample size	715			
Log-likelihood ratio	-439.92			

* and *** indicate significance at 10% and 1% levels.

[a] 1 if upland and 0 otherwise

[b] 1 if irrigated and 0 otherwise

[c] EDYRS is the number of years spent by the household head in school

TABLE 16—TOBIT MODEL ESTIMATES OF MODERN VARIETY ADOPTION (FARM – LEVEL)

Variables	Coefficient Estimates for MV Adoptors[a]	Standard error	Marginal effects
Upland (% area)	-0.0415	0.200310	-0.3067
Irrigation (% area)	0.0132	0.162560	0.0978
EDYRS[b]	0.0027	0.014654	0.0198
Constant	0.0795	0.217430	0.5878
Sample size	200		
Log-likelihood ratio	-97.272842		

[a] Used the Mcdonald-Moffit method of decomposition to derive estimates for farm households who actually adopted MVs

[b] EDYRS is the number of years spent by the household head in school

TABLE 17—PROBIT MODEL ESTIMATES OF MAHSURI VARIETY ADOPTION (PLOT – LEVEL)

Variables	Coefficients	Standard error	Marginal probability	Elasticity of marginal probability
Dummy for lowland[a]	0.60574***	0.126	0.2299	0.1891
Farm size (ha)	1.55E-01***	0.059	0.0587	0.1146
Constant	-0.79723***	0.11231	-0.3026	-1.4228
Sample size	436			
Log-likelihood ratio	-273.83			

*** indicates significance at 1% level.

[a] 1 if lowland and 0 otherwise

TABLE 18—TOBIT MODEL ESTIMATES OF MAHSURI VARIETY ADOPTION (FARM – LEVEL)

Variables	Coefficient Estimates for Mahsuri Adoptors[a]	Standard error	Marginal effects
Lowland (% area)	0.0906	0.230	0.1788
Farm size (ha)	0.0479	0.092	0.0947
Constant	-0.0384	0.1525	-0.0758
Sample size	174		
Log-likelihood ratio	-108.27719		

[a] Used the Mcdonald-Moffit method of decomposition to derive estimates for farm households who actually adopted Mahsuri over other MVs

APPENDIX 1—TECHNOLOGICAL FEATURES OF RICE PRODUCTION IN EASTERN UTTAR PRADESH, BY DISTRICT*.

Districts	% Irrigated area (1996-1998)	%HYV area (1996-1998)	Fertilizer use(kg NPK/ha)			
			1970-1972	1980-1982	1990-1992	1998-2000
Allahabad	83	83	16	45	96	138
Azamgarh	42	92	16	39	79	100
Bahraich	6	85	8	29	41	61
Ballia	58	91	16	58	98	102
Basti	4	70	22	36	80	115
Deoria	36	96	32	63	135	157
Faizabad	76	97	32	71	113	171
Ghazipur	77	94	17	69	106	126
Gonda	2	84	14	32	44	72
Gorakhpur	6	89	25	50	88	133
Jaunpur	78	95	22	74	104	104
Mirzapur	70	79	8	25	44	54
Pratapgarh	81	72	15	56	78	100
Sultanpur	49	93	19	48	67	89
Varanasi	90	95	29	66	121	184
Esatern UP	44	90	19	51	85	118

*Triennium averages. Source: Uttar Pradesh ke krishi ankerey, Directorate of Agriculture Lucknow.

APPENDIX 2—RICE AREA, PRODUCTION AND YIELD IN EASTERN UTTAR PRADESH, BY DISTRICT, 1998-2000*

District	Area ('000 ha)	% Irrigated area	Production ('000 t)	Yield (t/ha)
Allahabad	201	93	576	2.86
Azamgarh	294	42	847	2.88
Bahraich	195	4	511	2.62
Ballia	119	66	327	2.75
Basti	357	4	957	2.66
Deoria	238	39	855	3.59
Faizabad	215	92	740	3.45
Ghazipur	136	91	421	3.09
Gonda	214	2	592	2.77
Gorakhpur	311	7	987	3.17
Jaunpur	126	89	398	3.16
Mirzapur	191	71	574	3.01
Pratapgarh	111	85	288	2.59
Sultanpur	160	57	494	3.09
Varanasi	181	95	682	3.78
Esatern UP	3048	56	9248	3.03

*Triennium averages. . Source: Uttar Pradesh ke krishi ankerey, Directorate of Agriculture Lucknow.

Sl no,	Variety Name	Breeding Method	Morphological features at vegetative stage	Spikelet characters	Grain Characters	Agronomic Features	Physiological Features	Resistance to Pest Insects	Resistance Diseases
1.	Basmati	From local Basmati	A tall-statured 145cm) variety, high tillering, compact growth habit, weak stemmed, dark green leaves, panicle well exerted, plant parts all green	Husk color straw, partial small awns, panicle length 27.9 cm, no. of grains per panicle 98, 1000-grain weight 22.9 g	Grains long slender, length 6,76 mm, breadth 1.76 mm, L/B ratio 3.84, kernel color white, translucent abdominal white occasionally present, scented, non-glutinous amylose content 19.10%, hulling 76.8%, milling 69.0%, head rice recovery 46.0%, alkali	Recommended for kharif season under irrigated transplanted condition in Basmati growing areas, seed rate 20 kg/ha for transplanting, spacing 20x5 cm with 2-3 seedlings/hill, fertilizerdose 60-30 kg NP/ha with 25 kg zinc sulphate	Photoperiod sensitive, duration from seeding to maturity 140-150 days, lodging and shattering type	Resistant of WBPH, susceptible to stem-borer	Resistant to sterm-rot, susceptible blast disea
2.	Janaki	From a local landrace Chenab	Tall (150-155cm), apiculus and leaf sheath pigmented, erect and dark green leaves.	Husk color blackish purple, grain L x W: 6.55mm x 2.65 mm, L/B ratio 3.10, awns absent, 1000-grain weight 29.6 g	Grain long bold, kernel colour red, hulling 75.5%, milling 73.2%, head rice recovery 68.35%, non-scented	Recommended for chaur land where water depth is arnd 100 cm, suitable for kharuhan planting, recommended low dose of fertilizer: 40kg N + 40kg P + 20kg K/ha, yield 2.5-3.5 t/ha	Photo-sensitive, flowers in second week of October	Resistant to RTV	Tolerant to blast
3.	Mahsuri	Cross between Taichung 65/Mayang Ebos 6080/2 in Malaysia	Tall (150cm), good tillering, all plant parts pale green to green, no pigmentation, panicle well exerted	Lermma-palea colour brown, husk color brown, awnless, grain length 6.8 mm, breadth 2.2 mm, L/B ratio 3.1	Kernel short slender, white, translucent, no abdominal white, kernel length 5.0 mm, breadth 1.9 mm, L/B ratio 2.63, non-scented, non-glutinous	For khari/season of Telangana region, total duration 145 days, average yield 4.0-5.0 t/ha; Also recommended in Chhattisgarh, Maharashtra and Orissa	Photo-insensitive, non-lodging		
4.	NDR-359	Cross BG 90-2-4/OBS7-677 (IRRI)	Semi-dwarf (90-95 cm), erect, moderate tillering, sturdy culm, panicles small, non-synchronous flowering, 50% flowering in 90-100 days after seeding	Spikelets awnless, short-tipped, white abdomen	Kernels long bold, L/B ratio 2.96, hulling 77%, milling 52.1%, water uptake 396 ml/100g, volume expansion 5.40, kernel elongation ratio 1.51, possesses good cooking quality with protein 9.34%	Medium duration, recommended for cultivation in irrigated areas in UP	Duration 135 days from seeding to maturity	No major pest affects the crop under field condition	Resistant to leaf blast, bacterial to blight, bro spot; moderately resistant to sheath rot leaf streak
5.	NDR-80	Cross between N 22 and IR 36	Plants dwarf, erect, profuse tillering, panicles medium long and compact, plant parts all green, non-pigmented	Husk straw color, spikelets awnless, good threshability	Kernels medium slender, good cooking quality	Recommended for irrigated medium duration paddy cultivation, suitable for rice-wheat cropping system, yield 55q/ha	Duration 115 days from seeding to maturity,50% flowering in 75 days after nursery sowing	No major damage by insect pests	Resistant to blast
6.	NDR-97	Cross N 22 and Ratna	Plants dwarf erect 75-80 em), profuse tillering, panicles medium long, compact	Spikelets awnless, straw Colour, white stigma	Kernels long slender, L/B ratio 3.10, hulling 78.57%, milling 70.40%, head rice recovery 60%, water uptake 320ml/l00 g, volume expansion 4.5, kernel elongation ratio 15, alkali value 6.00, no aroma	Recommended for eastern UP, Orissa and West Bengal in rainfed ecology for direct seeding as well as for transplanting conditions, yield 40 q/ha	Duration 90 days from seeding to maturity	No major pest affects the variety	Moderated resistant to bacterial to blight and sheath rot

APPENDIX 3—MODERN RICE VARIETIES IN EASTERN UTTAR PRADESH—*Contd.*

Sl. no.	Variety Name	Breeding Method	Morphological features at vegetative stage	Spikelet characters	Grain Characters	Agronomic Features	Physiological Features	Resistance to Pest Insects	Resistance Diseases
7.	Pant-l0	Cross between IR32/Mahsuri /IR28 (IRRI)	Semi-dwarf (92 cm), panicle fully exerted, plant parts all green, non-pigmented, shortnarrow flag leaf	Husk color straw, awns absent, tip awns may develop in adverse environments	Grains long slender, length 6.90 mm, breadth 2.20mm, L/B ratio 3.l3, kernel color white, hulling 79.5%, milling 75.0%, head rice recovery 63.0, non-scented.	Recommended for cultivation in northwestern plains of UP and plains of Uttaranchal under normal dates of sowing and normal fertility (120 kg) in the rainy season, average yield 5.8 to 6.0 t/ha under normal planting	Photo-insensitive, duration from seeding to maturity 125 days (121-131 days), prone to lodging under very high fertility	Tolerant to SB,LF, WBPH, RWMandGB under field conditions	Tolerant to BL, BLB a ShB under field conditions
8.	Pant-12	Cross between Govind and UPRM 201-1-1	Semi-dwarf (95cm) panicle compact and fully exerted, long erect flag leaf, stiff straw, plant partsall green, non-pigmented	Husk color straw, awns absent, panicle length 25.0 em, number of grains per panicles 113.0, 1000-grain weight 25.1g	Grains long slender, length 6.50mm, breadth 1.95 mm, L/B ratio 3.33, kernel color white, hulling 79.05%, milling 73.9%, head rice reovery 58.3%, alkali value 5.5, non-scented	Recommended for plains of UP and Uttaranchal for i rrigated ecosystem under normal dates of sowing and normal fertility (120kg/ha N) in the rainy season, average yields 5.0 to 5.5 t/ha under normal planting	A photo-insensitive variety, duration from seeding to maturityl30 days, non-lodging	Moderately susceptible to BPH	Tolerant to BLS and B under field conditions
9.	Rajendra	Cross IJ 52/T(N) 1 by pedigree method	Semi-dwarf (70cm), good tillering, all plant parts green, well exerted panicle	Husk straw colored, awnless	Kernel long slender, white, transluscent, no abdominal white, non-scented, non-glutinous	Suitable for irrigated dry conditions in kharif in Telangana and also for rabi areas of A.P.	Photo-insensitive, non-lodging	MR toGM and SB	Toelrant to Blast
10.	PNR-381	Cross between Tainan 3 mutant and Basmati 370	Semi-dwarf(height around 100cm) with green foliage, long and compact panicles	Husk color brown	Long slender grains, translucent endosperm, 1000-grain weight 17.5g, hulling 80.0%, milling 71.5%, HRR 56.8%, kernel color white, alkali value 4.5, grain type long slender fine	Recommended for both irrigated and rainfed conditions of Haryana, UP, Bihar, West Bengal	Duration 90-105 days under direct seeded condition and 105-120 days under tansplanted condition depending on date of sowing, location and other ecological factors		The variety has shown appreciable resistancve blast and brown spot
11.	Pant-4	Cross between IR 262 and Remadja	Semi-dwarf (93.cm), panicle fully exerted, plant parts all green, non-pigmented	Husk color straw, erect flag leaf, compact panicles, awns absent, tip awns may develop under adverse climatic conditions,panicl e length 22.3 em, nuber of grains per panicle 126.0, 1000-grain weight 2.0g	Grains long slender, length 7.30mm, breadth 2.40 mm, L/B ratio 3.04, kernel color white, hulling 78.4%, milling 74.3%, head rice recovery 63.0%alkali value 2.3, non-scented	Recommended for irigated ecosystem of Upans Uttaranchal under normal dates of sowing and normal fertility (120kg/ha N) in the rainy season, responsive to higher doses of fertilizers (up to 180 kg/ha), average yield 5.5 to 6.0 t/ha under normal planting	Photo-insensitive, duration from seeding to maturity 128-130 days, non-lodging, non-shattering (hard threshing)		Tolerant to BLB, BI at BS under firled conditions
12.	Sabha Mahsuri	Cross GEB 24/T(N) 1/Mahsuri	Semi-dwarf, good ti11ering, all plant parts green, dark green erect leaves, panicle we11-exerted	Lemma-paea colour green, husk straw coloured. Awnless, grain length 7.0mm, breadth 1.9mm, L/B ratio 3.68, 1000grain weight 14.6 g	Kernel medium slender, white, transluscent, abdominal white absent, non-scented, non-glutinous	Suitable for Telangana and Rayalaseema areas .in particular and A. P. in general, kharif season, total duration 150 days, average yield 4.5-5.0 t/ha	Photo-insensitive, non-lodging	Released by State Variety Release Committee in 1986	Used as parent in varieties I m Samba, Ja, Sannalu

APPENDIX 3—MODERN RICE VARIETIES IN EASTERN UTTAR PRADESH—*Concld.*

Sl. no.	Variety Name	Breeding Method	Morphological features at vegetative stage	Spikelet characters	Grain Characters	Agronomic Features	Physiological Features	Resistance to Pest Insects	Resistance Diseases
13	Sarjoo-52	Cross T(N)1 and Kashi	Plants semi-dwarf, erect, profuse tillering, panicles long compact with full exertion, synchronous flowering, plant parts all green, non-pigmented	Spikelets awnless, apiculus colourless	Kernels long bold, good cooking quality	Recommended for irrigated high fertiliry managementareas a UP, 50% flowering in 100 days after nurserysowing, duration 135 days from seeding to maturity	Photoperiod insensitive, good threshability	No major insect pest damages the crop	Moderatel resistant to BLB
14.	Swarna/ Sona Mahsuri	Cross between Sana and Mahsuri	Dwarf, compact tillering.	Lemma-palea dirty brown colour, awnless.	Kernel long slender, white, translucent, no abdominal white, non-scented	Recommended for Krishna western delta of Andhra Pradesh in kahrif season, total duration 140-145 days, yield 6-6.5 t/ha	Photo-insensitive, non-lodging	Tolerant to GM	Resistant to blast

Farmers Income: Increasing the Viability of Small and Marginal Landholders through Horticulture

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Abstract

India leads the world in horticulture production occupying second place in both fruit and vegetable production. Horticultural crops require less irrigation water with higher productivity compared to cereals leading to higher returns from marginal inputs. Besides, they are also suitable for intensive cropping. Further, the employment generated from horticultural enterprises is very high (upto 2510 man days/ha/annum). Horticultural crops are also known as protective foods providing vitamins, minerals and anti-oxidants, providing nutritional security for the nation, besides economic security. Considering the high productivity of these crops the amount of calories produced per unit area is very high with the added advantage of holistic nutrition.

In this context, an analysis has been made to evaluate the economic feasibility of horticulture crops to analyze whether it is profitable to the small and marginal landholders to shift towards horticultural crops. Benefit cost analysis of horticultural crops revealed that, for all horticultural crops, BC ratio is more than 1, indicating that for each rupee invested, the farmer can definitely get more than 1 rupee in return (and even more for certain horticultural crops) which indicates that it is economically feasible to shift to horticultural crops. If small and marginal farmers could bring their land under horticultural crops more particularly vegetable crops the income levels can be improved leading to better standard of living. Cultivation of medicinal and aromatic plants, starting nurseries and establishment of small scale processing units is more beneficial to small and marginal farmers. Encouraging cultivation of horticultural crops can change the economic, social and natural scenario of India.

Introduction

Over the past two decades, major shift has been observed in dietary patterns and the consumption all over the world which is more diversified both in urban and rural areas as well as among rich and poor households. Rising income levels, urbanization, increase in awareness among the people about the health benefits of fruits and vegetables, socio-demographic factors and trade liberalization policies over the past two decades are the reasons for this shift.

Though, India is the second largest producer of fruits and vegetables in the world after China, producing 15 per cent of world's vegetables and 8 per cent of the world's fruits contributing to 29.65 % to GDP from 13.5% area out of the 18.5% contribution from Indian agriculture to GDP, production is still unable to meet the nutritional requirements of the country at the rate of 250 g. of fruits and 400 g. of vegetables per capita as suggested by ICMR.

Diversification in Horticulture is the best option as there are several advantages of growing horticultural crops as enunciated by the 10th planning commission on horticulture.

1. Produce higher biomass than field crops per unit area resulting in efficient utilization of natural resources.
2. Are highly remunerative for replacing subsistence farming and thus alleviate poverty in varied agro-ecosystems like rainfed, dryland, hilly, arid and coastal.
3. Have potential for improvement of wastelands through planned strategies.
4. Need comparatively less water than many other field crops.
5. Provide higher employment opportunities.
6. Are important for nutritional security.
7. Are environment-friendly.

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8. Have a high potential for value addition.

9. Have high potential for foreign exchange earning.

10. Make higher contribution to GDP.

Small and marginal farmers account for nearly 80 per cent of the total operational holdings in the country, cultivating more than 50 per cent of the total area. Economists, planners, policy makers and critics often argue that small and marginal holdings are not economically viable under the existing technological and socio-economic environment, besides cannot provide adequate income to an average family.

There are suggestions that higher incomes can be obtained from these small and marginal holdings, if they diversify their activities by including high-value and value-added crops/ commodities for which there is a growing demand both in the national and the international markets. Normally, as farm size decreases, the cropping pattern gets more and more intensified, diversified and oriented to high-value crops, to increase income level and also to guard against risk. Theoretically, smaller the farm size, higher is the tendency to diversify.

The main objective of this article is to examine the growth in horticultural sector in the state of Andhra Pradesh and to analyse the economic viability of diversification towards horticultural crops in improving the net income of small and marginal farmers.

Methodology

Annual compound growth rates were used to measure the trend in area and production of fruits, vegetables, flowers and spices during 1998-99 to 2009-10 in three regions of Andhra Pradesh selected for the case study. Region-I includes Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam and Nellore districts. Region-II consists of Chittoor, Kadapa, Anantapur and Kurnool Districts, where as Region-III consists of Mahabubnagar, Rangareddy, Hyderabad, Medak, Nizamabad, Adilabad, Karimnagar, Warangal, Khammam and Nalgonda districts.

Compound growth rate was analysed using exponential growth function of the form

$Y = ab^t e_t$

Where,

Y = Dependent variable for which growth rate is estimated.

a = intercept

b = Regression coefficient

t = Time variable

e = Random error

The compound growth rate was obtained for the logarithmic form of the equation as below.

$\ln Y = \ln a + t \ln b + \ln(e)$

Then, the compound growth rate (r) was computed by using the relationship

r = (Antilog of b - 1) x 100

Benefit-cost ratios have been computed as an indicator of economics of investment criteria. This ratio helps in judging the feasibility of investing in a project and it depicts the total financial return for each rupee invested in cultivation of a crop. The B-C ratio of horticultural crops has been compared with other staple crops to evaluate the feasibility of shifting towards horticultural crops.

BCR = Gross returns/Cost of Cultivation

Where, Gross returns = Yield*Price

Since published data on cost of cultivation of horticultural crops is not available in published form, data was obtained through primary survey and costs and returns was compiled from various sources available. In computation of cost concepts of fruit crops, establishment cost is an important component and the gestation period between time of investment and getting commercial benefits is more and hence, the total cost of establishing and managing the orchard was spread over the total period to have the average annual estimates of the cost of cultivation. The average annual costs were estimated taking into account the number of years lag before orchard becomes commercially viable.

Results and discussion

Trend in area and production of fruits in Andhra Pradesh during the period 1998-99 to 2009-2010 have been plotted in Figure 1 and it indicates increasing trend in both area and production of fruit crops. Similarly, trend has been observed in area and production of vegetables during the study period as depicted in Figure 2. Area and production of flowers also recorded significant growth except during 2009-10 (Fig.3) while spices recorded fluctuations in area and production during the study period (Fig.4).

Figure 1. Trends in area and production of fruits in Andhra Pradesh

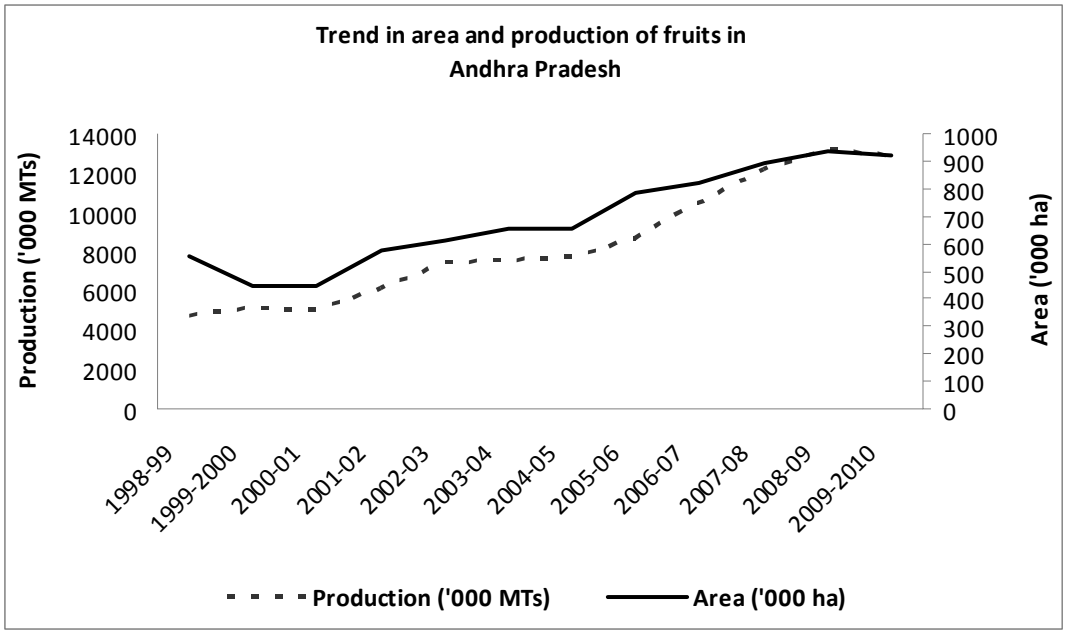


Figure 2. Trends in area and production of vegetables in Andhra Pradesh

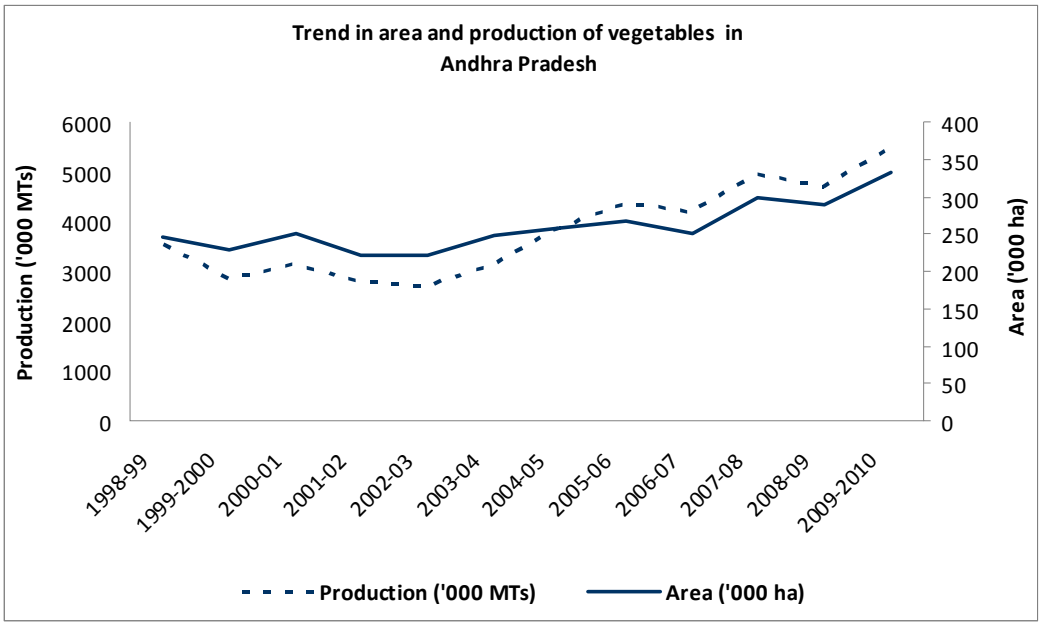


Figure 3. Trends in area and production of flowers in Andhra Pradesh

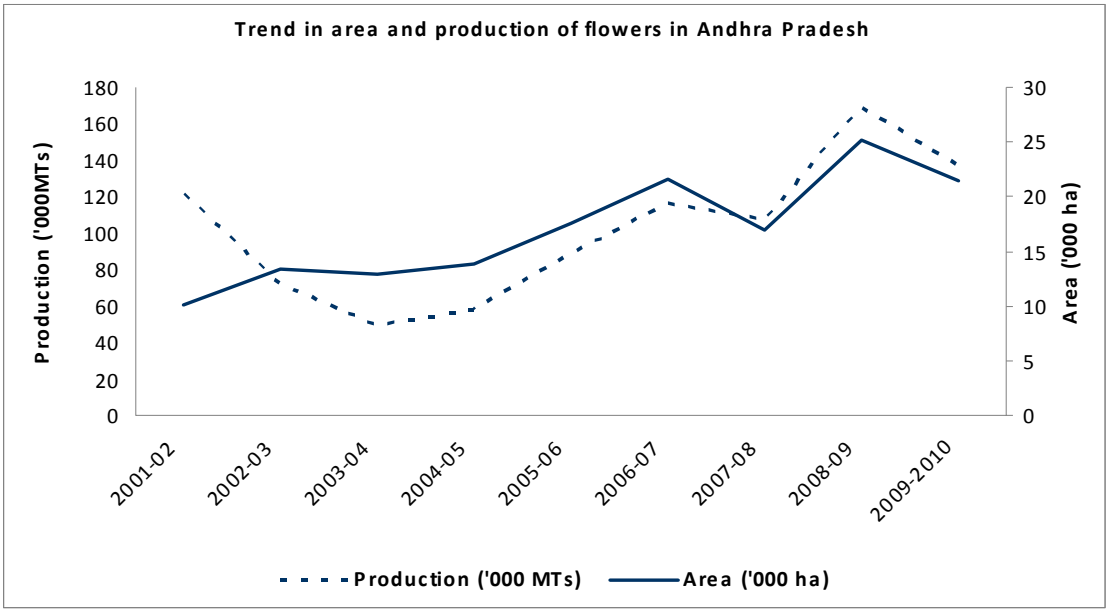
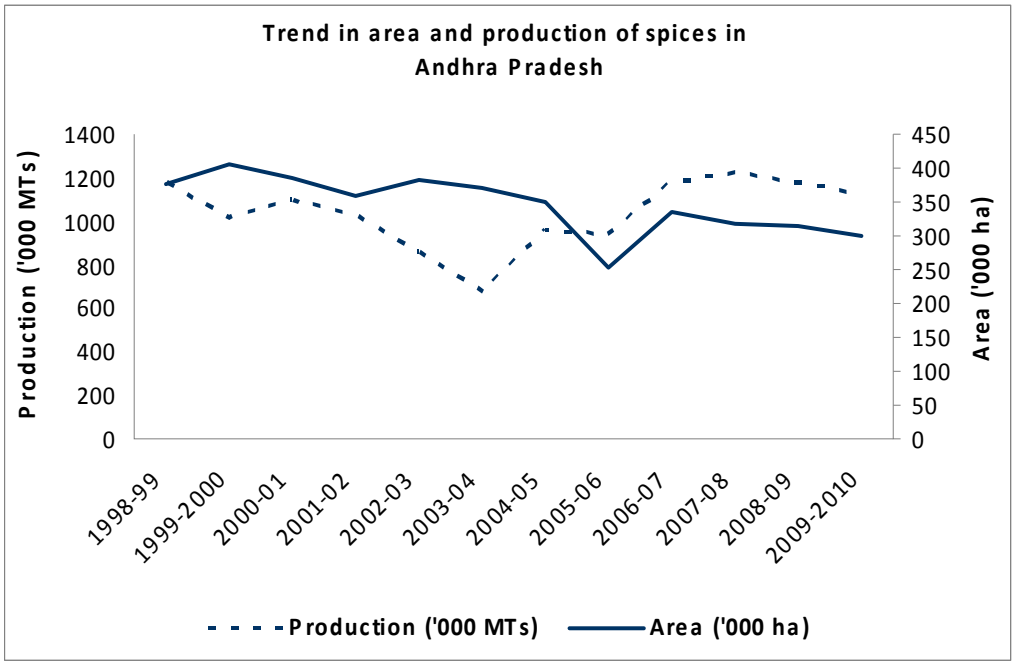


Figure 4. Trends in area and production of spices in Andhra Pradesh



The growth rates in area and production of fruits, vegetables, flowers and spices in all the three regions of Andhra Pradesh and the state as a whole over the period 1999-2000 to 2000-2010 have been presented in Table 1. The area under fruits grew at an annual rate of 1.34 per-cent, 9.67 per cent and 15.25 per cent in Region I, Region II and Region III respectively. A.P. as a whole registered a growth rate of 7.05 per cent while growth rates in production were 6.24, 11.43, 18.54 and 10.63 per cent in Region I, Region II, Region III and A.P. as a whole respectively. The significant increase in growth rates in fruit production is mainly the result of area expansion and contribution of productivity has also been significant in increased production.

The analysis of growth rates of vegetables revealed that, there was more growth in Region III (5.89%) than other two regions and state as a whole registered only 2.79 per cent growth. Similarly, significant growth was observed in Region III (11.60%) and A.P. as a whole registered 5.83 per cent growth rate. Similar is the growth trend in vegetable production i.e., highest growth rate in Region III (11.60%) and the state as a whole registered a growth rate of 2.79 per cent in vegetable area and 5.83 per-cent in vegetable production.

Vegetable production is concentrated close to the demand centers and the area under vegetables was high near urban centres and surrounding districts. Where as, fruits have specific niches based on agro-climatic and soil characteristics. However, fruit production is gradually spreading to non-traditional areas due to availability of improved varieties.

Interestingly, flowers have registered very high significant growth rates both in area and production in all the three regions as well as the state as a whole. In area under flower crops, Region I, Region II and Region III have shown growth rates of 113.03, 130.02 and 111.24 per-cent respectively. Similarly, 144.86 per cent, 166.24 per cent and 151.85 per cent growth was observed in Region I, Region II and Region III respectively. The state as a whole registered a growth rate of 142.28 per cent and 182.13 per-cent in area and production. During the last ten years there has been introduction of protected cultivation of cut flowers on commercial scale all across the state. A number of floriculture units have become exporters of cut flowers to Europe, Middle East, Japan, USA, Australia and S.E. Asian Countries. Though significant growth rate was observed in flower crops, area cultivated under flower crops is very less and there is lot of scope for increasing the area and production of flowers.

However, when spices growth in the state was observed, negative growth rate is observed in Region II (-8.41%), Region III (-3.32%) and A.P. as a whole (-2.69%) in area, where as in spices production negative growth is observed in Region II (-3.57%).

TABLE 1—COMPOUND ANNUAL GROWTH RATES OF FRUITS, VEGETABLES, FLOWERS AND SPICES IN ANDHRA PRADESH FOR THE PERIOD FROM 1999-2000 TO 2009-2010 (PER CENT)

Crops	Coastal Andhra		Rayalaseema		Telangana		Total A.P.	
	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
Fruits	1.34	6.24	9.67	11.43	15.25	18.54	7.05	10.63
Vegetables	2.09	5.29	0.08	2.63	5.89	11.60	2.79	5.83
Flowers	113.03	144.86	130.02	166.24	111.24	151.85	142.28	182.13
Spices	0.95	2.86	-8.41	–3.57	–3.32	1.17	–2.69	1.01

The main factors responsible for significant growth in area under fruits and vegetables include higher return relative to other crop groups, higher demand for fruits and vegetables, big push from the government through National Horticulture Mission and Technology Mission for Integrated Development of Horticulture in Andhra Pradesh. Due to shift in demand pattern towards high value crops, farmers are also responding to market signals and are gradually shifting production-mix to meet the growing demand for high value commodities.

In addition, because of huge post harvest losses and severe supply constraints, availability of horticultural produce is low. In order to produce enough surpluses for domestic consumption as well as exports, more area should be brought under horticulture. In this context, a feasibility check has to be conducted to study the economic viability of horticultural crops and analyse whether it is profitable for the farmers to shift towards horticultural crops.

Benefit-Cost ratios of major cereals, fruits, vegetables, flower crops and spices along with some staple food crops are presented in Table 2.

TABLE 2—COST OF CULTIVATION OF IMPORTANT CROPS IN ANDHRA PRADESH

Crop	Cost of cultivation (Rs./Ha)	Gross returns (Rs./Ha)	Benefit-cost ratio(BCR)
Paddy	54613	61375	1.12
Jowar	23787	20587	0.87
Maize	38684	37503	0.97
Ragi	39115	28333	0.72
Mango	34400	93458	2.72
Banana	56300	90080	1.60
Citrus	27183	73122	2.69
Ber	9414	22380	2.38
Pomegranate	26153	36015	1.37
Tomato	61000	78000	1.28
Brinjal	45000	108500	2.41
Bhendi	39460	63500	1.61
Cabbage	54650	165600	3.03
Tapioca	28700	85400	2.98
Bottle gourd	34600	96400	2.79
Onion	53326	73817	1.38
Chillies	48900	66800	1.37
Turmeric	44500	98000	2.20
Chrysanthemum	56000	260000	4.64

The results show that except for paddy, farmers are not able to recover the cost of cultivation for staple food crops like jowar, maize and ragi where the BCR is less than 1, where as for horticultural crops, BCR is more than 1 and some times it is even higher as in case of cabbage and chrysanthemum. That is, for every rupee invested in one hectare of land under cultivation of horticultural crops, the returns are more than one rupee after sale of the produce. Hence, it can be concluded that it is economically viable and beneficial to shift towards horticulture production. There is tremendous scope for improving the economic status of small and marginal farmers in the state by shifting to horticultural crops which had a BCR of more than one, especially in regions where productivity of staple food crops is very low or where it is not profitable to cultivate them.

In addition to the above crops, small and marginal farmers can benefit from growing medicinal and aromatic crops, raising nurseries and protected cultivation of flowers and vegetables. Further, they can establish small scale processing units or form into co-operatives for establishing larger units and go for value addition of horticultural crops, the crops having much scope for value addition and the products having demand for export.

A study on employment potential of horticultural industry showed that on an average 858 man days per hectare are required in fruit cultivation varying from 460 man days/ha for sapota and guava to 2510 man days/ha in grape. Around 200 man days are required for vegetable cultivation. By bringing the cultivable waste land under fruits and additional area under vegetables and also by including vegetables in crop rotation, it would be possible to enhance the employment opportunities besides improving the nutritional standards of people.

Horticultural crops are known as protective foods as they contain a wealth of phytochemicals essential for human health. All foods that are red in colour like red apples, cherries, cranberries, red grapes, pink/red grapefruit, red pears, raspberries, strawberries, watermelons, beets, red peppers, radishes, red onions, red potatoes, rhubarb and tomatoes contain phytochemicals such as lycopene and anthocyanins with potential health-promoting properties.

Foods that are orange and yellow contain varying amounts of antioxidants such as vitamin C as well as carotenoids and bioflavonoids such as yellow apples, apricots, cantaloupes, grapefruit, gold kiwifruit, lemons, mangoes, nectarines, oranges, peaches, yellow pears, persimmons, pineapples, tangerines, melons, butternut squash, carrots, yellow peppers, potatoes (yellow fleshed), pumpkin, sweet corn, sweet potatoes and yellow squash.

Foods that are white, tan and brown contain varying amounts of phytochemicals like allicin which include bananas, brown pears, dates, white nectarines, white peaches, cauliflower, garlic, ginger, Jerusalem artichoke, kohlrabi, mushrooms, onions, parsnips, potatoes (white fleshed), shallots, turnips and white corn.

Foods that are green in colour contain phytochemicals such as lutein and indoles, which have potential antioxidant, and health-promoting benefits. The foods that contain them are avocados, green apples, green grapes, honeydew melons, kiwifruit, green pears, artichokes, asparagus, broccoli, brussel sprouts, cabbage, beans, celery, cucumbers, endive, leafy greens, leeks, lettuce, green onions, okra, peas, green pepper, spinach, watercress and zucchini.

Foods that are blue or purple like blackberries, blueberries, blackcurrants, purple grapes, plums, prunes, raisins, purple cabbage, eggplant, purple Belgian endive, purple peppers and potatoes (purple fleshed) contain phytochemicals such as anthocyanins and phenols, which have potential antioxidant and anti-ageing benefits.

Horticultural crops generally have less water requirement than field crops. Table 3 gives an insight into how the water requirements are strikingly different for certain horticultural crops and cereals and sugarcane.

TABLE 3—WATER CONSUMPTION PATTERNS OF SOME FOOD CROPS

Crops	Water consumption (mm/kg yield)	Productivity(t/ha)	Calories supplied per kg of produce
Field crops			
Rice	300-2500	2.50	3490
Jowar	350-650	1.00	3490
Maize	400-750	2.30	3420
Wheat	300-450	2.90	3460
Sugarcane (juice)	1000-1500	67.50	390
Fruits			
Coconut	—	8300 nuts	4440
Banana	700-1700	35.9	116
Grapes	450-900	11.10	710
Mango	—	6.60	740
Guava	600-850	12.00	510
Citrus	600-950	8.80	480
Dates	900-1300	10.00	1440
Vegetables			
Tomato	290-430	19.00	200
Brinjal	250-300	17.50	240
Lady's finger	300-400	11.60	350
Potatoes	350-625	22.70	970
Cabbage	290-460	21.50	270
Cauliflower	440-540	18.30	300
Onion	229-460	14.20	500

From the above table it is clear that the water requirement of cereals and other field crops is high but the productivity is low compared to fruit and vegetable crops. The amount of calories they supply per unit area is also low and the horticultural crops supply other important nutrients in addition to empty calories.

Conclusion

Annual compound growth rates of fruits, vegetables, flowers and spices revealed that growth was significant for fruit crops, tremendous increase in growth rate for flower crops, where as growth was marginal for vegetable

crops and negative growth rate was observed for spice crops. The Benefit-cost ratio of major horticultural crops in Andhra Pradesh has been found to be more than that of the staple food crops, which is indicative that it is profitable and economically viable for small and marginal farmers to shift to horticultural crops. However, this study does not indicate that, entire cultivable area should be brought under horticultural crops. The land should be re-allocated in such a manner that optimal output and income is generated, keeping in mind the domestic demand, export targets and improving the economic conditions of the farmers.

It is estimated that India has 240 million acres of cultivable wasteland, which can be brought under orchard crops as they can be grown under rain fed conditions, without curtailing the area under food crops. Income levels of farmers can improve even if small amount of land is diversified towards horticulture, and more importantly towards vegetables and flowers when there is a possibility of year round cultivation. Farmers and women in urban areas can cultivate roses, gladiolus, gerbera, orchids, carnations, etc. which have high demand in urban areas. Slow growth in productivity is a cause of concern and needs to be addressed through appropriate technological, institutional and economic policies.

Farmers can also improve their income through value addition to the horticulture products through processing, packaging and marketing. For example, dry flowers for decoraration and flowers for extraction of perfumes and natural dyes can earn higher net returns to the farmers. Hi-tech cultivation under controlled conditions i.e. protected cultivation of high value crops is also another source of enhancing the income of horticultural farmers. Though initial establishment costs are high, government is giving subsidies to the farmers who are taking up protected cultivation of high value crops.

Finally, it is concluded that, farmers can get more benefits from horticultural crops by increasing area under improved or hybrid varieties through diversification from traditional crops to plantations, orchids, vineyards, flower garden, vegetable garden etc and also by increasing production and productivity of horticultural crops through advanced cultivation practices, i.e., high-tech horticulture.

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Improving Economic Viability of Small and Marginal Landholders through Vegetable Cultivation in Himachal Pradesh

S K Sharma and Virender Kumar[1]

Introduction

Though Himachal Pradesh has come to be recognised as an epitome of planned development throughout the country, yet agriculture and allied activities continue to be the mainstay of a majority of the population as these provide direct sustenance to more than sixty per cent of the population. These activities contribute around 16.0 per cent to the gross state domestic product. The agriculture in the state is dominated by the small and marginal landholders. At present there are 9.14 lakh total land holdings in the state with an average holding of 1.10 hectare. The small and marginal farmers with a landholding of up to 2.0 hectare account for 86.4 per cent of total peasantry in the state. Their share in the total operated area is 50.8 per cent. These holdings are highly scattered and fragmented and as such defy economies of scale and any serious efforts of farm mechanisation. In addition, the dependence of agriculture on nature in the state is very high as about 81 per cent of the cultivated area is rainfed and about 80 per cent of the total rainfall occurs during the monsoon period of June to September. This scenario of dwindling holding size, over dependence on nature and restricted scope of mechanisation make traditional agriculture unviable in this hilly state. Notwithstanding above scenario, agriculture in the state has witnessed umpteen changes during the past two decades. Most important of these changes is the transformation of agriculture towards the vegetable based diversification in the state. This process of agricultural diversification, which was hitherto confined to selected pockets and valleys in the higher and mid-hill areas, has expanded to new areas in the low and mid-hills of the state. Many new developments such as polyhouse cultivation of crops and growing of more lucrative cash crops have added new dimensions to the agriculture in the state. All these developments have led to boost the incomes of the small and marginal landholders in the state. With this background in view, the present paper seeks to highlight the scope of improving economic viability of small and marginal landholders through vegetable cultivation in the state of Himachal Pradesh using the evidence from field surveys.

1. Growing Marginalisation of Farming

The extent of land under plough, *inter alia*, directly affects production of crops and hence incomes of the farmers especially in hilly areas where cultivable land is scarce and highly fragmented. During the past four decades, the number of land holdings in the state has grown up from 6.09 lakh in 1970-71 to 9.33 lakh in 2005-06 registering an increase of 54 per cent (Table I). Though the total area cultivated by these holders increased marginally from 9.30 lakh hectares to 9.68 lakh hectares during the same period, the average land holding has come down from 1.53 hectares in1970-71 to 1.04 hectares in 2005-06 in this hilly state, indicating 32 per cent decline during the same period. As a result, these holdings are being increasingly rendered uneconomic and unprofitable for farming. Besides, due to lack of land consolidation, the holdings are scattered and hence become difficult to manage. Land lease and tenancy regulations, on the other hand, do not allow farming on large areas in the state (Go I, 2005).

So far as the average size of operational holding across districts is concerned, in 1970-71 holding size in Sirmaur and Solan was greater than two hectares while except Kullu where holding size was less than one hectare, all others districts had holding size ranging from one to two hectares. The scenario in 2005-06 revealed that Sirmaur sustained its holding size of greater than two hectares while Chamba and Bilaspur joined Kullu district where the holding size was less than one hectare. The rest of the districts had holding size in the range'of one to two hectares. It implies that overtime the holding size became smaller and small and marginal farmers grew rapidly in the state which is a great challenge to agricultural development in the state.

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TABLE 1—DISTRICT-WISE OPERATIONAL HOLDINGS IN HIMACHAL PRADESH, 1970-71 TO 2005-06

Sr. No.	Districts	Agricultural Census					
		1970-71			2005-06		
		Number (lakh)	Area (lakh ha)	Average Size (ha/farmer)	Number (lakh)	Area (lakh ha)	Average Size (ha/farmer)
1.	Bilaspur	0.32	0.46	1.46	0.56	0.52	0.92
2.	Chamba	0.49	0.54	1.11	0.70	0.55	0.79
3.	Hamirpur	0.46	0.72	1.57	0.73	0.74	1.01
4.	Kangra	1.34	2.18	1.62	2.30	2.04	0.89
5.	Kinnaur	0.07	0.12	1.86	0.11	0.14	1.37
6.	Kullu	0.52	0.40	0.78	0.68	0.42	0.63
7.	Lahaul & Spiti	0.03	0.05	1.90	0.04	0.06	1.54
8.	Mandi	0.96	1.17	1.22	1.50	1.29	0.86
9.	Shimla	0.63	1.12	1.78	1.10	1.25	1.13
10.	Sirmaur	0.33	0.79	2.43	0.49	0.99	2.02
11.	Solan	0.38	0.87	2.26	0.50	0.87	1.73
12.	Una	0.58	0.88	1.53	0.63	0.81	1.29
Himachal Pradesh		6.09	9.31	1.53	9.33	9.68	1.04

Source: Statistical Outline of Himachal Pradesh (various issues), Department of Economics & Statistics, Shimla-9, Government of Himachal Pradesh.

A usual practice in most of the regions is to classify farmers into various categories based on the land at their disposal. It is helpful in designing plans, strategies and policies for agricultural development because the socio-economic conditions differ in each case. Based on their land holding, farmers in Himachal Pradesh are categorized into five size classes of marginal farmers, small farmers, semi-medium farmers, medium farmers and large farmers (Table 2). It can be seen that most of the farmers (68.21%) in the state were marginal having only 26.67 per cent (almost one-fourth) of the cultivable land with them. The next largest category was small farmers (18.82%) cultivating about one fourth (25.27%) of the cultivable land which is nearly the same as that of marginal farmers.

TABLE 2—DISTRIBUTION OF VARIOUS FARM SIZE CATEGORIES IN HIMACHAL PRADESH, 2005-06

Sr. No.	Category	Size Class (ha)	Number ('000)	Percentage	Area ('000 ha)	Percentage
1.	Marginal	<0.05	418.78	44.87	103.64	10.70
	Farmers	0.05 - 1.0	217.84	23.34	154.60	15.97
		Sub-Total	636.62	68.21	258.25	26.67
2.	Small Farmers	1.0 - 2.0	175.65	18.82	244.74	25.27
3.	Semi-	2.0 - 3.0	62.26	6.67	150.36	15.53
	Medium	3.0-4.0	26.19	2.81	89.99	9.29
	Farmers	Sub-Total	88.45	9.48	240.36	24.82
		4.0 - 5.0	12.91	1.38	57.26	5.91
4.	Medium	5.0-7.5	12.17	1.30	72.97	7.54
	Farmers	7.5 - 10.0	4.06	0.43	34.77	3.59
		Sub-Total	29.14	.3.12	164.99	17.04
5.	Large	10.0 - 20.0	3.08	0.33	39.63	4.09
	Farmers	>20.0	0.45	0.05	20.37	2.10
		Sub-Total	3.53	0.38	60.01	6.20

Source: Statistical Outline of Himachal Pradesh, Department of Economics & Statistics, Shimla-9, Government of Himachal Pradesh.

Furthermore, semi-medium farmers occupied the third position (9.48%) but have almost equal share of the cultivable land (24.82%) as that of marginal and small farmers. Higher positions showed more inequalities, medium farmers constituted only 3.12 per cent but accounted for 17.07 per cent of cultivable land. Similarly, large farmers were less than half per cent (0.38%) but were having 6.20 per cent of the total land. It could be concluded that wide inequalities have emerged in land distribution in the state which pose a threat to the growth and viability of marginal and small farmers in the long run.

2. Improving Economic Viability of Small and Marginal Landholders through Vegetable Cultivation

The enticing returns from high value cash crops and equally incentivised policy framework of agricultural diversification of state government have allured the farmers in the state to undertake the cultivation of these crops. Resultantly, the state has witnessed appreciable agricultural diversification towards high-value cash crops, especially off-season vegetables. The cultivation of vegetables such as green peas, tomato, beans, cabbage, cauliflower, capsicum, etc which was earlier confined to mid and high-hill pockets has expanded to newer areas in low and mid-hills in the post mid 1990s. Recently, the polyhouse Cultivation of vegetable and flower crops has given further impetus to the diversification of agriculture in the state (Kumar, 2011). These changes have been appositely captured in Table 3. The area under vegetables witnessed almost three-fold increase from 23000 hectare in 1990-91 to nearly 64000 thousand hectare at present. Consequently, the production of vegetable grew from 3.65 lakh tonnes to 12.06 tonnes during the same period. Here it is worth mentioning that the average productivity of vegetables exhibited smaller increase from 15.87 tonnes per hectare to 18.88 tonnes per hectare in 2009-10. Put in other words, it is amply evident that most of the increased production of the vegetables has come through an increase in area as shown by the compound growth rate (CGR) of 6.29 per cent per annum. The growth rate in productivity of vegetables, however, was 0.93 per cent per annum. Thus, there is a strong need to increase the productivity of vegetables in the state if vegetable cultivation is to continue augmenting the incomes of the farmers in the state.

TABLE 3—AREA, PRODUCTION AND YIELD OF VEGETABLES CROPS IN HP. 1990-91 TO 2009-10

Year	Area (ha)	Production (tonnes)	Yield (t/ha)
1990-91	23,000	3,65,000	15.87
1994-95	24,500	4,00,000	16.33
1998-99	29,000	5,00,000	17.24
2002-03	35,220	6,21,918	17.66
2009-10	63,879	12,06,242	18.88
Growth rate (per cent per annum)	6.29* (0. 7466)	7.28* (0. 6730)	0.93* (0.2766)

NOTE: Figures within parentheses are standard errors. * Indicates significance at 5 % probability level. Source: Kumar, 2011.

The crucial role of vegetable cultivation in improving the economic viability of small and marginal landholders in this hilly state has been revealed by various field level studies conducted by the CSK HPKV, Palampur from time to time. In a recent such study under the flagship scheme 'Rashtriya Krishi Vikas Yojna (RKVY)' of the Central Government, it was found that the farmers earned fairly high net returns through cultivation of these vegetable crops (Table 4). As is evident from this table, the farmers were found to earn net returns varying from Rs. 273140 in capsicum to Rs 43861 in tomato over Cost D from one hectare in different districts of the state where these crops are grown predominantly. The net returns over Cost D from green pea cultivation in the tribal districts of Kinnaur and Lahaul Spiti were Rs 249446 and Rs. 105400 per hectare, respectively. Thus, it is amply evinced by these studies that the cultivation of vegetables in this hilly state has helped the farmers in overcoming the constraint of small sized landholdings by providing higher returns per unit of land.

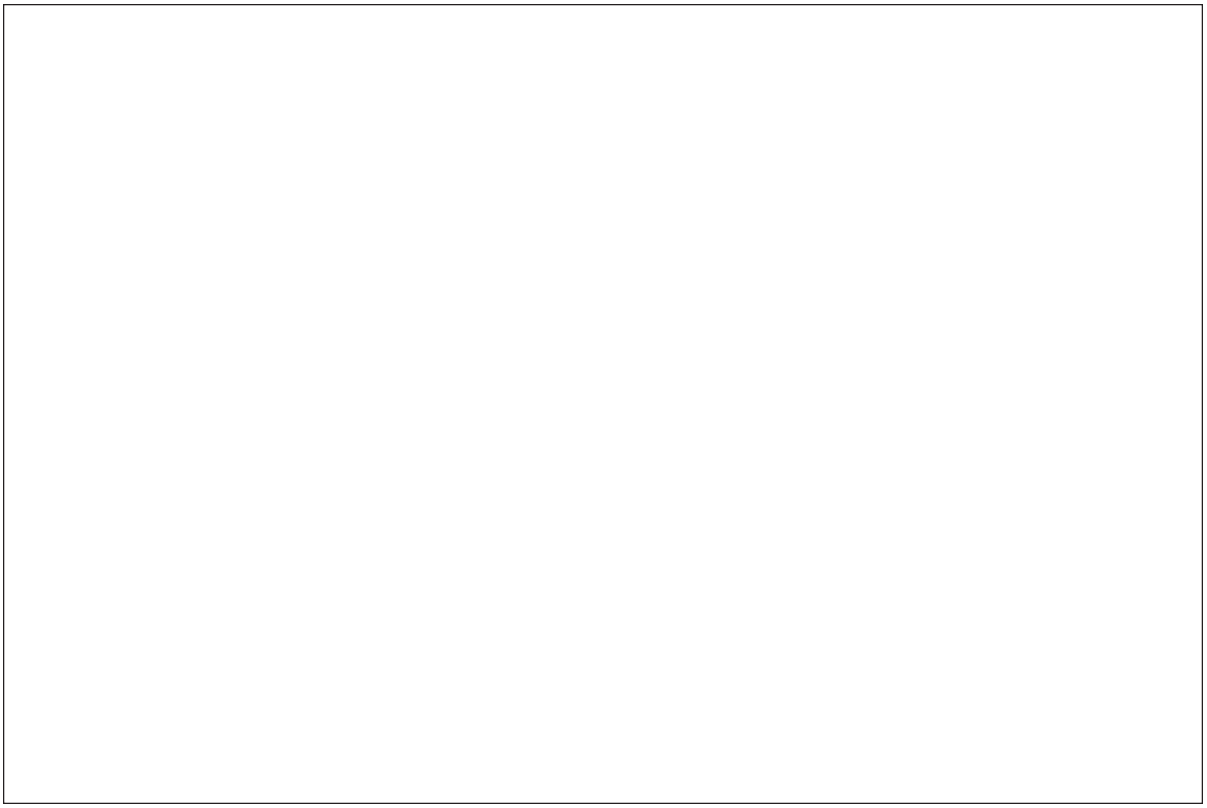
TABLE 4—RETURNS FROM DIFFERENT VEGETABLE CROPS IN HIMACHAL PRADESH

(Rs/ha)

Crop	Gross Returns (Rs/ha)	Net Returns (Rs/ha) over			
		Cost A_1	Cost B	Cost C	Cost D
1. Capsicum (Solan)	585000	472966	382116	301491	273140
2. Pea (Kinnaur)	497745	387617.5	317018	272018	249446
3. Pea(Lahaul and Spiti)	314750	236282	165682	124432	105400
4. Ginger Sirmaur and Bilaspur)	361850	209187	165075	97575	71150
5. Tomato (Solan and Sirmaur)	415950	331725	239937	77687	43861
6. Garlic (Sirmaur and Kullu)	330000	190850	163824	73074	47386

Source: Department of Agricultural Economics, Extension Education & Rural Sociology, CSKHPKV, Palampur.

In another study (Sharma *et al*., 2004) examining the overall land productivity across various mountain farming systems, it was' observed that the gross income per hectare of land holding was remarkably higher under vegetable based systems in both the low and mid hills zones showing the better use of land resource (Fig. 1). Further, the composition of farm incomes evinced that vegetable crops made significant contribution towards farm incomes under vegetable based systems. Around 40 per cent of the gross farm income was derived from vegetable crops in both the zones. The contribution of foodgrains was fairly low at 16 to 20 per cent whereas livestock made significant contribution (32 to 38 per cent). The average gross farm income was estimated at Rs. 62230 per farm in low hills zone and Rs 69351 per farm in mid hills zone. This goes to substantiate the fact that cultivation of vegetable crops



Figl. Land Productivity under Different Mountain Farming Systems in H P.

certainly leads to an improvement in the viability of the small and marginal land holders in the state.

The high income earning potential of vegetable crops along with fruit crops, especially in high and mid hill districts of Lahaul and Spiti, Shimla, Kullu, Kinnaur, Solan and Sirmaur has also been highlighted by a country level study (Chand et ai., 2009). It was reported that the average agricultural productivity expressed in rupees per hectare in these districts ranged from Rs 78 thousand in Sirmaur to Rs 1.5 lakh in Lahaul and Spiti. The three districts of Lahaul and Spiti, Shimla and Kullu recorded per hectare productivity of more than Rs 1.0 lakh. This was the highest observed productivity throughout the country in a study of 551 districts. Only one district, Howrah in West Bengal, with a flat topography could cross the Rs. one lakh mark. All the above mentioned studies amply prove that notwithstanding growing marginalisation of holdings in the state of Himachal Pradesh, the vegetable based diversification of agriculture has helped in improving the economic viability of small and marginal landholders.

3. Factors Responsible for Agricultural Diversification

Rising incomes as a result of economic growth lead to changes in the consumption basket of people towards high value commodities such as vegetables, fruits, milk and milk products, meat and fish, etc. The growing urbanisation, the availability of newer technological options, declining agricultural prices, expanding role of private sector, improving supply chain management, improving food and nutritional safety, growing trade liberalization, etc. are the other factors that have been found to influence the process of agricultural diversification across space and time. The analysis of the factors facilitating crop diversification towards vegetables in Himachal Pradesh revealed that this transformation has been brought about by adopting developmental strategies that sought to create basic infrastructural facilities such as strong road network and appropriate R & D institutions in the state. In addition, the availability of huge market in the neighbouring states, high level of market consciousness among farmers and the emergence of self-help institutions were other important drivers of the ongoing process of crop diversification. The field studies have further shown that in addition to the inherent variations in agro-climatic and socio-economic conditions, factors like landholding size, availability of irrigation facilities, availability of family labour, family size, non-farm income and education of the head of the family were other important determinants of the process of crop diversification in the state (Sharma, 2011).

Conclusions

The facts brought out in the foregoing analysis are indicative of the growing marginalisation of landholdings in the state of Himachal Pradesh. The fragmented and scattered pattern of these holdings further renders them uneconomical when only traditional crops are grown on these holdings. However, more lucrative option of growing cash crops such as off-season vegetables in the state has provided a silver lining for the vast majority of the peasantry in the state, more so in the mid to high hill districts. The proper development strategy of the successive state governments, spot on support of R & D institutions and the hard work of hill peasantry have gelled together in promoting this agricultural transformation. All these endeavours have been contributing towards the augmentation of the incomes of small and marginal farmers in the state, thus leading to the improvement in their living standards.

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Viability of Small and Marginal Farmers in India: An Overview of Initiatives by the Government of Karnataka

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Agriculture continues to be the mainstay for a majority of Indian population even in the present times of rapid changes taking place in industrial and service sectors. This primary sector still provides employment to about 58 per cent of the workforce, and has the responsibility of feeding a vast population, besides providing the basic raw materials to the manufacturing sector. However, the performance of the sector has been discouraging in recent times causing concern among policy makers about its very viability. . With the share of agricultural sector in the GDP persistently declining (presently, less than 15 per cent), the average annual growth of the sector during the last two decades was less than half (around 3 per cent) of the overall average growth of the economy (6-7 per cent). The dismal performance of the sector could be traced back to a host of causes such as predominance of dry land farming, depleting soil fertility, declining growth in public investment for agricultural R&D, spurious quality inputs, small sized holdings, credit constraints etc.

The issue of small sized holdings in Indian agriculture has always been a subject matter of serious discussions at various levels owing to their large number on the one hand and various constraints surrounding them on the other. The operators of small sized holdings are of two types - small and marginal farmers. While the small farmers are the ones, who operate the holdings of 2.5 to 5 acres, the marginal farmers operate the holdings of less than 2.5 acres. In 2005-06, marginal and small farmers accounted. for 83 per cent of the operational holdings in the country and 41 per cent of the operated area. While 65 per cent of these operational holdings are marginal with an average size of only 0.20 ha, 18 per cent are small with an average size of 1.42 ha. The small sized holdings restrict farmers' ability to invest in improved technology or purchase expensive high yielding inputs. In addition, their bargaining power in the market is very meagre. As such, small and marginal farmers find it difficult to generate adequate income for their living, especially when they depend mainly on low value subsistence crops without the alternative options of off farm income. At the all India level, 42.40 per cent of small and marginal farmers were dissatisfied with farming as against 28.10 per cent of medium and large farmers (NCEUS, 2008). This is indicative of the adversities encountered by small and marginal farm operators. It is for this reason that the Twelfth Plan Working Group on Disadvantaged Farmers Including Women [12th Plan WG on D&W Farmers] (2011) rightly identified small and marginal farmers, among others, as disadvantaged farmers.

The constraints faced by the small and marginal farmers, which render their farm operations economically non-viable can be grouped as:

(a) Capital constraints, which inhibit the use of high yielding inputs

(b) Technological constraints in terms of limited availability of technology that matches their resource base

(c) Infrastructure and institutional constraints that take the form of inadequate farm implements, lack of irrigation and poor transportation and storage facilities

(d) Production constraints that prevent this class of farmers from' venturing into high value crops like fruits owing to the long gestation period and inability of farmers to wait for long to reap the benefit

(e) Credit constraints that arise on account of their ignorance about the products available in the financial markets and inability to offer required security

(f) Market constraints due to the small marketable surplus, which limits their bargaining power

The economic viability issues of small and marginal farmers have prompted several researchers to probe into the matter and suggest remedial measures to make their farm operations viable. For example, Mandeep et al (2009), who probed into the factors influencing the viability of small and marginal farmers in Punjab concluded that the intensity of various factors in demarcating the farmers into viable and non-viable ones differed across regions and farming categories. They opined that value productivity of crops, farm investment, income from off-farm activities and supplementary enterprises like dairying contributed to the viability of farms.

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Meenakshi Rajeev et al (2011) investigated into the nature and dimensions of farmers' indebtedness in India and opined that small and marginal farming households needed credit on a continuous basis to meet their working capital needs, but faced constraints in accessing it both from formal and informal sources. They observed that the small and marginal farmers constituted around 80 per cent of the total farm operators, but their access to institutional credit was poor. For example, the percentage of formal loan to the total outstanding loan was only 24 per cent for farmers with less than 0.01 ha holdings; around 45 per cent for the farmers with holding size of 0.01 - 0.40 ha, and around 53 per cent for the ones operating holdings of 0.41 - 1.00 ha. For small farmers, the share of formal loan in the total outstanding loan was around 58 per cent. The authors, thus, called for a greater access to the institutional credit in respect of these farm operators.

Wader *et al* (1996) conducted a pilot study in North Karnataka to examine the economic viability of small farmers. The findings of the study revealed that the small and marginal farmers, who were dependent exclusively on rainfed farming, failed to achieve economic viability. It was noticed that 82 per cent of non-viable small farmers were the ones that practiced only rainfed farming. On the contrary, it was pointed out that more than 80 per cent of viable cases were those of the farmers having irrigation facilities. This highlighted the importance of irrigation in imparting viability into the farm operations of small farmers, and called for institutional arrangements for providing minor irrigation opportunities. It was also pointed out by the findings that enterprise diversification with subsidiary occupations like dairy, poultry etc would render the small farm units viable. This was "established from the fact that more than 79 per cent of viable small farms had subsidiary enterprises along with the crop enterprises. It was also revealed that the high value crops like sugarcane, cotton, chilli, fruits and vegetables added to the viability of the small land holders. The investigators held that the promising enterprises for attaining economic viability would vary across the agro-climatic locations. As such, they prescribed zone specific viable enterprises for eight agro-climatic zones of the Northern Karnataka.

Recognizing the crucial role of small and marginal farmers in the agricultural scenario of the country, the governments, both at the central and state levels, are engaged in devising the strategies to induce viability into their farming operations and transforming their livelihoods. Several central sector schemes of the Government of India offer various types of benefits for farm operators with special package of assistance for small and marginal farmers. The assistance available for horticultural operations under National Horticulture Mission, financial security assured under National Agricultural Insurance Scheme (NAIS), subsidized premium facility for small and marginal farmers under NAIS, subsidies extended for construction of rural godowns under Grameena Bhandar Yojane, debt waiver of small and marginal farmers and one time settlement (OTS) of non-performing assets (NPA) of other category of farmers under Agricultural Debt Waiver and Debt Relief Scheme, 2008 etc are some of the initiatives that reflect the concern of the central government towards making viable the livelihood of farmers in general and small and marginal land holders in particular. In a similar way, one can find several steps initiated by the state governments for the improving the farming conditions of agriculturists with a special emphasis on small and marginal land holders. Karnataka is one such state, where one can see several instances of efforts made by the State Government in this regard.

In Karnataka, like in other states, agriculture is characterized by the predominance of small and marginal land holdings. The total number of operational holdings in the state increased from 70.79 lakhs in 2000-01 to 75.81 lakhs in 2005-06 registering an increase of 7.10 per cent. During this period, the average size of land holdings decreased from 1.74 ha to 1.63 ha. The marginal holdings in the state have a maximum share of 48.2 per cent in the total operational holdings accounting for a mere 13.3 per cent of the area operated, while the small holdings account for 26.60 per cent of the operational holdings and 23.2 per cent of operated area.

The state of Karnataka takes pride of having presented a -separate budget for agriculture. The governments in the state, from time to time, have been implementing several programmes for the welfare of the farming community, some of them being specially designed for small and marginal farmers. The programmes intended to help the farming community in general include, among others, setting up of quality control laboratories to test seed, fertilizer and soil quality; establishment of Organic Farming Mission; distribution of quality seeds at subsidized rates; assistance for establishing threshing yards; distribution of agro processing equipments; promotion of farm mechanization through the distribution of High-tech farm implements with subsidy; subsidized supply of micro-nutrients, bio-fertilizers, gypsum, vermicompost, oil cakes etc; subsidy for production of bio-fertilizers; financial assistance for promotion of micro irrigation; relief for the families hard hit by farmers' suicides; relief for farmers' death by snake bite or fall from trees; assistance for the formation of Raitha Shakti Groups; assistance for farmers' study tours; setting up of Raitha Samparka Kendras for transfer of technology and scheme implementation; waiver of a loan amount of Rs.25,000 obtained from co-operatives; lending of interest free loan of rupees one lakh from co-operatives etc.

In addition to the above schemes that target the farming community in general, there are a few programmes that are implemented with the sole intention of assisting

small and marginal farmers. For example, recognizing the fact that the capacity of small and marginal farmers to make investment in expensive farm implements is limited and hence they can not conduct agricultural operations in time in the face of high implement cost and scarcity of agricultural labour, the government has been establishing custom hire-service centres from where these farmers can hire tractor and other high-tech implements on rental basis. During 2011-12, a total of 660 hire service centres were started across 13 districts, one each for a cluster of ten villages for providing agricultural implements to farmers on rental basis under Rastriya Krishi Vikas Yojana through registered Primary Agricultural Credit Co-operative Societies.

Based on the success of this scheme, a sum of Rs. 50 crores has been proposed in the budget for 2012-13 for opening another 500 hire service centres across the remaining 17 districts, each at a cost of Rs. l 0 lakh through selected registered co-operative societies. A decision to this effect has been already taken by the state cabinet.

Recognizing the importance of irrigation in making small and marginal farmers economically viable, the Government of Karnataka launched Ganga., Kalyan Scheme. The programme offers subsidy for small and marginal farmers of backward classes, who would like to dig borewells. This facility is available both for community irrigation and individual borewells. In respect of community irrigation scheme, the small and marginal farmers, who have totally eight acres of land comprising three beneficiaries, will get two borewells; those having 15 acres of land comprising five beneficiaries will get three borewells. Borewells will be drilled underground, submersible pump sets will be installed and energisation for the borewell will be done by the Karnataka Minorities Development Corporation Limited. This scheme is entirely a subsidy scheme. In respect of an individual beneficiary holding 2 to 5 acres of land, one borewell will be drilled and pumpset will be supplied. The total expenditure allowed is Rs. l,00,000/- (Grant of Rs.86,000 + loan of Rs.14,000), which includes energisation charges. An allocation of Rs.95 crores for this scheme has been made in the state budget for 2012-13.

Yet another novel experiment of the Government of Karnataka (GoK) towards empowering small and marginal farmers of the state is Suvarna Bhoomi Yojane (SBY). This scheme aims at transforming the livelihoods of small and marginal farm households by providing an incentive of Rs 10,000 per family to develop two acres of their agricultural land by shifting from low-value to high-value crops like fruit trees, vegetables, spices, and medicinal and aromatic plants. The programme, which was started during the year 2011-12, benefitted around 0.25 million farmers. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), which has innovated and tested new development pathways along with GoK for improving livelihoods of small and marginal farm households through Sujala-ICRISAT watershed development and Bhoochetana-ICRISAT mission mode initiatives, is leading the consortium to provide technical support to the SBY in 30 districts. The other consortium partners include Department of Horticulture, State Agriculture Universities (SAUs) at Bangalore, Dharwad and Raichur, University of Horticultural Sciences, Bagalkote (UHS), Bangalore University, Department of Agriculture, Watershed Development Department, Indian Institute of Horticulture Research (IIHR) and Non-Governmental Organisations (NGOs), among others.

Impact of SBY on the Lives of Small and Marginal Farmers:

For a quick feel of the impact of the programmes targeting small and marginal farmers in the state, the case of SHY may be considered. The project took off in June 2011, and completed 12 months of its operation in May 2012. In this context, ICRISAT, the consortium leader, took up an evaluation work to assess the impact of the programme (ICRISAT, 2012). The assessment study was carried out in all the 30 districts of the state. For this, information on crop adaptation, yields and economic benefits was collected trom SBY and non-SBY farmers using structured and pre-tested household questionnaires. In addition, SBY farmers, who had undertaken demo trials with improved management practices, were also covered to facilitate comparion of yield and economics across Non-SBY farmers, normal SBY farmers and SBY farmers with improved management practices. For selecting sample households, standardized methodology was used. Accordingly, 5.5 per cent of total SBY beneficiaries were selected. The number of non-SBY farmers selected from each district was half the number the SBY beneficiaries selected. For the entire state, the sample size was 20,699 farmers consisting of 12,730 SBY beneficiaries, 1,604 farmers, who took demo trials with improved management practices, and 6,365 non-SBY farmers. The data were collected between January—April, 2012.

Table 1 presents the average gross returns (Rs/ha) from the selected field crops without SBY and vegetable crops with SBY. The gross returns from SBY are presented both for normal SBY operations and improved SBY operations. These results need to be considered only as indicative as the numbers in the table are gross returns and not the net returns. It can be observed that the gross returns from vegetable cultivation under SBY (Rs.85,800—Rs. 2,51,000 per ha with normal operations and Rs. l,04,400 - Rs. 3,10,000 per ha with improved management) were much higher than those from field crops (Rs. 22,000 -Rs. 57,700 per ha). These findings point out the potential of SBY in that the additional gross returns from vegetable production under SBY were considerably large, which could more than offset the additional production costs associated with the

switch over to vegetable cultivation from traditional field crops, leaving the producers with additional net surplus.

The impact assessment study also made projections of improvement in the income of farmers, who could allocate 20 per cent of the area under field crops (non-SBY scenario) to the production of vegetables under SBY. The projections were made for various combinations of field crops (from which 20 per cent area would be taken away), vegetable crops (which would be taken up under SBY on the 20 per cent area displaced from field crop) and districts. For exposition purpose, Table 2 presents a few of such projections made by the assessment team of ICRISAT. As in the case of the previous table, the numbers in table 2 are gross returns only. As such, the results need to be taken as indicative only and interpreted with caution. It can be seen

TABLE 1—GROSS INCOME BEFORE AND AFTER SBY

(Rs/ha)

Before SBY		With SBY		
Major Field Crops	Gross Income (Rs/ha)	Major Vegetable Crops	Gross Income With Normal Practices (Rs/ha)	Gross Income With Improved Management (Rs/ha)
Maize	57,700	Tomato	1,02,000	1,26,000
Pearl millet	22,000	Brinjal	2,51,000	3,10,000
Ragi	28,500	Okra	1,11,200.	1,44,000
Sorghum	41,000	Red chillies	1,92,000	2,37,000
Green gram	40,900	Onion	85,800	1,04,400
Groundnut	51,600	Cabbage	1,57,800	2,08,800
Sunflower	47,000	Beans	2,21,000	2,69,000

Note: the numbers in the above table were extracted from the ICRISA T report

TABLE 2—PROJECTED IMPROVEMENT IN INCOME FROM SHIFTING OF AREA FROM FIELD CROPS TO VEGETABLES UNDER SBY

Field Crop	District	Gross Income with Field Crop (Non-SBY Scenario)	Improvement in Income with 20 per cent of Field Crop Area Allocated to Vegetable Crop (%)				
		(Rs/ha)	Tomato	Brinjal	Okra	Chillies	Beans
Maize	Bagalkot	53,240	27	96	34	69	81
	Bijapur	47,872	33	110	40	79	92
	Dharwad	98,736	06	43	09	28	34
	Gadag	55,440	25	92	32	65	77
	Haveri	71,016	15	67	21	47	56
Groundnut	Bellary	23,920	85	239	100	178	205
	Bijapur	9,200	254	354	293	495	565
	Haveri	84,180	10	54	14	36	44
	Koppal	61,410	21	81	27	57	68
	Raichur	27,140	73	208	86	155	178

Note: the numbers in the above table were extracted from the ICRISAT report

from the table that allocating 20 per cent area of field crops to vegetables would, in general, considerably increase the gross returns across districts. For example, by taking away 20 per cent of area under maize and allocating it to tomato crop, gross income could be enhanced by as much as 33 per cent, on an average, in Bijapur district; displacing the same amount of land from groundnut production and devoting it for tomato production would increase the income by 254 per cent in this district. These projections indicate the potential of the programme to increase the

income levels of small and marginal holders, who would be willing to take up vegetable production instead of growing only field crops. Not withstanding these indicative findings, the Government of Karnataka is of the opinion that the progress achieved under the SBY in 2011-12 was not fully satisfactory owing to the drought conditions during the year. As such, the state has decided to. reformulate the programme and implement it more successfully during 2012-13. .

To conclude, small and marginal farmers are an integral part of the Indian agricultural system. The economic viability of this class of farm operators is important not only for their livelihood sustenance, but also for the food security and overall farm prosperity in a country like ours, where agriculture is still a mainstay for a majority of population. Achieving viability of this group of farmers requires certain changes in their farming environment. For example, creating irrigation facilities, enabling them to take up subsidiary occupations like dairy and motivating them to include high value crops like fruits and vegetables in their cultivation practices go a long way in making the farm operations of small and marginal farmers economically viable. Our Governments, both at the centre and the states, have been devising the strategies from time to time for providing economic living for our farmers, especially the small and marginal ones.

The Government of Karnataka, which has a distinction of having presented a separate budget for agriculture, has come out with several plans and programmes for the benefit of farmers with a special emphasis on small land holders. The programmes aimed at waiving off cooperative loans, providing farm machinery on rental basis, strengthening irrigation capabilities, encouraging small operators to switch to high value crops and providing interest free cooperative loans are some of the initiatives that the state can boast of in its endeavour to uplift the lot of small and marginal farmers. It is heartening to note that the state is incessantly looking forward to the new ways to achieve the goal of economic viability for small and marginal farmers.

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Livestock Sector in India: Strategies for Enhancing Smallholders' Income

RAKA SAXENA[1] AND A K SRIVASTAVA[2]

The Indian Livestock Economy

The Indian livestock system is the endeavour of smallholders. Livestock keeping is a centuries-old tradition for millions of Indian rural households and domesticated animals have been an integral part of the farming systems since time immemorial. Livestock sector contributes significantly to the Indian economy and comprises of the livestock wealth socio-economic development in the country. It has 56.7% of world's buffaloes, 12.5% cattle, 20.4% small ruminants, 2.4% camel, 1.4% equine, 1.5% pigs and 3.1% poultry. In 2010-11 livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP (GOI 2011). Livestock keeping is an integral component of Indian agriculture supporting livelihood of more than 2/3 of rural population. Rural households keep livestock because of the wide spectrum of benefits such as income, food, manure, draft power and social status. According to livestock census 2007 there are 199.08 million cattle and 105.34 million buffaloes (Table 1). There has been increase in livestock population with positive growth in different categories of milch animals between 2003 and 2007 livestock census. A larger growth has been noticed in case of small ruminants.

TABLE 1—LIVESTOCK POPULATION IN INDIA

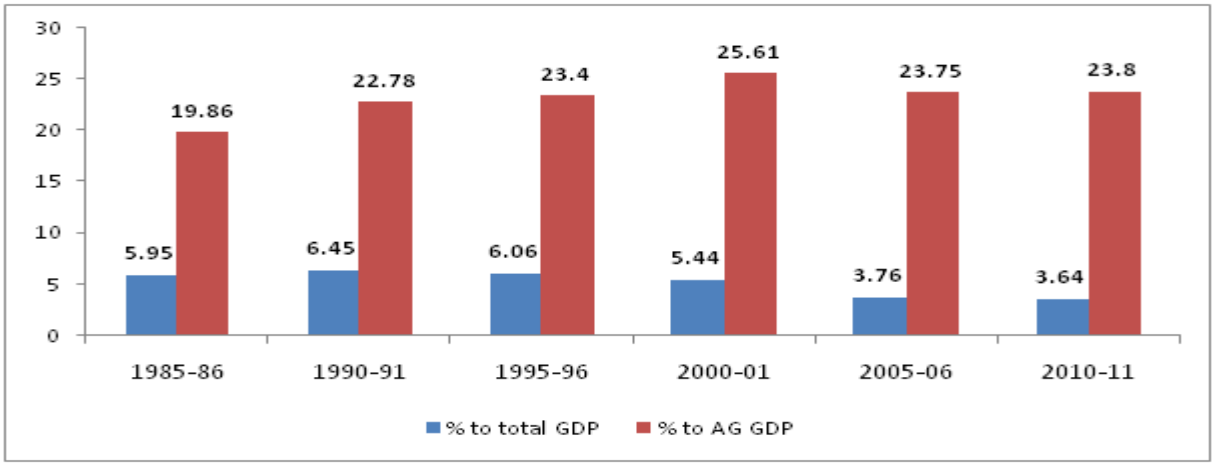
Species	Livestock Census		Growth Rate (%)
	2003	2007	2007 over 2003
Cattle	185.18	199.08	1.83
Buffalo	97.92	105.34	1.84
Sheep	61.47	71.56	3.87
Goat	124.36	140.54	3.10
Total Livestock	**485.00**	**529.70**	**2.23**

Source: GOI (2012)

The Livestock Revolution

Moving on to the development path, Indian economy has witnessed various signs of development. The share of agricultural sector in total GDP has declined from around 34 per cent in 1981-82 to 15 per cent in 2010-11. Consequently the share of livestock sector also declined and reached to 3.6 per cent in 2010-11, however, the share of livestock in agricultural GDP has increased from 19.86 per cent in 1985-86 to 23.8 per cent in 2010-11 (Fig. 1), this illustrates the importance of livestock sector in Indian economy.

Fig 1: Contribution of livestock sector to Indian economy and agricultural sector



Source: GOI (2012)

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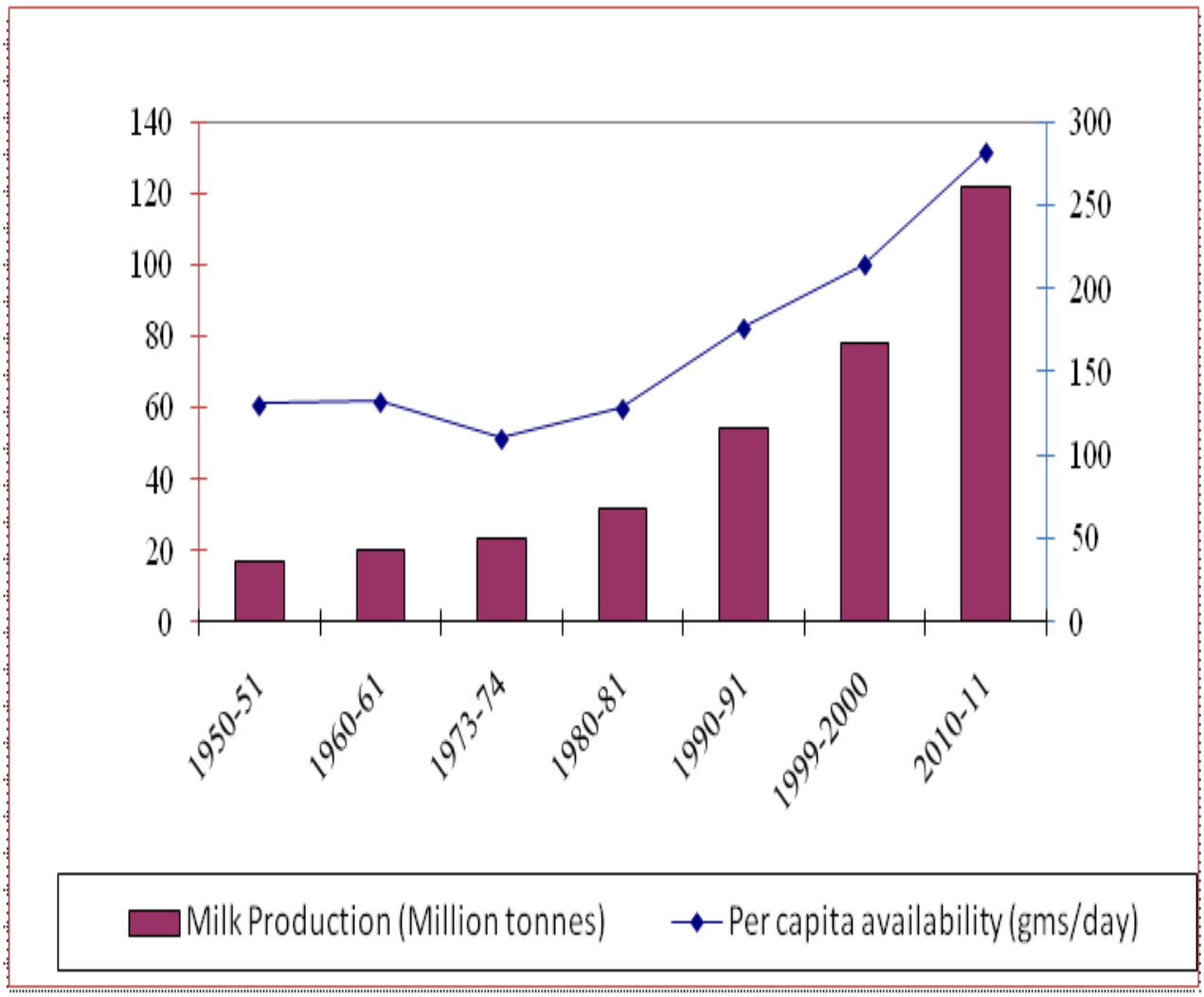
India has made rapid strides in milk production and the milk production has increased from 17 million tons in 1950-51 to 121 million tons in 2010-11 (Fig. 2), registering a steady growth rate of 3.5-4.5 per cent during this period as against the world average growth rate of about one per cent. Livestock sector is an integral part of farming system of Indian economy, adding value to the tune of more than Rs.170 thousand crore (4.4%) to the country's GDP (CSO, 2009). The share of livestock sector in value of output from agricultural and allied activities has increased from 25.8% in TE2001/02 to 27.8% in TE2010/11; thanks to the enhanced production of livestock products, especially that of milk which accounts for 68% of the value of output from livestock sector. The contribution of milk group is higher (Rs. 1,78 th crore) than that of paddy (Rs. 1,23 th crore), wheat (Rs. 83 th crore) and sugarcane (Rs. 26 th crore). About 80 per cent of milk produced in the country is handled in the unorganized sector and the remaining 20 per cent is equally shared by cooperatives and private dairies (Economic Survey, 2009-10). More than 80 percent of milk produced in the country comes from small holding and landless farmers.

Fig. 2: Trends in milk production per capita availability in India.



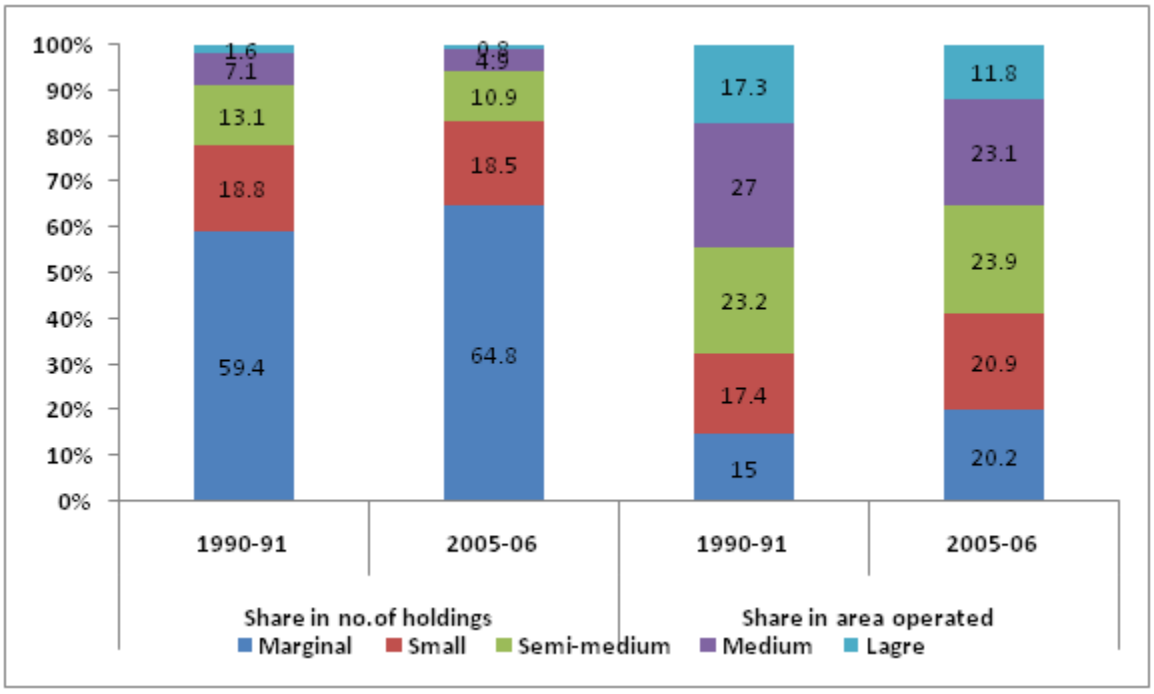
Source: GOI (2012)

Shrinking Landholding and Contribution of Smallholders

Indian agriculture is dominated by small and marginal farmers, constituting around 83 per cent share in the number of holdings during 2005-06. Small holder agriculture is important for ensuring sustainable agriculture growth, food security and livelihood security in India. However, it is alarming to note that despite of constituting 83 per cent share of number of holding small and marginal farmers operated only 41 per cent area, whereas, large farmers holding less than 1 per cent share in the number of holding operated around 12 per cent area (Fig 3). A tremendous increase of 28.92 per cent was noticed in the

number of marginal and small holdings during 1990/91 to 2005/06 whereas the number of large holdings declined from 1654 to 1096, showing a decline of 33.57 per cent. The holdings are continuously being fragmented and seek attention of policy makers in terms of suitable policy formulation.

Fig. 3: Distribution of no. of holdings and area operated by major size classes



Source: GOI (2012)

Distribution of livestock holding in general and milch animal in particular appears to be far less unjust than distribution of land holding. The small holders (both marginal and small farmers) in India constituting 83 per cent share in number of holdings share around 72 per cent of the livestock (Table 2). This indicates that livestock keeping is an inseparable part of smallholder's economy. This also establishes the relationship between the class status and livestock holding. On an average, the smallholders keep 1 to 2 cattle and buffalo and 1 small ruminant. The number of livestock increases as we move further in the hierarchy of size classes.

TABLE 2—DISTRIBUTION OF LIVESTOCK ACCORDING TO DIFFERENT SIZE CLASSES, 2005-06

Category of land holding	Distribution of livestock (%)	Number of holdings (000)	Operated area (000)	Area per holding	Livestock per holding	
					Cattle & Buffalo	Sheep & Goat
Marginal (< 1 Ha)	50.1	83694	32026	0.38	1.45	0.82
Small (< 2 Ha)	21.6	23930	33101	1.38	2.30	1.43
Semi-medium (< 4 Ha)	15.9	14127	37898	2.68	2.99	1.89
Sub-total	87.7	121751	103025	0.85	1.79	1.06
Medium (< 10 Ha)	9.6	6375	36583	5.74	4.07	2.67
Large (>10 Ha)	2.8	1096	18715	17.08	5.53	4.55
Sub-total	12.3	7471	55298	7.40	4.29	2.94
Total	**100**	**129222**	**158323**	**1.23**	**1.94**	**1.17**

Source: GOI (2012)

Table 3- Describes livestock holding according to different size classes. It is surprising to note that small holders have share of around 83 per cent in poultry. In India, the landless, marginal and poor poultry farmers keep an average flock of 7-8 non-descript hardy but low-yielding poultry birds, mainly as a source of eggs for home consumption and to meet one-off expenditures, whereas wealthier farmers can keep flocks with over 20,000 broilers for profit motives (Mehta and Nambiar, 2007).

The landless labourers also own milch animals and earn substantial additional incomes from sale of milk, particularly in the dairy co-operative society (DSC) villages and other areas where milk-marketing infrastructure exists. Bovine stock holding size as a rule is larger in Punjab, parts of Haryana and western Uttar Pradesh.

TABLE 3—LIVESTOCK HOLDING ACCORDING TO DIFFERENT SIZE CLASSES, 2005-06

Category of Land Holdings	Cattle		Buffaloes		Sheep	Goat	Total	Poultry
	Males	Females	Males	Females				
Marginal	33.50	47.01	12.88	27.85	27.55	54.81	210.25	142.35
Small	16.69	18.77	5.52	14.03	14.77	18.77	91.00	41.33
Semi-medium	12.17	13.45	4.28	12.36	10.13	12.88	66.92	24.78
Medium	6.59	7.97	2.76	8.65	5.61	7.53	40.06	9.06
Large	1.29	2.18	0.61	1.99	2.39	2.74	11.53	4.05
All Classes	**70.2**	**89.4**	**26.1**	**64.9**	**60.4**	**96.7**	**419.8**	**221.6**

Source: GOI (2012)

On an average, 44 per cent farm households in India are associated with dairying. The participation rate in dairying increases with size of landholding. However, marginal and small farmers constitute the major share of milk producing households (77%) and, thus dominate dairying contributing 68% to total milk production (NSSO, 2005).

Increasing Income of Smallholders : A Case Study of Anmol Women Milk Cooperative (AWMC) at Karnal, Haryana

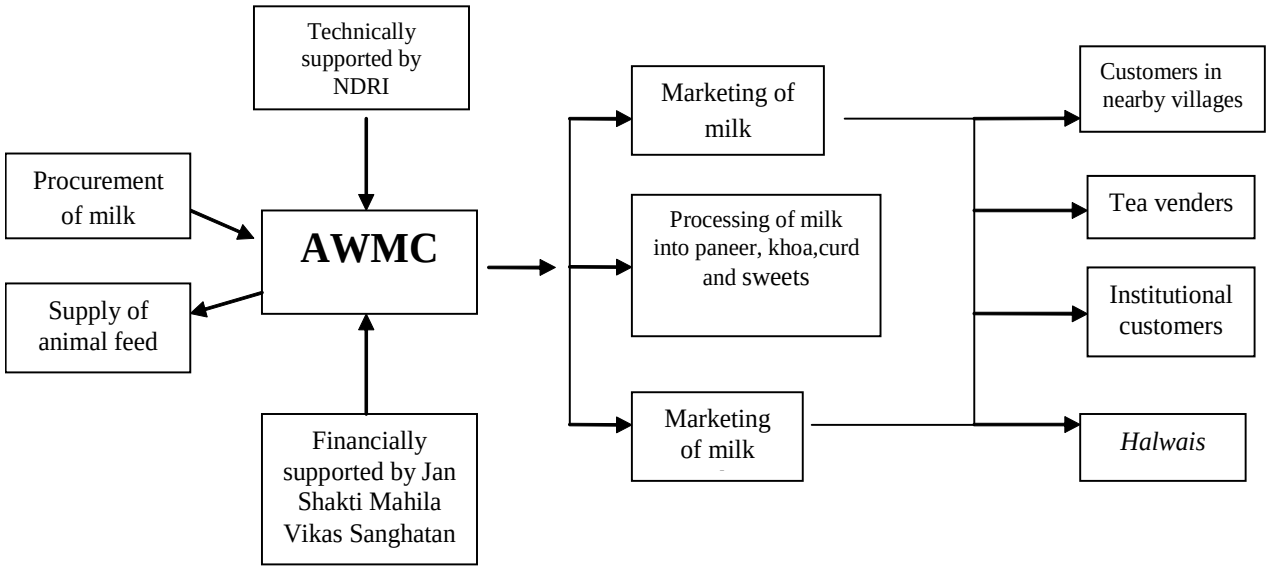
Evolution of AWMC: AWMC was formed in October 2010 with support of Arpana Group, which is running around 550 Self Help Groups related to various aspects and technical guidance from National Dairy Research Institute (NDRI), Karnal. NDRI is providing training to various groups on different aspects of dairy production and processing. The women members of AWMC also attended number of such training programmes at NDRI, which initially did not result in much impact. In July 2010, a serious thought was given to formation of a group which will collect milk from nearby areas and assume the responsibility of distribution and processing. Initially, 14 members consented to be the members of AWMC and contributed Rs 500 as membership fee and share capital of Rs 5000 each. However, there existed only 10 members when the AWMC first came into being. Thus, the group started with contributed capital of Rs 57,000 and a loan of Rs 50,000 was obtained from Jan Shakti Mahila Vikas Sansthan at 12 per cent rate of interest. The group is headed by a Pradhan and Up-Pradhan.

TABLE 4—INFORMATION ON KEY PARAMETERS RELATED TO AWMC

Number of members (October 2010)	10
Capital	
Membership fee (@500 per member)	Rs 7000
Contributed capital (@5000 per member)	Rs 50000
Loan amount	Rs 50000 @ 12% rate of interest
Assets maintained	Cream separator, Milk testing machine, Fridge, Weighing machine, Packaging machine, Deep freezer
Activities of AWMC	Collection, testing and marketing of milkProcessing of milk into curd, khoa and paneer Marketing of curd, khoa and paneer

Milk Procurement and Processing: AWMC started with procurement of 20 litres of milk per day from the nearby households. Since the mechanical quality testing facilities were not available in starting, the quality was assured by milking of animals in front of the AWMC members. Initially, the group concentrated on distribution of collected milk and paneer which was processed by AWMC. The technical inputs and the trainings were provided by NDRI to AWMC members for making paneer, khoa, whey based products, lassi etc. The milk procurement jumped from 20 litres in October 2010 to 100 litres in January 2011. This led to introduction of another product i.e. khoa in the production basket.

Fig 4. Organization of AWMC



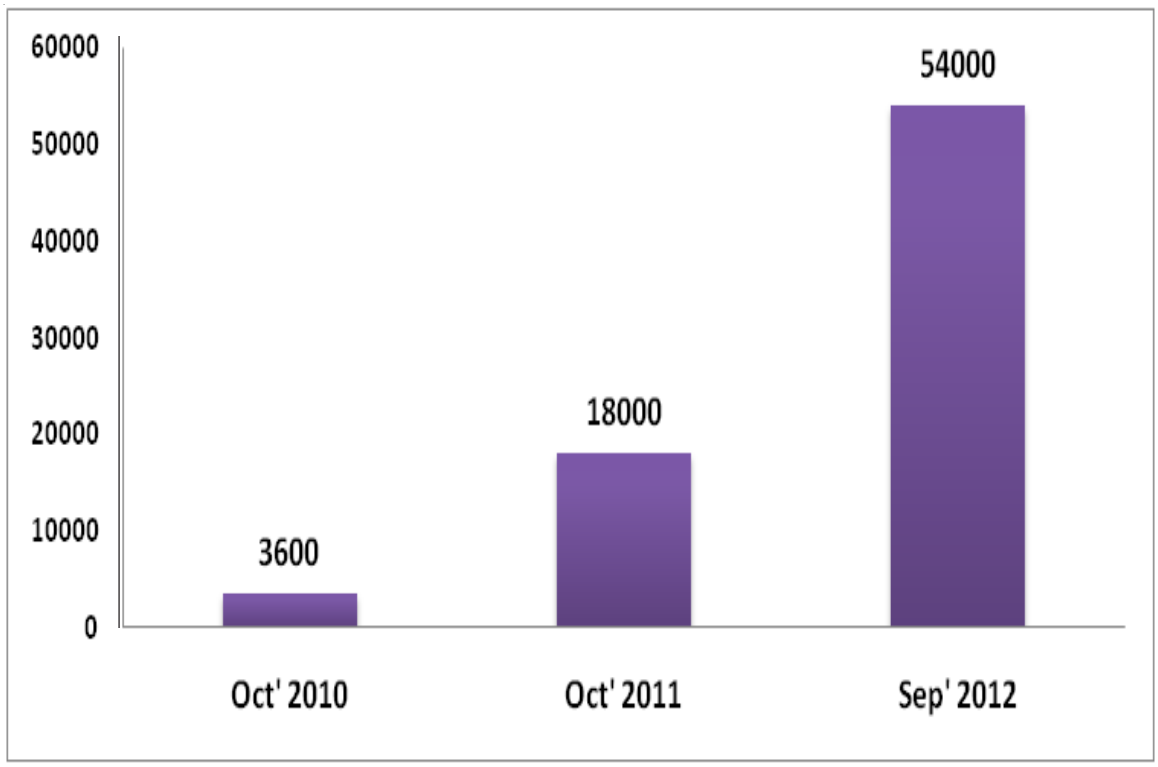
AWMC faced quality problems in milk procurement when the quantity increased. To ensure this, the mechanical milk testing was started at AWMC and a member was given the specific responsibility of quality checking. The adulteration in milk was noticed with refined oil with the intention to increase the fat content in milk. Such samples were rejected, which led to better establishment of AWMC image in the nearby areas. For regular suppliers, the random quality checks were carried out to assure quality. AWMC started preparing curd from February 2011. Sweets were also prepared on special occasions like festivals, marriages, special orders etc. The procurement reached upto 250 litres per day by January 2012. To cater to the increasing procurement and maintaining quality of the products, a Deep Freezer was also purchased by the AWMC.

Price determination and supply: AWMC is procuring both cow milk and buffalo milk from the farmers. Cow milk is procured at Rs 20 per litre and buffalo milk is procured at Rs 25 per litre. The cow+buffalo mixed milk is supplied to the customers at Rs 30 per litre. Khoa was initially marketed at Rs 50 per kg but now sold at Rs 250 per kg. Paneer is sold at Rs 160 per kg. The three variants of curd viz, full cream, toned and double-toned are sold at Rs 45, Rs 30 and Rs 23 per kg, respectively. The buyers for these products were customers in the same village and nearby villages, tea stalls, halwais and other institutional buyers. The payment to the farmers is done at each month end. For promotion of its products, AWMC put up its stalls in many other organizations, farmers' fairs, dairy mela etc. This created wide publicity of its products. The group also made the uniform compulsory for group members in such participations, which also helped in creating visible impact. Considering that the farmers needed advance payments for meeting out their input expenses, AWMC started giving advance payments to the farmers. This helped in strengthening the bond between the farmers and AWMC and also assuring a regular supply. AWMC also tied with some animal feed companies and started supplying animal feed to the farmers on payment basis. AWMC also earned margin on szupply of each bag of animal feed to the farmers.

Increase in Income: The Fig 5 shows earning per member of AWMC. The members work in shifts and spend around 3-4 hours on various activities of AWMC. There has been tremendous growth in earning per member over a span of less than two years. It increased from Rs 3600 per member per month in October 2010 to Rs 54000 in September 2012. Also, the demand for AWMC products has increased over a period of time. Considering all these, AWMC is now

planning to upscale the level of milk procurement and production of milk products.

Fig 5. Income from dairy activities



Major Challenges and Prospects: Proper identification of markets and marketing of dairy products have really been a great challenge for AWMC members. Also, improper planning at the initial stage led to some kind mismanagement for the organization. Since the gas connection was not purchased initially, wood was used for boiling of milk which left burning smell in the products made from that milk. The electricity problem also resulted in quality deterioration and losses in the products. Since the household premises of Pradhan were used for performing various activities, group also faced the problem of shortage of space. The milk procurement by AWMC has tremendously increased over a period of time and it is expected to increase further due to increasing demand for the products offered by AWMC. Considering this, AWMC has planned to go for packaged milk and packaging of other dairy products offered by AWMC to build long term relationship with its customers. Systematic record keeping is also essential for the growth of an organization, the group has started the process of procuring computer softwares for computerization of their records. The group has also planned to buy one retail shop in Karnal market to further increase the sales.

MAJOR STRATEGIES FOR INCREASING FARMERS' INCOME

There has been an increase of 18% in the Plan Outlay for the Department of Agriculture & Co-operation, which implies increased allocation for Agriculture R&D. The R&D activities would augment farmers' income, generate employment opportunities, create trade surplus, and besides being economically sustainable, will also be catalyst in social and environmental sustainability of livestock production system in the country. There may be two pronged strategy to harness the untapped potential of Indian livestock and dairy sector; the short/medium term approach for realizing the gains should emphasize more on nutrition, health and value addition aspects; while the longer term approach should be breed improvement and application of biotechnology for enhancing livestock and milk production.

Breeding Strategies

Anestrous and repeat breeding in buffaloes and bovines are two of the most serious reproductive problems, therefore effective breeding strategies are the need of the hour. Keeping in mind the resource position of the farmers, which is by and large poor, it is important that breeds are developed for high milk production that can be reared under the rugged Indian conditions where fodder scarcity, heat and humidity are a reality.

Feeding Strategies

It has been well documented that proper feeding is by far the most important factor hampering the productivity

of Indian ruminants. There is a need to optimize the use of available feed resources and enhancing the bioavailability of nutrients from these feed resources. Strategic supplementation of limiting nutrients and area specific nutritional interventions are some of the approaches which are to be pursued for enhancing productivity. There is also a need to explore newer feed additives to improve the rumen fermentation, minimize wastage of nutrients and increase productivity of livestock animals. **Under the current budget, the Mission for Protein Supplement is being strengthened and a Rs 2242 crore project will be launched with World Bank assistance. This will bring improvement in the productivity of dairy sector.**

Linking Smallholders to Markets

Livestock in India would not turn out to be a profitable business until and unless it is carried out on commercial lines and due attention is given to bringing the smallholders in the organized marketing fold. The smallholders lack access to productive assets such as credit, refrigeration facilities and to information. Building participatory institutions for small-scale farmers would allow them to be integrated with livestock processors and input suppliers. Contract farming can be an important tool for strengthening participatory producers' co-operatives in livestock sector. However, many marketing constraints hampering the growth of cooperative sector need to be looked into, viz. lack of properly organized system of marketing, inadequate processing facilities, shortage of technical manpower, adulteration, unhealthy trade practices etc.

Promoting Value Addition and Processing

It is necessary to realize the potential of indigenous livestock products with appropriate shelf-life improvements in addition to practicing modern technologies for improved utilization and marketing. Establishing small-scale ventures for the production of value-added products would go a long way in improving the economics of livestock production and meeting consumer demand.

A new centrally sponsored scheme titled "National Mission on Food Processing" would be started in cooperation with the State Governments in 2012-13. The value addition of the livestock foods through the development of newer biotechnological and micro & nanotechnological approaches would bring in a new era of foods that would address the future needs of the mankind. Studies on the diversity of the micro-organisms would further help in developing novel livestock foods with enhanced health attributes. There is an urgent need for developing rapid and reliable techniques for monitoring quality and safety management of livestock foods. Also innovations in molecular biology would greatly help in achieving the objectives of quality and safety of livestock foods. Further challenges in the areas of science can only be met through human resource development of high caliber and state of the art infrastructure.

Ensuring Credit to Smallholders

Institutional credit for smallholder livestock producers is extremely hard to access on various accounts. Even at the turn of the century, a very large proportion of credit for smallholder livestock production in India comes from traditional moneylenders. Improving the quality of credit and access to it will enable the smallholders to move up from subsistence farming to progressively viable crop–livestock farming, adoption of improved technologies and help in achieving relatively higher outputs and farm incomes. Smallholder livestock farmers can benefit the most from the microfinance programme which will provide support for SHG formation & nurturing. However, the studies report that microfinance alone does not automatically lead to the desired results of promoting enterprises. Microfinance programmes should focus on devising low-cost mechanisms of reaching the rural poor.

Ensuring Animal Health

Future growth of livestock sector will depend crucially on availability of services that address the problems of low productivity, disease incidences and quality and hygiene issues associated with livestock and livestock products. Public health services, such as zoonotic and food-borne disease control, hygiene, food safety and environmental control remain insignificant and in most regions non-existent. Private and public animal health services be clearly identified, veterinary departments be equipped to make strategic plans and institutions and mechanism be in place to minimize market failure. Animal health services delivery to the smallholders in remote and marginal areas requires special consideration and there is need for government to explore new models of delivery of veterinary services to such regions.

Effective Technology Transfer and Lab to Land Linkages

The potentiality of science and livestock research should be harnessed by validating and transferring the technologies related to increasing the animal productivity, value addition of livestock products and reducing cost of production. There is need to integrate the efforts of various private agents to the livestock extension mechanism to cover large number of rural masses which will help in the nutritional security of the nation. Effective Information and Communication Technology based quick extension delivery mechanism and grievance handling should be developed. Women being important force in livestock production, it becomes necessary to improve their skills and making them more productive. This could be achieved

by offering relevant training programmes in techniques and cost-effective technologies and influencing their decision-making process. The scope of new extension models of information delivery for serving smallholders need to be explored. These may include distant and marginal areas - involving village community based worker, NGOs, providing incentives to agricultural graduates in starting their own clinics and locale specific integrated ICT modules. The tools of information dissemination involving various stakeholders could go a long way in bridging the information gap and creating a viable and self-sustainable information dissemination system for smallholder livestock producers.

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Livelihoods, Employment and Income for Marginal Fishers and Fish Farmers in India

W. S. LAKRA* & M. KRISHNAN

Introduction:

Agriculture is the backbone of the Indian economy. India is one of the leading agricultural countries in the world and one of the biggest sources of its wealth is its output generated from land and water. Indian agriculture plays a crucial role in the economic development of the country. Fisheries are next to agriculture in terms of income-generating opportunities, employment, and food supply. Fisheries provides employment and sustainable livelihoods to various sections of the society in rural India, especially weaker sections. India possesses a long coastline of 8129 km with an immense potential of producing and developing a variety of seafood which directly leads to the generation of a substantial amount of exports. Fish is an important source of protein and its capture, harvest, processing, handling, transportation and distribution provides livelihoods for millions of people of the country and also contributes to the foreign exchange earnings to the Indian economy.

Fishers and fish farmers face the problems of poverty, unemployment, inequalities in access to health and education. This may be attributed to declining marine fish landings and aquaculture, both freshwater and shrimp, becoming more and more commercial in nature. Small and marginal fishers and fish farmers need to be supported to raise their socio-economic well being.

Role, challenges and opportunities for small and marginal fishers and fish farmers in India

There are many issues and challenges for small and marginal farmers of fisheries sector in India. Vast stretches of estuaries, backwaters, bays are available along Indian coast which provide better opportunities to small and marginal fish farmers. Research institutions, government aid agencies and other NGO's have been working towards identifying suitable avenues for employment and income to this group of population who would be able to use their inherent skills only in fish and fisheries related enterprises.

Many such avenues have been identified by the concerned agencies both in marine and inland water sectors which are elucidated below

Marine fisheries related avocations

Mussel culture

Molluscan species such as oysters, mussels and clams are well suited for the development of new technologies of culture as a result of their high nutritional and commercial value. Mussel culture, Oyster culture, Clam culture, Seaweed culture, Crustacean farming (crab fattening), Ornamental fish culture are the income-generating activities for fish farmers.

In the South-west coast of India, especially Malabar region of northern Kerala is a well known mussel fishery zone of India. Over 7,000 t (80%) of the total green mussel (Perna viridis) catch is exploited annually from this zone. Suitable technologies for mussel culture have been developed in 1971 and subsequently field demonstrations in different areas with direct involvement of local rural folk were carried out. The technology of mussel farming is simple, economically viable and eco friendly. Mussel farming can be done through two methods i.e. raft culture and open sea farming. Korapuzha Estuary of Kerala state is a fairly large estuary suitable for mussel and oyster farming. The successful adoption of mussel farming in the Kerala state prompted the Aquaculture Development Agency of Kerala (ADAK) to initiate a group farming initiative in the Korapuzha estuary. Technical assistance was provided by CMFRI. These demonstrations have conclusively shown that mussel farming can provide an excellent alternate livelihood option for the communities dependent on these water bodies (Laxmilatha P. *et al.*, 2009).

The technologies demonstrated for mussel and oyster farming and their respective impacts are presented in the table 1.

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TABLE 1—TECHNOLOGY DEMONSTRATIONS AND THEIR IMPACT

Demonstration	Place	Group	Impact
Open sea mussel culture demonstration raft in (3 ft x 3 ft), 2001	Mussel bed, Thikkodi, Calicut	Mussel pickers	The effective utilisation of the mussel seed for farming, which the mussel pickers used to discard
Mussel culture demonstration farm, 2002	Purangara, Badagara	Women self help group	Viability of mussel farming technology
Mussel culture demonstration farm, 2002	Poorapuzha Estuary Parappangadi, Malappuram district	NGO (Unemployed youth)	Viability of mussel farming technology
Demonstration cum research farm for edible oyster culture 2002	Korapuzha estuary Kozhikode,	Local rural group	Viability of oyster farming technology
Integrated bivalve farm 2003, 2004,2005	Moorad estuary, Kozhikode	Local rural group	Viability of mussel and edible oyster farming technology
Integrated bivalve farm 2004, 2005	Chaliyar estuary, Kozhikode	Local rural group	Viability of mussel and edible oyster farming technology

Source: (Laxmilatha P. *et al.*, 2009).

The mussel farming initiatives have paid rich dividends in terms of increasing mussel production through farming besides increasing the social and economic benefits to the rural farmers both men and women who have taken to this method of farming (Table 2). Technology adoption, increased production through farming, women's empowerment, development of mussel seed trade and rope making and technology diversifications are the visible and tangible outcomes (Laxmilatha P. *et al.*, 2009).

TABLE 2—TRENDS IN MUSSEL FARMING ADOPTION IN KERALA

Rack Culture

Year	Estuary/Place	Production (T)
(1)	(2)	(3)
2000	Padanne, Kasargod district	250
2002-03	Korapuzha estuary, Kozhikode	62
2003-04	Korapuzha estuary, Kozhikode	40
2003-04	Kadalundi estuary, Malappuram district	380
2004-05	Kadalundi estuary, Malappuram district	420
2004-05	Padanne, Kasargod district	2500
2005-06	Moorad estuary Korapuzha estuary	9
2005-06	Kozhikode, Malappuram districts	77
2005-06	Padanne, Kasargod district	3086

Bottom Culture

2004-05	Kannur	268

Source: (Laxmilatha P. *et al.*, 2009).

The sustained mussel farming initiatives and interventions carried out has provided alternate livelihood options and livelihood diversification. It has led to increased fishing income, besides supporting complementary household activities particularly among womenfolk, rather than substituting one secure income source for another. Encouraging alternate livelihood options raises the opportunity income of fishing with potential conservation and economic benefits. There is further scope for widening the horizons of these interventions by introducing other allied activities like small scale homestead processing units such as depuration, pickling, dried mussel and ready to eat processed products (Allison, E.H. and Ellis, F. 2001).

Oyster Culture

In addition, small and marginal fish farmers can also adopt oyster culture since there are rich oyster beds located

in the east coast of India especially in Pulicat Lake, Ennore estuary. Marakkanam backwater, Edayar estuary, Marakkanam backwater, Chinnaveerampattanam, Coleroon, Athankarai estuary and Tuticorin bay. The oysters occur in a natural bed either in heaps or in patches to form heaps of 1 to 1.5 height covering many hectares of the bottom of an estuary or backwater of littoral and enlitloral zones. They are also found attached to the rocks, concrete piers, piles and submerged branches of mangrove plants (Nayar and Mahadevan,1983).

Economics of oyster culture

The basic technology for oyster culture has been developed, but the production rates are fairly high when compared with those obtained elsewhere adopting similar technology. Culture duration is considerably less in the tropical waters. The cost of production of culture produce includes the procurement of tiles, cultch material, lime coating, fabrication of cages, purchase of poles, coir rope, synthetic nylon twine 2 mm, rope 4 mm size, boat and other farm materials. So the rack-tray culture require high capital investment and involves short-term replacement costs and recurring maintenance expenditure. A cost benefit study of oyster culture by the rack-tray method on 0.25 hectares producing 3 tones of oyster flesh annually, has been made. With cost production 'at Rs.19 per kg. flesh, and at a selling price of Rs. 28 per kg. the net income before tax would be Rs.27,000-about 30 per cent return on investment (Silas *et al*., 1982). A simple estimate of oyster culture shows the per annum cost of Rs. 800 per rack and gross income of Rs.920 per rack based on production of 4,600 oysters per rack and selling cost at Rs.20 per 100 oysters. On the above basis 250 racks in one hectare areas can produce 140 tones of whole oysters grossing Rs.30,000 a year (Nayar and Mahadevan, 1983).

Clam culture

The developed technology for the seed production of venerid Clams, *Paphia malabarica, Meretrix meretrix*, and the blood clam, Anadora granosa in 1988 at the tuticorin shellfish hatchery laboratory have since been standardized. Data on clam culture indicate that clam seed of 10.7 to 12.4mm attain a marketable size of over 30 mm within 3.5 to 5 months. They can be stocked at high densities upto 4000/ sq.m. The retrieval varied from 7.05% to 17.64% at harvest. The mortality was very high when 3mm seed was transplanted. Covering the transplanted clam bed with a protective net not only prevented crab predation but also helped the clams to maintain their position in the substrate against strong water currents (Appukuttan K. K. *et al*., 1998).

Seaweed culture and economics

Seaweed mariculture is an important and profitable livelihood option for the coastal fishing community. Seaweed farming is widely practiced along east coast of India especially Mandapam area. The raft method is suitable in areas where water currents are weak, e.g. Palk Bay. The major advantage of floating rafts is that they can be easily moved to another location if necessary, and removed from the water during bad weather. Rafts can also be used as drying racks by providing appropriate support when placed onshore (Krishnan and Narayana Kumar, 2010). An data regarding seaweed farming by raft culture in the east coast of India is presented below.

TABLE 3—ECONOMICS OF SEAWEED FARMING (RAFT CULTURE) IN TAMILNADU, INDIA: ANALYSIS OF COSTS AND RETURNS FOR THE FIRST YEAR OF OPERATION

Item Number	Item	Quantity
1.	Cost of 45 rafts per farmer - Rs.	31,050
2.	Subsidy from TNDoF (50%) - Rs.	15,525
3.	Bank loan (50%) - Rs.	15,525
4.	Production from 45 rafts in 45 days (kg fresh weight)	300
5.	Seed material allocated to the next stocking cycle (Kg.)	60
6.	Production of dried weed	24 Kg
7.	Interest on bank loan (11 %) - Rs.	1,708
8.	Insurance - Rs.	380
9.	Returns (24 Kg. @ Rs. 14.00 x 270 days) - Rs.	90,720
10.	Net returns for the first year (9 - [2+7+8] - Rs.	73,107

Source: Seaweed Culture, Golden Jubilee VIllage Self Employment Opportunities, Government of Tamil Nadu (2008- 09).

It has been estimated that seaweed resources in India can provide employment to more than 20,000 fishers in harvesting and an equal number of jobs in post-harvesting activities, provided stocks are managed rationally. The seaweed resources along the southern end of the east coast at Tamilnadu of India provide a readymade livelihood for both men and women in poor fishing communities (Krishnan and Narayana Kumar, 2010,). Rao and Mantri (2006) have reported that there are 13 seaweed landing centres on the southeastern coast. According to Immanuel and Sathiadhas (2004), five thousand women in southeastern India depend upon seaweed related activities for their livelihood.

Therefore to enhance the farmers' income and improve their viability, seaweed farming can serve as an excellent opportunity to small and marginal fishers in India.

Brackishwater aquaculture

Brackish water fish farming is a system of aquaculture that focuses on the production of quality fin and shell fish and also crustaceans that are found in the creeks, lagoons, and estuaries through rational rearing. It has a capacity of bridging wide gap between fish demand and supply. Crustaceans like crabs are also in great demand for export and also locally.

Crab fattening and economics

Crab fattening activity can also serve as an alternative livelihood option to the women of the coastal communities. The mud crabs inhabit coastal as well as brackish water environments. Mud crabs are a seafood item of high demand being exported to foreign countries alive. Culturing of the mud crab is not economical hence the crab fattening being profitable is practiced. Mud crabs are recently gaining importance in corporate sector too due to its export value and has been realized as an alternative species due to set back in shrimp farming. Crab fattening is essentially stocking soft shelled crabs or water crabs that are held in smaller impoundments for 20-30 days till the shells are hardened and they flesh out. Fattening of mud crabs is being undertaken in the states of Andhra Pradesh, Tamilnadu, Karnataka, Orrisa and West Bengal. There are four species of mud crabs used for culture are Scylla serrata, S. tranquebarica, S. paramamosain and S. olivacea. Among these S. tranquebarica is mostly used since it is easily available abundantly in coastal area, in the inshore sea, estuaries, backwaters, coastal lakes and mangrove swamps (M. S. Swaminathan Research Foundation, 2009). The costs involved and profits made through crab fattening are presented below.

TABLE 4—FINANCIAL VIABILITY OF CRAB FATTENING

Cage size	1 square metre with nine inner segments
Culture period	20-30 days
Stocking density	1/each inner segment
Survival	90%
Initial price for crab	Rs. 100/Kg
Cycles per year	8
Farm gate price	Rs.250/Kg

Source: (M. S. Swaminathan Research Foundation, 2009).

TABLE 5—ECONOMICS OF CRAB FATTENING IN ONE CYCLE

Purchase of water crabs @ Rs. 100/Kg. totally 71.6 Kg. for all the 10 cages	7160
Feed cost (50 kg trash fish) @ Rs. 20/Kg.	1000
Total sales (67.5 Kg. p. good crab @ Rs. 250/kg.	16875
Wages @ Rs. 50/8hrs, per day 2hrs so for 25 days @ Rs..50	1250
Total income	16875
Operation cost (feed cost + purchase + labor cost)	9410
Net profit per cycle	7465
Total for 8 cycles	59,720

Source: (M. S. Swaminathan Research Foundation, 2009).

Integrated aquaculture

For improving the income viability of small and marginal farmers which can benefit them immensely, the concept of integrated aquaculture can also be suggested.

Without knowing the scientific basis of this system, farmers have been practicing it for the years. Of late, the government of India including central government institutes, state government universities, and other organizations has come forward to provide scientific basis to such integrated farming systems.

Since the farm size is too small, farmer cannot employ the family labour force year around, if they grow the mono crop. Hence farmer resorts to integrate the various types of farming systems including, cropping, livestock, fishery, piggery, goatary, and horticulture (fruits, vegetable, flower, apiculture, plantation etc.). This results in higher use efficiency of inputs including fertilizers, reduction of risks, increasing employment opportunities, and extracting higher farm income, thereby improving the income viability of small and marginal fish farmers (Biswas, 2010).

TABLE 6—INCOME GENERATED BY DIFFERENT COMPONENTS OF INTEGRATED AQUACULTURE:

Component	Total cost (Rs.)	Net returns (Rs.)
Field crop (rice, maize, rice bean)	3315	5638
Multistoried cropping (coconut, ginger, turmeric, pineapple)	3831	9089
Banana, Papaya	900	1466
Vegetables (Brinjal, Okra, Tomato Potato)	3812	8310
Floriculture	125	100
Fishery (Multilayer)	3722	16603
Poultry	9240	981
Duckery	5387	713
Mushroom	18184	12856
Apiary	170	1180
Biogas	600	1431
Total	49286	58367

Source: (Behra, 1994)

Freshwater aquaculture

Ornamental fisheries

In freshwater fisheries sector, culture of ornamental fishes also provides an excellent opportunity for the small and marginal fishers and entrepreneurs/ farmers to improve their income viability and also escalate the chances of employment. Business of ornamental fishes can be done in freshwater, brackishwater and marine ornamental fishes. The market opportunities for locally available species of ornamental fish species are increasing gradually in both domestic and international market. Proper collection and selling of native ornamental fishes (wild catch) as well as culture of exotic species (captive breeding) suitable in the region can provide number of agri-business opportunities. Ornamental fisheries have been proved financially viable and required only small investment. The immense efforts of the government, institutions and organizations can raise the ornamental fish production in a particular region and help the fish farmer to gain the larger income share. The investment on establishment of local ornamental fish production units is presented below.

TABLE 7—ECONOMIC VIABILITY OF INVESTMENT ON ESTABLISHMENT OF INDIGENOUS ORNAMENTAL FISH PRODUCTION UNITS

Sr. No.	Particulars	Units	Value
1.	Fixed cost (4 units @ Rs. 131500/unit	Rs.	684000
2.	Annual variable cost (for 4 units @ Rs. 39700/unit)	Rs	158800
3.	Estimated annual production of fish (No. of fry)	No.	400000

TABLE 7—ECONOMIC VIABILITY OF INVESTMENT ON ESTABLISHMENT OF INDIGENOUS ORNAMENTAL FISH PRODUCTION UNITS—*Contd.*

Sr. No.	Particulars	Units	Value
4.	Release to natural water bodies (40% of production)	No.	160000
5.	Survival in natural water bodies (40% of release)	No.	64000
6.	Estimated catch from natural water bodies (60% of survived)	No.	38400
7.	Return from sale of farm raised fry (@ Rs. 2/piece)	Rs.	400000
8.	Estimated return from sale of fry from wild catch (Rs 3/piece)	Rs.	115200
9.	Gross return including catch	Rs.	515200
10.	Net return (Gross return - Annual variable cost)	Rs.	356400
11.	**Economic viability (when wild catch included)**		
12.	Net present value (NPV)	Rs.	1243378
13.	Internal rate of return (IRR)	Per cent	51
14.	Benefit-cost ratio (BCR)	Ratio	1.87
15.	Economic viability (when wild catch not included)		
16.	Net present value (NPV)	Rs.	640979
17	Internal rate of return (lRR)	Per cent	32
18.	Benefit-cost ratio (BCR)	Ratio	1.26

Source: (MandaI, 2007).

Financing Livelihoods and Up-scaling Investments

With the establishment of the National Fisheries Development Board (NFDB) at Hyderabad, financing fisheries has received a big thrust. The NFDB has finance schemes for both large scale as well as small and marginal fishers and fish farmers. The following tables give a bird's eye view of the schemes in operation.

The NFDB has major thrust in the area of intensive aquaculture in ponds and tanks (Table 8). Subsidies at the rate of 20% is given for construction of new fish/ponds and tanks. Subsidies are also given for renovation of existing fish/prawn ponds and tanks of entrepreneurs and farmers. Subsidies are also given to cover a portion of the cost of inputs. This is also given for establishment of freshwater prawn seed hatcheries and also for the establishment of feed mills of 1.2 quintal per day, besides others.

TABLE 8—INTENSIVE AQUACULTURE IN PONDS AND TANKS

Sl. No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
1.	Construction of new fish/prawn ponds and tanks		
		(a) Rs. 3.00 lakhs/ ha for plain areas	20% subsidy with a ceiling ofRs. 0.60 lakhs/ha. and 25% subsidy to SC & STs with a ceiling of Rs. 0.75 lakhs/ha.
	Existing species Entrepreneurs/ farmers	(b) Rs. 4.00 lakhs/ ha in hill states/ Districts and NE region	20% subsidy with a ceiling of 0.80 lakhs/ha. and 25% subsidy to SC & STs with a ceiling of Rs. 1.00 lakhs/ha.
	New species Pangasius sutchi	Rs. 3.00 lakhs/ha	20% of the unit cost for all farmers and 25% subsidy to SC & STs
2.	Renovation of existing fish/prawn ponds and Tanks Entrepreneurs/farmers	Rs. 0.75Iakh/ha	20% subsidy for all
	New species Pangasius sutchi	Rs. 0.75Iakh/ha	farmers/entrepreneurs with a ceiling of 0.15 lakhs/ha and 25% subsidy to SC & STs with a ceiling of Rs. 0.1875 lakhs/ha.

TABLE 8—INTENSIVE AQUACULTURE IN PONDS AND TANKS—*Contd.*

Sl. No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
3.	Costs of inputs		
	For prawn farming Entrepreneurs/farmers	Rs.1.80 lakhs/ha	20% subsidy with a ceiling of Rs. 0.36 lakhs/ha for all farmers
	For fish/prawn farming in Paddy fields Entrepreneurs/farmers	Rs. 0.50 lakhs/ha.	20% subsidy for all farmers/entrepreneurs
	New species Pangasius sutchi	Rs. 5.00 lakh / ha	40% of subsidy of the unit cost for initial period of 2 years and thereafter 20% for all farmers and 25% for SC / ST farmers.
4 .	Establishment of freshwater prawn seed hatchery		
	Capacity: 25 million PL / unit/year State Governments	Rs. 30.00 lakhs/unit	90% of the unit cost as one time grant to the States for establishment of hatchery at State Level.
	(ii) Capacity: 5-8 million PL /unit/year for Entrepreneurs/farmers	Rs. 12 lakhs/unit	20% subsidy with a ceiling of Rs.2.40 lakhs to entrepreneurs / farmers.
5.	Feed mill of 1.2 quintal/day	7.5 lakhs/unit	20% subsidy with a ceiling of Rs. 1.5 lakh per unit to Entrepreneurs/ Farmers.

Source: http://nfdb.ap.nic.in/pdf/GL.pdf

The NFDB also has focus on fresh water ornamental fishers. (Table 9). 50% of unit cost is subsidized for backyard hatchery, medium scale ornamental fisheries unit and for setting up of aquarium fabrication units by SHG's entrepreneurs.

TABLE 9—FRESH WATER ORNAMENTAL FISHERIES

Sr No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
1.	Backyard hatchery	Rs. 1.50 lakh	50% unit cost as subsidy to entrepreneurs, members of Women SHGs/ Fisherwomen Cooperative Societies.
2.	Medium scale unit	Rs. 4 lakhs	50% unit cost as subsidy to beneficiaries
3	Setting up of Aquarium fabrication units SHGs/Entrepreneurs	Rs. 1.00 lakh	50% unit cost as subsidy to members of Women SHGs/Fisherwomen Cooperative Societies and 25% unit cost as subsidy to individual persons.

Source: http://nfdb.ap.nic.in/pdf/GL.pdf

As far as costal agriculture is concerned, the NFDB provides different types of assistance for brackish water finish culture and input assistance for the same (Table 10).

TABLE 10—COASTAL AQUACULTURE

Sr. No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
1.	Construction of ponds for brackish water fin fish culture	Rs. 2.40 lakhs/ha	25% cost subject to a maximum of Rs. 0.60 lakhs/ha as subsidy.
2.	Input assistance for brackish water fin fish culture.	Rs.3.00 lakhs/ ha. (subject to the approval of CIBA based on the production levels)	1. One time back ended subsidy of 25% to all farmers to a maximum of 0.75 lakhs/ha and 2. 30% subsidy in case of SC/STs to a maximum of Rs. 0.90 lakhs/ha.

Source: http://nfdb.ap.nic.ni/pdf/GL.pdf

The NFDB also supports mariculture. Mariculture of mussel/oyster/clam culture and other commercial shell fishers. It also supports seaweed culture at the rate of Rs 5,000 per unit for SHG and for entrepreneurs (Table 11).

TABLE 11—MARICULTURE

Sr. No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
1.	Assistance to Mussel/Oyster/clam culture/ other commercial shellfishes	Rs. 20,000/ Unit of 50 m2	50% subsidy on the unit cost
2.	Seaweed culture	Rs. 5,000/ unit	50% subsidy on the unit cost to women SHG's and Entrepreneurs.

Source: http:/nfdb.ap.nic.in/pdf/GLpdf

As far as development domestic fish marketing is concerned NFDB given assistance for setting up of retail fish outlet, assistance for fish retail by fishers women and for construction of plat forms for sun drying of fish.(Table 12).

TABLE 12—DEVELOPMENT OF DOMESTIC FISH MARKETING

Sr. No.	Name of the activity/Scheme	Unit Cost	Pattern of Assistance
1	Setting up of retail fish Outlets	Up to Rs.10.00 lakhs	Subsidy @ 25 % of approved project cost to entrepreneurs (30%subsidy for SCs /STs/ NE regions). 40% subsidy on the project cost to Fisherwomen who are involved in fish marketing and fisherwomen who are from fishermen Community and members of local fishermen or fisherwomen
2	Retailing by fisherwomen	Up to Rs. 10.00 lakhs	co-operative societies.
3	Platform for Sun drying of fish	Unit cost limited to Rs. 35,000/- per platform of min 150 sq. feet.	(a) 90% grant to the Govt. Departments / Quasi Govt. Organizations/ Research Institutes (b) 25% subsidy (30% for SC/ ST & NE regions) to Fishermen/fisherwomen /SHGs/ entrepreneurs.

Source: http:/nfdb.ap.nic.in/pdf/GLpdf

Conclusions:

From the entire sphere of farming systems focused in this paper, strategies suggested for improving the income and employment viability of small and marginal farmers, revolves around money, resources, time, and family labour. Fish farmers' families gets scope for gainful income and employment throughout the year and thereby assuring good standard of living and high income even from small holdings. From the above suggested strategies it is clear that small and marginal farmers can earn high income provided that the farmers' applies all the field operations as well as marketing himself. Further, income can be escalated if the farmers' harvests the crop during festivals also an early harvest can help to get a high price.

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AGRICULTURAL PRICES IN INDIA

It is an old adage that Agricultural prices mirror the economy of a country. It is more true in the case of an agricultural country like India. Viewed from this angle, it is quite an important publication. It gives information on index numbers, farm (Harvest) prices, wholesale and retail prices of various agricultural commodities, etc.

Economic Analysis of Marginal and Small Land Holders

R.P. Singh[1] and Jai Prakash[2]

Introduction

Agriculture sector is the main stay of Indian economy, contributing about 15 per cent of national gross domestic product (GDP) and more importantly, about half of India's population is wholly or significantly depended on agriculture and allied activities for their livelihood (Government of India, 2011a). The contribution of agricultural sector to GDP has continued to declined over the years, while that of other sectors particularly service sector, has increased. In 1970-71, agriculture contributed about 44 per cent of GDP, which decline to 31.4 per cent and 14.6 per cent in 1990-91 and 2009-10 at (2004-2005 prices), respectively. (CSO, 2011). Nevertheless agriculture remains a major source of employment, absorbing about 52 per cent of country's workforce in 2004-2005, down from about 70 per cent in 1971. The share of agricultural export in total export value declined from about 18.5 per cent in 1990-91 to about 10.6 per cent in 2009-10, while the share of agricultural export to total country's imports increased from 2.8 per cent in 1990-91 to 8.2 per cent in 1998-99 and declined to about 4.4 per cent in 2009-10 (Government of India, 2011b).

The scenario of Indian farmers has been changing over periods in the country. The population of marginal and small farmers holding are increasing in the country and now these farmers constitute over 80 per cent of farming house hold. The average size of holding is decreasing day by day due to pressure of population on land. The average size holding was 2.69 hectare in 1960-61, declined to 1.84 hectare in 1980-81, 1.57 hectare in 1990-91 and further declined to 1.33 hectare in 2000-01 in the country. The number of marginal farmers increased from 38.4 per cent in 1950-51, further increased to 56.4 per cent in 1980-81 and reached to a level of 62.30 per cent in 2001. Similarly number of small farmers increased from 10.2 per cent to 17.2 per cent during the same period. These farmers have only very small quantity of marketable surplus. Moreover, there staying power are low because of their extreme poverty. In Bihar, the average size of holding is quite low as compared to national level. This was mainly due to heavy pressure of population on land, particularly in north Bihar. The situation in Jharkhand state is also different from other states, because 90 per cent area is unirrigated area and mono cropping system is prevalent in all regions of the state. The average size holding of Jharkhand is nearly 1.20 hectare. Moreover, nearly 30 per cent is waste land in the state. Rainfed farming restrict farmers for rabi crop resulted fellow land in whole of the year and marginal and small farmer migrated from the native villages to distant area in search of employment and income. The present study is an attempt to analyse economic condition of marginal and small farmers and their way of increasing their income in different agro-climatic zones of Bihar and Jharkhand.

Review of literature

Gangwar and Bhatia (1990) studied the economics of milk production and optimum livestock-cum-crop combinations for less than 2.2 hectares farm in Haryana and concluded that local cows could not compete at all even with the existing level of technology. When improved technology was adopted, buffaloes could also not compete with the crop production even through capital borrowing fund facility was available in the production plan. The emphasized the importance to popularize crossbred milch animals. The study revealed that dairying provided additional employment for human labour on small farms with additional availability of capital.

Gopalappa (1996) revealed that a significant changes in the income levels and standard of living of the marginal and small farmers due to diversification of the farm activities. To achieve these, the farmers have to be supported by means of financial assistance and extension service. As has been noted in the survey there is good scope to increase the income through crop diversification.

Singh et al. (1997) stated that diversification of crop farming with high yielding milch animals can play an important role in increasing income and employment on marginal farms. Dairying, being a self income generating enterprise, reduces the short term credit requirement by supplying regular income to the farmers.

Murthy et al. (1998) examined the impact of farm diversification on income and found that the value of income varied only in a narrow range for largely diversified farm (with diversification index between 0.01 and 0.40) and largely specialized farms (with diversification index between 0.6 and 1.00) inferring that diversification minimized risk by stabilizing income.

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Singh et al. (1998) concluded that crop farming with dairy enterprise has no significant effect on the income and employment on the entire synthetic farm situations with allocation of fixed farm resources optimally. Further, the adoption of improved technology coupled with adequate credit facility dynamics the entire gamut of income and employment potential and offers the single best measure to solve the chronic problem of under-employment of family labour in the rural sector. Further dairying, being a self income generating enterprise, reduce the short term credit requirement by supplying regular income to the farmers. Besides, the results emphasize the need for strengthening a close co-ordination between credit and other development agencies and stream lining the flow of necessary inputs and services like extension, marketing etc. in order to benefit the cultivation of the area.

Singh et al.(1998) analyzed that it can be inferred that diversification of crop farming with high yielding milch animals can play an important role in increasing income and employment on marginal farms. Dairying, being a self income generating enterprise, reduces the short term credit requirement by supplying regular income to the farmers. However, the available medium term credit of the farmers is being manager, a substantial amount of its requirement for medium term loan increase manifold with the introduction of high yielding milch animals of improved breeds. Thus, the study suggests that the financial agencies should come forward unhesitatingly to provide medium term credit on easy term to the marginal farmers to diversify their farming with dairy enterprise, which would reduce the income variability and realized full potential of income generation and which offers the single best measure to solves the chronic problem of unemployment disguised employment of family labour on these farms.

Sidhu and Bhullar (2004) stated that livestock economy especially, dairy is considered to be an economically viable alternative for increasing income and employment in the farm sector of Punjab. It is clear that the contribution of crop sub-sector to the agriculture growth as well as fixed cost and degradation of soil and water resources. The importance of dairy, especially on small and marginal farms has increased and the proportion of dairy to the total farm business income on these farms has increased. The economic sustenance of these farmers is primarily dependant on dairy enterprise as it helps in utilizing their surplus family labour, requires less land and water resources and provides cash income to meet their daily consumption needs. The diary sector has also helped in generating employment on small, marginal and semi-medium farms despite fall in employment in crop production. However, the decrease in labour demand for crops on medium and large farms was so large that even the increase per capita income, rise in milk prices and expansion of milk processing and milk collection facility were responsible for the growth of dairy enterprises in the state.

Bala and Sharma (2005) reported a spectacular shift in the cropping pattern over the period 1990-91 to 2002-03 in the *Kullu* district. The tradition cereal crops have been almost completely replaced by the vegetable crops. The dominance of relatively short duration vegetable crops in the cropping pattern has raised the cropping intensity. The vegetable crops being highly labour intensive have generated more employment has increased by about 44 percent. The agricultural income per farm has increased by 332 percent over the period. Consequently, the general standard of living of the farming community has been perceived to be uplifted.

Kumar et al. (2006) concluded that the optimization of resource use under the sustainable farming systems has indicated scope for readjustment in the existing enterprises pattern for maximizing from returns. The increase in net return due to optimum allocation of resource use and selecting crops that require less water for irrigation could be one of the strategies to overcome the problem of water scarcity. This livestock rearing specially buffalo keeping has been highly profitable even under.

Methodology

The study was conducted in different agro climatic zones of Bihar and Jharkhand during 2001-02 under NATP project (Mission Mode). The procedure was adopted in selection of agro climatic zone, district, sub-division, blocks, and villages are given below:

Selection of agro climatic zones Bihar: All three agro climatic zones were selected purposively.

Zone- I, North West Alluvial Plain Zone,

Zone- II, North East Alluvial Plain Zone, and

Zone- III, South Bihar Alluvial Plain Zone.

Selection of Districts:

Under each zone, one district was selected randomly for the present study. Under Zone- I, *Samastipur* was selected randomly. Similarly, *Shaharsha* district and *Rohtas* district under Zone- II zone and Zone- III were also selected randomly.

Selection under sub-division:

Under selected district, *Samastipur* sub-division, *shaharsha* subdivision and *Bikaramganj* subdivision were also selected randomly.

Selection of Blocks:

From each selected subdivision one block namely *Kalanpur* block, Sour *Bazar* and *Bikaramganj* were selected randomly.

Selection of Villages:

Under *Kalanpur* Block of Samastipur district, the villages namely; Bar*auni, Bakhtiyarpur, Hazipur raza, Shahuri* and *Madanpur* were selected randomly. Similarly under Sour *Bazar* block of *Saharsha* district, the villages namely; *Bhabtiya, Rautakhaim, Raghunathpur, Kacharadone* and *Suhat* were also selected randomly. While under *Bikramganj* block of *Rohtas* district, five villages namely; *Lokaya, Kajhain, Kermaini, Amadarh* and *Matuli* were also selected randomly.

Selection of Farmers:

The complete lists of marginal and small farmers in the selected villages were prepared with the help of *Mukhiya/ Sarpanch*. From the prepared list of marginal and small farmers, different numbers of samples were selected through probability proportion to size (PPS method). Under zone- I, 52 marginal farmers and 23 small farmers, under zone- II, 65 marginal and 43 small and under zone- III, 24 marginal and 41 small farmers were selected from different selected villages.

Jharkhand State

Jharkhand state has been divided into three ago climatic zones namely;

Zone- IV- Central and North Eastern Plateau Zone,

Zone- IV- Western Plateau Zone, and

Zone- VI- South Eastern Plateau zone.

were selected purposively.

Selection of District:

Under each zone one district was selected randomly for the present study. Under Zone- IV; *Dumka* was selected randomly. Similarly, *Palamu* district and *Saraikela* and *Kharsawan* district under Zone- V zone and Zone- IV Zone- VI were also selected randomly.

Selection under sub-division:

Under selected districts, *Dumka* sub-division, *Palamu* subdivision and *Ghatshila* subdivision were also selected randomly.

Selection of Blocks

From each selected subdivision, one block namely *Dumka* block, *Daltenganj* and *Chandil* were also selected randomly.

Selection of Villages:

Under *Dumka* Block of Dumka district, seven villages namely; *Moretanga, Bandharjori, Khijuria, Hijla, Gidhnipahari, Karamtola* and *Harwadih* were selected randomly. Similarly under *Daltenganj* block of *Palamu* district, five villages namely; *Chukru, Kauria, Sua, Jarkat* and *Bakahri* were also selected randomly. While under *Chandil* block of *Kharsawan* district six villages namely *Ghatdumli, Tulgram, Balidih, Jugru, Palgaon* and *Dhunaburu* were also selected randomly.

Selection of Farmers:

The complete lists of marginal and small farmers in the selected villages were prepared with the help of *Mukhiya/ Sarpanch*. From the prepared list of marginal and small farmers, different numbers of samples were selected through probability proportion to size (PPS method). Under zone- IV, 73 marginal farmers and 46 small farmers, under zone- V, 97 marginal and 36 small and under zone- VI, 89 marginal and 40 small farmers were selected from different selected villages, respectively.

The primary data were collected in prepared scheduled through personnel interview on different aspects. The input data like land, irrigation area, cropping pattern, yield, livestock population including goat, sheep, poultry, were collected. The production data like cereals production, pulses production, oil seed, vegetables, milk and milk products, meat and meat products etc. were also collected. Tabular analysis techniques were used to present data in the study. The different farming system modules were examined and potential income and employment were analysed separately for both categories of sample farmers.

Result and Discussion

1. **Share of marginal and small farmer in total farmers:** The proportion of marginal and small farmers in total farmers in selected villages of Bihar revealed that the proportion of marginal farmers was high nearly 60 per cent in different zones of Bihar except zone III. The proportion of small farmers was about 25 per cent in all zone except zone III of the Bihar. All together marginal and small farmer shared more than 80 per cent in all zones of Bihar.

   The proportion of marginal and small farmers in different zones of Jharkhand was quite different in respect to Bihar. In this state, marginal and small farmers contributed more than 85 per cent in total farmers of the selected villages. The share of marginal farmers varied from 52 per cent to 65 per cent and small farmers varied from 24 per cent to 33 per cent.

   It was further observed that all these small and marginal farmers reared milch animal on their farm. The adoption of dairy enterprise on both categories of farmers in Bihar was about more than 60 per cent, while in case of Jharkhand the adoption of dairy animal was quite low in

respect to Bihar state. However, adoption was nearly 50 per cent on marginal farm which was nearly 43 to 35 per cent on small farmers.

2. **Size of Operational holding**: The average size of marginal farmers holding was nearly 0.50 hectare and of small farmers holding was about 1.6 hectare in Bihar (Table no. 1a). The percentage of irrigated land was nearly cent per cent in zone II and zone III on all categories of farmers. While in zone I, the percentage of irrigated area on marginal farm was about 54 per cent and 60 per cent on small farm, respectively. The cropping intensity was positively related with irrigation facility revealed that 200 per cent and more was observed in zone II and zone III, while in Zone I it was less than 200 per cent.

TABLE No. 1A —Average size of Farm Holding of Marginal and small Farmers in Bihar

(In hectare)

Zone	Marginal farm			Small farm		
	No. of farmers	Irrigated area	Total Area	No. of farmers	Irrigated area	Total Area
Zone I	52	0.20	0.37	23	0.92	1.54
Zone II	65	0.58	0.58	43	1.68	1.68
Zone III	24	0.52	0.52	41	1.60	1.60

In Bihar, the average size of family of marginal and small farmers was about 6 and 8 persons per family. There was no considerable difference in different zones in different categories of farmers. The per capita cultivable land on marginal and small farm was 0.09 hectare and 0.19 hectare, respectively.

The average size of holding on marginal farm and small farm was nearly 0.45 hectare and 1.53 hectares, respectively (Table no. 1b). The percentage of irrigated area was nearly 7.0 per cent for marginal farmers and nearly 6 per cent on small farms.

TABLE No. 1B Average Size of Farm Holding of Marginal and Small Farmers in Jharkhand

(In hectare)

Zone	Marginal farm			Small farm		
	No. of farmers	Irrigated area	Total Area	No. of farmers	Irrigated area	Total Area
Zone IV	73	0.04	0.46	46	0.06	1.54
Zone V	97	0.02	0.45	36	0.04	1.48
Zone VI	89	0.06	0.51	40	0.18	1.50

The cropping intensity varied from 90 percent to 110 per cent in the different zones of the state. The average size of the family of marginal and small farmers in the state was nearly 6.5 and 7, respectively. The per capita arable land on marginal and small farmers was 0.08 hectare and 0.21 hectare, respectively.

3. **Production system on sample farms**: The crop production system with combination of livestock varies from zone to zone on different categories of sample farmers in Bihar. In zone I the most important production system was livestock plus crop followed by local cow plus crop and buffalo plus crop on marginal farmers. In zone II on the same categories of farmers' again similar production system was dominated. While in zone III buffalo plus crop production system was major production system followed by livestock plus crop. Under small farmers livestock plus crop was further important combination of production system followed by buffalo plus crop and similar trend was observed in zone II also. While in zone III, buffalo plus crop was the most important production system.

TABLE No. 2—Production System on Selected Farmers of Bihar and Jharkhand

Sl. No.		1	2	3	4	5	6	
Production system		Local Cow + Crops	Buffalo + Crops	Cross Breed + Crops	Goat + Crops	Pigs + Crops	Livestock + Crops	Total Selected sample
Zone I	Marginal	13	11	1	6	—	21	52
	Small	5	6	2	1	—	9	23
Zone II	Marginal	11	9	—	9	—	36	65
	Small	7	7	—	1	—	28	43
Zone III	Marginal	1	12	—	1	—	10	24
	Small	4	28	—	—	—	9	41
Zone IV	Marginal	14	—	—	15	8	36	73
	Small	5	—	—	8	5	28	46
Zone V	Marginal	10	3	—	41	1	42	97
	Small	2	2	—	14	—	18	36
Zone VI	Marginal	6	—	—	43	2	38	89
	Small	4	—	—	15	—	21	40

4. Main and subsidiary occupations of sample farmers: The source of income varies from zone to zone in the state. And this was mainly due to availability of irrigation facilities on the farm. In zone II and zone III agriculture/ crop production was the main source of income of both categories of the farmers. While in zone I, agriculture / crop production was main source of income of small farmers, while wages was the main source of marginal farmers. The second most important source of marginal farmers for this zones was rural artisan and small business. The study further revealed that in Bihar, marginal farmers used lease in area, daily wages including agricultural labourer as a subsidiary occupation for survival of the family (Table no. 3).

In Jharkhand state, daily wages as a main source of income of marginal farmers in zone IV, while in zone V and zone VI daily wages, rural artisan and small business as a main source of income of this category of farmer. Agriculture was the main source of income of small farmers in zone V and zone VI. However, small farmer of zone IV took as main source of income as rural artisan and business and family hired labour. These farmers had taken daily wages and business and rural artisan again as a subsidiary occupation. In case of marginal farmers, daily wages and rural artisan were the main source of income in zone V and zone VI, while in zone IV agriculture again as a subsidiary source of income. Marginal farmers were busy in crop production by taking leased in area in the zone.

5. Cropping pattern: The cropping pattern of the region was positively associated with irrigation facilities in the different zones of two states. The study revealed that in Bihar, the cropping intensity varies from 176 per cent to 234 per cent in the different zones (Table no. 4a). The zone II of Bihar was having highest cropping intensity in the state followed by zone I. Paddy was the major crop in the cropping pattern in *Kharif* season while, maize was second most important crop of *Kharif* season particularly in zone II. In Rabi season, wheat crop was a major crop for all categories of farmers. Pulses and oilseed crops were occupied second and third position in *Rabi* crops for all categories of farmers. Rabi maize was also taken by all categories of farmers in zone I and zone II of the Bihar.

TABLE No. 4A—Cropping Pattern of Marginal and Small Farmers of Bihar

(Area in hectare)

Marginal farmers							
	Paddy	Maize	Wheat	Pulses	Oilseeds	Others	Total
Zone I	0.21	0.02	0.24	0.13	0.03	0.11	0.74
Zone II	0.46	0.3	0.42	0.48	—	—	1.66
Zone III	0.52	—	0.4	—	0.08	—	1

TABLE No. 4A—Cropping Pattern of Marginal and Small Farmers of Bihar—*Contd.*

(Area in hectare)

Small farmers	Paddy	Maize	Wheat	Pulses	Oilseeds	Others	Total
Zone I	0.94	0.13	0.89	0.39	0.11	0.23	2.69
Zone II	0.92	1.1	0.8	0.2	—	—	3.02
Zone III	1.6	—	0.88	0.64	0.08	—	3.2

The cropping pattern analysis further indicates that paddy was the main crop of all categories of farmer in Jharkhand (Table no. 4b). The second most important crop of the state was maize in *Kharif* season.

TABLE No. 4A Cropping Pattern of Marginal and Small Farmers of Jharkhand

(Area in hectare)

Marginal farmers	Paddy	Maize	Wheat	Pulses	Oilseeds	Others	Total
Zone IV	0.32	0.14	—	—	—	—	0.46
Zone V	0.16	0.1	0.09	0.06	0.04	0.01	0.46
Zone VI	0.34	0.06	—	—	—	—	0.4
Small farmers							
Zone IV	1.01	0.29	—	—	—	0.05	1.35
Zone V	0.55	0.35	0.27	0.33	0.2	0.13	1.83
Zone VI	0.91	0.25	—	—	—	—	1.16

Wheat crop was taken by marginal and small farmers in zone V only due to availability of better irrigation facility as compared to zone IV and zone VI. While pulses crop was most important crop of zone V followed by wheat and oilseed. The cropping intensity varied from 72 per cent to 111 per cent in the state.

6. Bovine and goat Population: Its population includes buffalo, local cow and cross breed in Bihar, the population study revealed that the existence of cross breed cow was almost absent except zone I in the state. On marginal holding, the average number of bovine varied from about 0.7 to 1.3 adult units per household (Table no. 5a).

TABLE No. 5A—Bovine Population on Marginal and Small Farmers in Bihar State

Zone	Types of farm	Buffalo	Local Cow	Cross Breed Cow	Total	Goat
Zone I	Marginal	0.50	0.26	0.18	0.94	0.90
	Small	0.29	0.20	0.18	0.67	1.12
Zone II	Marginal	0.30	0.39	—	0.69	2.10
	Small	1.50	0.60	—	2.10	3.70
Zone III	Marginal	1.10	0.20	—	1.30	0.50
	Small	1.16	0.10	—	1.26	1.10
Pooled	Marginal	0.63	0.28	0.18	0.98	1.17
Average	Small	0.98	0.30	0.18	1.34	1.97

The average bovine population was highest in zone III and lowest in zone II on marginal farms. It was further observed that buffalo population was dominated in all zones on the household in comparisons to local and cross breed. The number of bovine population was positively associated with size of operational holding in the state. The number of bovine on small farmers varied from 1.1 to 3.7 that were highest in zone II. Buffalo population was again dominated on all house hold in all zones however zone II was rich among all zones. Among cattle, local cattle were most important for all regions in the state. The study also revealed that marginal farmers were having more number of local cows in comparisons to small farmers. This was mainly due to lack of capital of the marginal farmers. The average number of goat was 1.1 and 1.9 unit on marginal and small farm household, respectively.

TABLE No. 5B—BOVINE POPULATION ON MARGINAL AND SMALL FARMERS IN JHARKHAND STATE

Zone	Types of farm	Buffalo	Local Cow	Cross Breed Cow	Total	Goat
Zone IV	Marginal	—	0.60	—	0.60	3.75
	Small	0.20	0.30	—	0.50	1.33
Zone V	Marginal	—	0.50	—	0.50	1.00
	Small	—	0.41	—	0.41	0.98
Zone VI	Marginal	—	0.70	—	0.70	2.10
	Small	0.19	0.58	—	0.77	3.80
Pooled	Marginal	—	0.60	—	0.60	2.28
Average	Small	0.20	0.43	—	0.56	2.04

In Jharkhand state the average number of bovine per household was all most equal in marginal and small farmers' (Table no. 5b). The local cow was dominated on both categories of farmers in all zones. Few small farmers were having buffalo in the state. Cross breed cow was completely absent in all zones of the state. There was no much difference in number of local cow on small and marginal farmers. However, marginal farmers' were found to be positive in rearing of bovine. Similar condition was found in rearing of goat by the marginal farmers except in zone VI.

1. Employment in crop production, bovine and goat rearing: The table no. 6a revealed that the average employment per annum per farm was quite high on small farms than that of marginal farm but there was no substantial difference in total employment days on different farms of same size of different agro climatic zones. An employment day per annum was positively related with size of farm in the different regions. The on an average employment opportunity was about 126 man days and 333 man days on small and marginal farmers in the state of Bihar.

TABLE No. 6A—EMPLOYMENT UNDER LIVESTOCK ON MARGINAL AND SMALL FARMERS (PER FARM) IN BIHAR

(In man days per farm)

Zone	Types of farm	Crop	Bovine	Goat & Sheep	Total
Zone I	Marginal	83.22	103.50	33.40	220.12
	Small	305.52	75.00	40.00	420.52
Zone II	Marginal	184.26	73.50	44.00	301.76
	Small	335.22	241.50	48.00	624.72
Zone III	Marginal	112.00	132.60	21.00	265.60
	Small	358.40	143.50	46.20	548.10
Average	Marginal	126.49	103.20	32.80	262.49
	Small	333.05	153.33	44.73	531.11

The table further indicates that the employment opportunity was less than 50 per cent or more than that of their counterpart in Bihar. This was mainly due to lack of irrigation facility resulted mono crop farming system pull down cropping intensity less than 100 per cent in the Jharkhand. The average employment opportunity in crop production was about 55 man days and 181 man days on marginal and small farms respectively. There was no much

difference in different zones of state except small farmers in zone V due to *rabi* crop (wheat and pulses).

The average employment per year per farm on marginal and small farm was about 150 man days and 197 man days, respectively. The employment day varied from region to region on both categories of famers and this was probability due to variation in number of livestock. The employment opportunity in livestock production was seem to be high on marginal farm than that of small farm (Table no. 6a).

In Jharkhand state, the annual employment in rearing of livestock was nearly 87 man days and 100 man days on marginal and small farm (Table no. 6b). It was further observed that employment opportunity in livestock was comparatively high on small farm than that of marginal farm in all zones of the state. Goat rearing created similar opportunity as created by bovine population for employment in the state. This was mainly due to availability of grazing of fallow land which is very suitable land for rearing of goat.

TABLE No. 6B—EMPLOYMENT UNDER LIVESTOCK ON MARGINAL AND SMALL FARMER IN JHARKHAND

(In man days per farm)

Zone	Farm Holding	Crop	Bovine	Goat & Sheep	Total
Zone IV	Marginal Farm	45.00	72.00	40.50	157.50
	Small Farm	152.76	62.50	55.85	271.11
Zone V	Marginal Farm	54.52	39.00	29.00	122.52
	Small Farm	215.76	51.25	44.10	311.11
Zone VI	Marginal Farm	66.00	47.00	32.00	145.00
	Small Farm	174.00	54.00	34.00	262.00
Average	Marginal Farm	55.17	52.67	33.83	141.67
	Small Farm	180.84	55.92	44.65	281.41

8. Income from crop production: Paddy was the main contributor in income from crop production followed by wheat on both categories of farmers in Bihar. Maize was next important crop of the farmers particularly Northern Bihar in the state. Pulses and oilseeds were also an important crop shared in farm income. The vegetable contribution was very minimal in both categories of farmers (Table no. 7a).

TABLE NO. 7A—INCOME FROM CROP PRODUCTION IN BIHAR

(In Rs.)

Marginal farmers								
	Paddy	Maize	Wheat	Pulses	Oilseeds	Vegetable	Others	Total
Zone I	2404.48	4356.08	402.3	2560	700	400	2640.5	13463.4
Zone II	6432.91	6867.6	7710.4	7575.1	—	—	—	28586
Zone III	9517.32	—	4160	2000	—	—	—	15677.3
Small farmers								
Zone I	10764	16390.7	2560	8536	2700	600	4998	46548.7
Zone II	12866.2	25282.4	15408.8	4400	—	—	—	57957.4
Zone III	29265.6	—	9152	1408.25	2000	—	—	41825.9
Average	11875.09	13224.20	6565.58	4413.23	1800.00	500.00	3819.25	34009.77

In case of Jharkhand state, paddy was most important crop followed by maize in income from crop production (Table no. 7b). Wheat and pulses has also contributed substantially in income of crop production. Vegetable was taken mostly by small farmers from production point of view. The average income of the farmer was much higher on small farm owing to large area.

TABLE No. 7B—INCOME FROM CROP PRODUCTION

(In Rs.)

Marginal farmers								
	Paddy	Maize	Wheat	Pulses	Oilseeds	Vegetable	Others	Total
Zone IV	2853.76	1127	—	—	—	—	—	3980.76
Zone V	1605.24	1690	1608.84	1320	1000	—	500	7724.08
Zone VI	5916	619.2	—	—	—	—	—	6535.2
Small farmers								
Zone IV	8970	2334.5	—	—	—	—	—	11304.5
Zone V	8468.5	5930	4826.52	7260	500	—	3250	30235
Zone VI	15652	2476	—	—	—	—	—	18128
Average	7244.25	2362.78	3217.68	4290.00	750.00	—	1875.00	12984.59

9. Income from livestock: The sources of income from livestock in all regions of Bihar were buffalo as a dairy animal for both categories of farmers.

TABLE No.8A —GROSS INCOME FROM BOVINE POPULATION ON MARGINAL AND SMALL FARMERS OF BIHAR

(In Rs.)

Zone	Types of farm	Buffalo	Local Cow	Cross Breed Cow	Total	Goat
Zone I	Marginal	1286.70	866.50	3477.60	5630.80	1197.35
	Small	3731.47	766.50	3091.20	7589.17	1289.20
Zone II	Marginal	5164.88	1593.34	—	6758.22	4027.80
	Small	16727.58	3354.40	—	20081.98	7096.60
Zone III	Marginal	14841.90	1585.70	—	16427.60	951.00
	Small	15831.36	792.66	—	16624.02	2091.10
Pooled	Marginal	7097.83	1348.51	3477.60	9605.54	2058.72
Average	Small	12096.80	1637.85	3091.20	14765.06	3492.30

Cross breed cow was reared by small and marginal farmer in agro climatic I zone of the Bihar. In Bovine, local cow was also a source of income as a dairy animal in all zones of Bihar. Goat was reared for meat purposes and contributed in livestock income more than local cow in all zones (Table no. 8a).

TABLE No. 8B—GROSS INCOME FROM BOVINE POPULATION ON MARGINAL AND SMALL FARMERS OF JHARKHAND

(In Rs.)

Zone	Types of farm	Buffalo	Local Cow	Cross Breed Cow	Total	Goat
Zone IV	Marginal	—	507.90	—	507.90	7908.75
	Small	—	485.13	—	485.13	2805.64
Zone V	Marginal	—	1015.98	—	1015.98	1001.00
	Small	283.35	507.35	—	790.70	1178.00
Zone VI	Marginal	—	7833.00	—	7833.00	3101.70
	Small	—	522.30	—	522.30	5612.60
Pooled	Marginal	—	3118.96	—	3118.96	4003.82
Average	Small	283.35	504.93	—	599.38	3198.75

In Jharkhand state, goat was the most important sources of income of all categories of farmers in all zones. The second source was local cow in the state. Few small farmers in zone V and zone VI were reared buffalo as a dairy animal (Table no. 8b).

Share of crop production and live stock in total on farm income: The gross income includes value of crops and value of milk and milk product on different categories of selected farmer in Bihar and Jharkhand. The analysis revealed that crop was the main contributor in gross income of both categories of farmers in Bihar (Table no. 9a). Nearly, 61 per cent income derived by crop enterprises by the marginal farmers and 72 per cent derived by small farmers in the state of their total on farm income per annum. The livestock enterprises contributed higher share in marginal farmer's income as compared to small farmers. It indicates that marginal farmer were taking much interest in rearing of dairy and goat by supporting additional income on their farm.

TABLE No. 9A—Percentage Share of Crop Production and Livestock in Total on Farm Income in Bihar

(In Rs.)

Zone	Marginal Farmer			Small Farmer		
	Crop Production	Livestock	Total	Crop Production	Livestock	Total
Zone I	13462.86	6828.15	20291.01	46548.85	8878.17	55427.02
Zone II	28373.01	10786.02	39159.03	57957.44	27178.88	85136.32
Zone III	13671.32	17377.20	31048.52	41825.85	18715.30	60541.15
Average	18502.40	11663.79	30166.19	48777.38	18257.45	67034.83
Contribution percentage	61.33	38.67	100.00	72.76	27.24	100.00

TABLE No. 9B—Percentage Share of Crop Production and Livestock in Total on Farm Income in Jharkhand

(In Rs.)

Zone	Marginal Farmer			Small Farmer		
	Crop Production	Livestock	Total	Crop Production	Livestock	Total
Zone IV	3980.76	8416.65	12397.41	11304.50	3290.77	14595.27
Zone V	7249.20	20169.98	27419.18	30233.05	1968.70	32201.75
Zone VI	6535.20	10934.70	17469.90	18128.00	7261.60	25389.60
Average	5921.72	13173.78	19095.50	19888.52	4173.69	24062.21
Contribution percentage	31.01	68.99	100.00	82.65	17.35	100.00

The study further revealed that in Jharkhand state marginal farmers received nearly 69 per cent of their on farm income from livestock, while the crop enterprises contributed nearly 30 per cent of their income. But this situation changed on small farmers when live stock shared only 17 per cent and crop enterprises 83 per cent in their total farm income. Zone wise analysis indicated similar trend among the two categories (Table no. 9b).

On farm income: On farm income includes crop income and livestock income on the farm. Gross income is a value of income of main product and by product. The net income is a surplus over total expenditure. Farm labour income is an income of net income plus imputed value of family labour engaged in production. It is clear from the table no.10a that all type of income increased with increased in size of farm. Per capita family labour income was about 2000 and 3000 on marginal and small farm per annum in Bihar. The income among different zone varied mainly due to variability in cropping intensity and extent of rearing of livestock on the farm.

TABLE No. 10A—On Farm Income of Marginal and Small Farmers in Bihar

(In Rs. Per annum)

Zone	Types of farm	Gross Income	Net Income	Family Labour Income	Per capita family labour income
Zone I	Marginal	20291	380	7005	1061
	Small	55427	4851	18402	2558
Zone II	Marginal	39359	8274	15667	2956
	Small	85156	15937	34522	4210
Zone III	Marginal	31049	9112	15878	2529
	Small	60541	21335	29975	3258
Over all	Marginal	30233	5922	12850	2182
	Small	67041	14041	27633	3342

In Jharkhand state, there was not much difference in per capita farm labour income different categories of farm in different climatic zones.

It was mainly due to low variability in cropping intensity and extent of livestock rearing. The average per capita farm labour income per annum was Rs. 1750 and Rs. 1860 on the marginal and small farm in the state. The average size annual income in form of gross income net income and farm family income is quite low in Jharkhand as compared to their counterpart in Bihar mainly due to availability of irrigation facility, better quality of land which resulted higher yield of cereals and pulses crops. The quality of dairy animal was also better in Bihar than that of Jharkhand.

Conclusions:

This analysis clearly indicates that agriculture and other allied enterprises can be factory of employment but not for income. The saving inform of family labour income expressed that vary minimum opportunity is available on the farm even though having more than 200 per cent cropping intensity in the area particularly zone II and zone III of Bihar. Farmers cannot maintain their farm family on agriculture and allied activities existing on their farm. Due to this marginal farmers and small farmers of these states are migrating from their area in search of labour in different states. The occupational analysis also indicates that majority of marginal and small farmers in both the states expressed that their main occupation are other than agriculture.

Policy implications:

The central issue in agricultural development is the necessity to increase productivity, employment and income for poor segment of agricultural population of whom the small and marginal farmers constitute a sizable section. Thus farmers should be organised and encourage towards formation of more integrated approach to agriculture. The need of hour is greater investment and accountability on research and extension of rural infrastructure, improved farmers education effective involvement of government to achieve targeted growth in agriculture. The economy of the country will improve if the farmers particularly marginal and small land holders and all farmers in general become prosperous and are really empower. The government should make a necessary change in its policy and programme in light of problem of marginal and small farmers.

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Inclusive Growth Through Food Supply Chain

SHAMIM AHMAD* & KHAN TUFAIL AHMAD**

ABSTRACT

The farmers are by and large confined to their traditional system of cropping and are scared of innovative forms of cropping and linking the produce with the markets or the supply chain members vertically or horizontally. The option of collaborating with agribusiness for value addition or making the produce marketable is also considered to be beyond the reach of an ordinary farmer. Agribusiness, to them, is a domain of urban large enterprises. The focus is now shifting towards inclusive growth of agriculture for ensuring the prosperity of farmers. This may be possible through diversifying agriculture by the route of backward integration in the Food Supply Chain of the country for the rural and farming communities. Involving the rural population in agro-food production, processing, retailing and entrepreneurship will connect them with vast global markets. Better management of supply chain will improve the marketing efficiency leading to benefit directly to the poor farmers. Development of efficient and inclusive value chains will also enhance urban–rural linkage, allowing the supply of safe and affordable food to increasing population. Management of Food Supply Chain with backward integration and its impact on the integration or diversification in food processing, wholesale grocery, retail markets, and restaurants should properly be planned. The effect of Food Supply Chain and backward integration on the welfare of the farmers and their living standards should also be evaluated. This will determine a roadmap to agricultural diversification and Food Supply Chain Management in India.

Keywords : Food Supply Chain**,** Backward Linkages, Farmers in Supply Chain, Integration in Food Marketing, Market linkage of Farming.

The Farming is an age-old means of livelihood for millions of Indians. According to Rhodes (1993) Industrialization of agriculture is also nearly as old as agriculture itself. Industrialization involves a switch from agriculture based upon a fixed resource (land) to one based upon manufactured and hence variable resources. However in spite of the development and advancement on scientific and business entrepreneurship model there have been few systems in which farmers have been adequately if not efficiently linked with market. This isolation on the part of farming community has deprived them of assured fair prices for their produce, leave alone a remunerative price.

Green revolution has lead to achieving a number of landmarks of high quality and large quantities of production in India. In the process of agricultural transformation, the farmers have put in all their resources and energies to liberate the country from acute crisis but their state has not improved significantly.

The plus points in agriculture indicate that there is abundant scope for India to be a world leader in food supply which may also sufficiently cater to the needs of the India's raising population. The focus is now shifting towards inclusive growth of agriculture for ensuring the prosperity of farmers at the bottom line. This may be possible through diversifying agriculture of the country. To make the farming remunerative, agriculture is to be transformed into a sort of agribusiness and linked directly with the markets (local and distant). At the same time better management of supply chain will improve the marketing efficiency leading to benefit directly to the poor farmers. The present paper attempts to analyse this hypothesis in the light of given theories, developments and examples.

The problems of agribusiness can be converted into big opportunities by linking the farmers through food supply chain management. There have been numerous cases in India and abroad where firms irrespective of States supports and cooperation, have adopted strategy of the Vertical Integration in a Forward and Backward form. Indian agricultural scenario has given birth to several concepts like that of Contract Farming, Captive Farming, Cooperative Farming and Terminal Market which promise to provide a proper linkage between the 'farm and market.'

The fact remains that still the food processing companies in India require timely and adequate inputs of good quality agricultural produce. Analyzing integration strategies in the food economy is an important research topic in the field of industrial organization in agricultural economics (Sexton 2000). One of the main objectives of researchers and policy makers will be to measure the impact of these strategies on farmers' and firm's success and growth. Secondly to analyze whether the backward integration on the part of firms has yielded any good result in particular for the organizations interested as well as for

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the other stakeholders. Further the management of Food Supply Chain with backward integration and its impact on the integration or diversification in food processing, wholesale grocery, retail supermarkets, and restaurants should be assessed. Finally the effect of Food Supply Chain and backward integration for the larger benefits of the welfare of the farmers and their living standards should be evaluated. This will determine a roadmap to agricultural diversification and Food Supply Chain Management in India.

Recognizing the need for and merits of Food Chain linkage with the farming community, several corporate organisations in India have taken lead and are involved in agro-commodity trading, processing, exports, etc. These firms have attempted to establish convenient systems/ models that ensure timely and consistent supply of raw material of the desired quality at low cost. The analysis of a few successful cases of contract farming and an arrangement for the problems and bottlenecks will guide us to draw the benefits and counter the criticisms levelled against this emerging alternative farm-business model.

The key characteristic of industrialized farming is the development of contractual arrangements between producers and farmers in the marketing chain. These arrangements have given rise to vertical integration in the form of backward as well as forward among producers and marketers. The World Bank (2001) points out that Vertical Integration linking input suppliers, producers, processors and supermarkets is already the common production structure in northwest Europe and parts of the USA. The successful examples of Europe and USA have great amount of influence on the Indian agro-industry. These influences and partnerships are taken at diplomatic level also whereby an agreement of assistance and sharing knowhow on the part of developed and less developed countries is worked out periodically.

1. Collaborative Measures in Food Supply Chains

Supply chains are the form of industrial organization which allows buyers and sellers who are separated by time and space to progressively add and accumulate value as products pass form one member of the chain to the next (Hughes 1994, Fearne 1996, Handfield and Nichols 1999). Supply chains are the conduits (Cooper et al. 1997) through which Supply chains enforce internal mechanisms and develop chain wide incentives for assuring the timely performance of production and delivery commitments (Iyer & Bergen 1997, Lambert and Cooper 2000).

Individual suppliers, producers and marketers who are associated through a supply chain coordinate their value creating activities with one another and in the process create greater value than what they would have while operating independently. Motives for collaboration between supply chain participants are well known and identified in detail (Mahoney 1992, Giunipero & Brand 1996). Supply chain strategies create synergies in one of the following three ways: (1) by expanding traditional markets, (2) by reducing the delivery cost of products, and (3) by targeting specific market segments.

2. Vertical Integration

Vertical integration is marketing system synchronization in which coordination of two or more stages occurs under common ownership via management directive (Martinez 1999). Horizontal integration is similar to vertical integration except that it refers to firms pursuing activities that are in the same stage in the marketing system.

According to Dobashi et al. (1999), there are three levels of integration. These are:

(a) Non-integrated firms tend to act as individual business units.

(b) Semi-integrated involves the processor taking over some parts of the production.

(c) Integrated corporate entities control all levels of the value chain by ownership or collaboration.

Recent researches which have surfaced in the food industry have identified a number of reasons to explain why farming community and processing industries enter into different forms of vertical coordination (such as contracting and vertical collaboration) as opposed to operating on open markets. Thus, for instance, farmers may enter into contracts to reduce price risks, to get access to capital and new technology, and to get an assurance for an outlet for their final produce and other by-products. On the other hand, processors may enter into contracts to get assured consistent quality and quantity of inputs to run their processing plants efficiently (Hennesey 1996). It has also been suggested that processors may integrate backwards into agriculture to internalize the deadweight loss associated with market distortions which are internalized by integration (Henderson & Mitra 1996).

3. Inclusive Food and Agriculture Value Chain Development in Rural Areas

Asian Development Bank's multi sector food security report (ADB 2009) states that engagement among the different players can be significantly enhanced by increasing synergy and value addition in the backward and forward linkages along the food and agriculture value chain, with particular attention to small farmers and other vulnerable groups. Such strategic interventions will help DMCs (Developing Member Countries) develop inclusive food and agriculture value chains that the operational plan espouses as a pathway to transforming Asia's rural and agriculture sector, thereby achieving sustainable food security.

Such value chains will allow efficient integration of food and agriculture production, with processing and marketing at the country and regional and/ or sub regional levels. With special emphasis on the poor and vulnerable groups that remain excluded from greater participation in economic activities, the value chains will also allow small producers adequate and fair access to inputs, markets, technologies, and information, and provide diverse incomes and job opportunities. The report further states that Development of efficient and inclusive value chains will also enhance urban–rural linkage, allowing supply of safe and affordable food to increasing numbers of urban poor people (ADB 2009).

Factor which is responsible for the firm's diversification is that a firm integrates backward or forward in the marketing channel in related businesses to achieve lower costs or control over the quality of an input whereas diversification is a portfolio strategy that occurs outside of the marketing channel. A detailed review of over 20 articles is presented in Dorsey (2006). With regard to the agribusiness literature Ding, Caswell, and Zhou (1987) found a lack of positive correlation between performance as measured by stock price and diversification. The current process of Diversification which started in the 1960s and 1970s when firms (e.g., conglomerates) diversified as a means of developing a portfolio of businesses that were not related with each other reached heyday in 1990's among agribusinesses.

4. Market Linkage and Supply of Agro Food

As shown in Figure 1, different dynamics and complexities of the food industry are evident. This could be one of the reasons of low level of integration, i.e. lack of knowledge and expertise for very low share of processed food in Indian agro-market. For development of rural entrepreneurship global trade is an opportunity waiting to be tapped in the Indian food market.

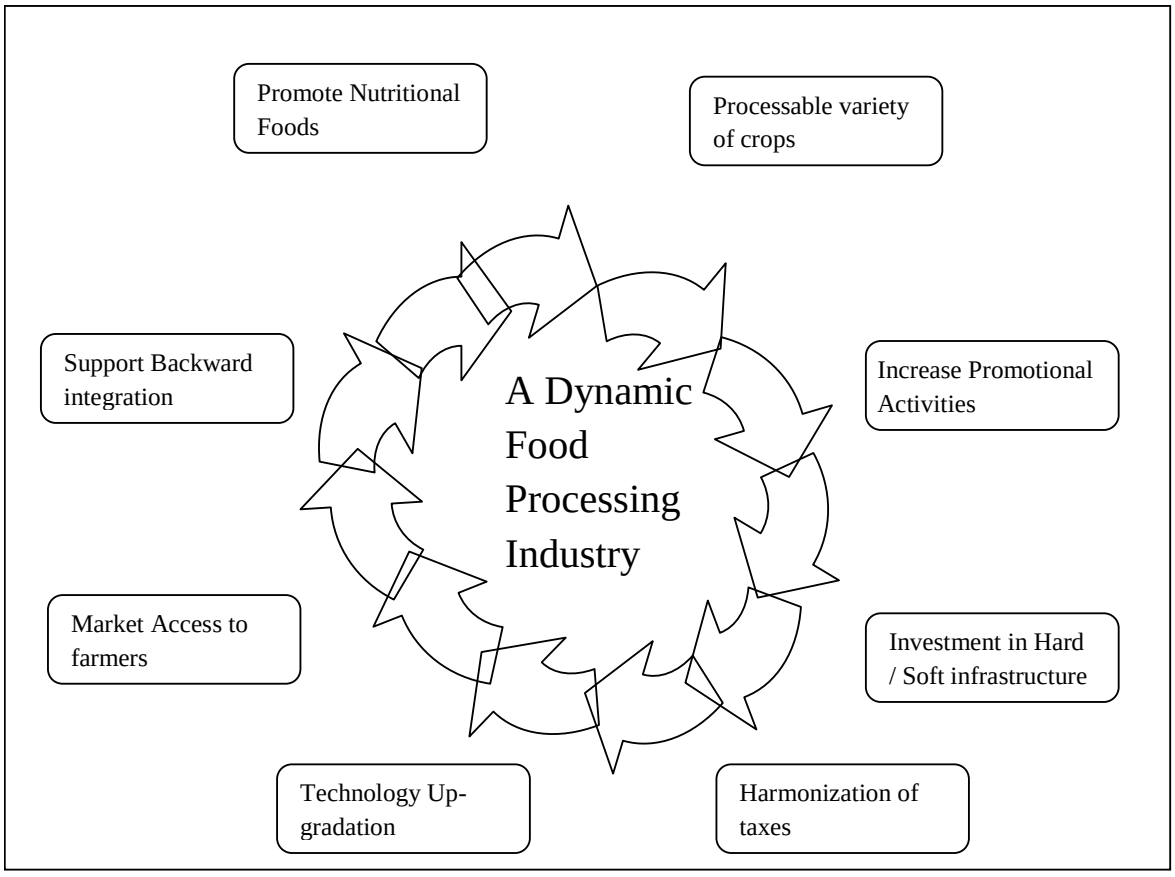

Figure 1: A Dynamic Food Processing Industry

This is a good time for companies to invest in quality facilities, diversification and develop products with features that appeal to the growing Indian consumer as well as foreign markets. Also, from a government's point of view, food processing sector can help to reduce the burden of subsidies and raise the farmer's income simultaneously. The issues confronted by farmers are growing day by day and becoming major social and economic problems for the country. It cannot be resolved through intervention approach alone. So, the government

should continue to support the industry with an enabling and growth oriented policy. Agricultural produce that is processed for domestic consumption can fetch higher prices. It will result in higher incomes for the farmers, and also it will generate direct and indirect employment for the rural population.

India's low level of processing is expected to change significantly in the future fuelled by sustained economic growth and steady urbanization. Processed food output is expected to grow at a strong 7 percent CAGR in terms of value from 55.6 billion USD in 2005 to 95.6 1 billion USD in 2013 (Business Monitor International, Jan-Mar 2009). Brand and quality of life consciousness, especially among the young and rich urban population, is also a key factor helping value growth over the forecast period.

The generic value chain of the food processing industry from raw material to retail for the consumer should be improved. Traditionally, different players across the value chain play different roles and work more or less independently.

Recently, the trend has been towards increasing integration and collaboration across players in the value chain, to garner mutual benefits. Such integration is being driven by the manufacturers, who are looking to integrate backward and establish linkages both with raw material producers (farmers) and aggregators/ logistics providers. These links have led to two kinds of models emerging in the sector namely Contract Farming and Terminal Markets.

Strengthening institutions like contract farming is an option to provide risk-mitigating services, and enable farmers to make the transition from traditional grain crops to higher value commodities (Gulati & Ganguly 2008). In addition to the assured markets and stable prices afforded farmers, the backward linkages help control transaction and marketing costs, yielding higher returns to contract farmers (Birthal et.al. 2005). In a contract, farmers by and large being on the receiving end do not negotiate the terms and conditions with the firm. This model will not succeed unless and until the farmers or their cooperatives get strong enough to come at par with the contracting firms to get a better deal from them.

Developing Terminal Markets is also another option for strengthening forward and backward linkages in the supply chain but the benefits may not always percolate fully to the farmers as these are urban-centric in nature. Both the above models are to be applied carefully by a situational approach for achieving the inclusive growth targets.

5. Globalization and Outsourcing Model of Backward Integration

From the Integration point of view, the strategy of offshoring determines a firm's supply chain efficiency in that particular industry. The Different industries have different supply chain structures. Strategic attempts for Globalization of firms require functional integration between internationally dispersed activities in which industries and commercial firms have two types of international economic network; one is producer driven and another is buyer driven.

The agro-foods and all allied products are an ideal industry with the dynamics of buyer-driven value chains. The relative ease of setting up agro-food companies, coupled with the prevalence of developed country's not very stringent protectionism in this sector, leads to an unparalleled diversity of food export to the developed countries of the world. Furthermore, the backward and forward linkages are extensive, and help to different activities associated with the industry (Gereffi, G. & Memedovic, 2003). According to Christopher (2005), globalization also tends to lengthen supply chain as companies increasingly move production offshore or source from more distant locations.

With the advent of globalization and enhanced levels of competition, many organizations have started to have considerable difficulties in developing and maintaining the range of expertise and skills needed to compete effectively. The emergence of American, European, Japanese and Third World multinationals has created a new competitive environment, requiring the globalization or at least semi-globalization of corporate strategy. The above need has led many companies to engage with various kinds of outsourcing.

Outsourcing is basically a managerial approach through an agreement between buyer and supplier(s) to avail processes or services that the buyer is providing internally at present with an intention to reduce cost, increase focus on core business, improve quality of products and services and to ensure more flexibility. The outsourcing, therefore, requires locating an expert who can perform a certain business processes or functions outside the firm more efficiently.

The process of outsourcing requires the maintenance of harmonious relationships between the two main parties i.e. the "outsourced" (that means buyers or the ones who outsource) and "outsourcer" (referring to suppliers or the ones who deliver services). A number of processes and functions can be outsourced in the supply chain by involving indigenous rural sources promoting rural entrepreneurship and farmers' prosperity

6. Conclusions

The trend has been towards increasing integration and collaboration across players in the value chain. It is driven by the manufacturers who are looking to integrate backward and forward to establish linkages both with farmers and aggregators/ logistics providers to garner mutual benefits. For strengthening these linkages in the

supply chain Contract Farming and Captive Farming models are to be applied carefully by a situational approach for achieving the inclusive growth targets. Contract Farming model will succeed only when the farmers or their cooperatives get strong enough to come at par with the contracting firms to get a better deal from them. In Terminal Markets' option, the benefits may not always percolate fully to the farmers as these are urban-centric in nature.

The agro-foods and all allied products offer great opportunities for setting up buyer-driven value chains to cater the demands world-wide with an unparalleled diversity of food export to the developed countries of the world. Such value chains will also require outsourcing many of their processes and functions by involving indigenous rural sources promoting rural entrepreneurship and farmers' prosperity.

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Impact of Crop Financing on Income and Employment on Marginal and Small Farm Households: A Study of Borrowers of Prathama Bank, the First R. R. B. of India

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Agriculture is the mainstay of Indian economy as 60 per cent of its population is dependent on it for their livelihood and it contributes about 14 per cent to national GDP. Agriculture, thus, forms the backbone of the Indian economy. Introduction of new agricultural technology has resulted into higher income and human labour employment per unit area. However, new technology is capital intensive as it requires heavy expenditures on inputs like fertilizers, HYV seeds, irrigation, plant protection chemicals as well as investment on power and machinery. As the majority of farmers in our country have very little marketable surplus hence, are unable to meet their farm financial requirements from their own funds. Thus, the new technology is largely responsible for contributing a big spurt in demand for production and investment credit. There is little doubt about the fact that unless credit is made available to the farmers, at a reasonable cost and easy terms and conditions, the tempo of agricultural development cannot be accelerated. Thus, for increase in agricultural production and income of the farmers, crop financing is must.

To meet the credit requirement of weaker sections of rural economy adequately, Regional Rural Banks (RRBs) were created in 1975. One of the most important objectives of RRBs is to promote the growth and development of agriculture through focus on marginal and small farmers. Hence, the basic idea underlying the direct farm financing operations of the RRBs is to improve the productivity of agriculture and to help the marginal and small farmers to move to a higher technological plan to raise their farm income.

The majority of Indian farmers being small and marginal are unable to meet the increased financial requirements to purchase the inputs required for agricultural production and hence, have pressing demand for production credit. So far, the non-institutional credit acted as a major source of agricultural credit in India, which is being provided by agriculturist money lenders, professional money lenders, merchants, traders, commission agents, land lords, friends, relatives and others. However, the non-institutional credit suffers from several evils. It is security oriented, carries exorbitant rates of interest and exploits the poor farmers in several ways. Because of this, the post independence national policy in this regard has been to progressively institutionalize the agricultural credit. With growth in banking sector, credit flow to agricultural sector has enhanced over the years, but mostly only better-off farmers have been able to access it leaving small and marginal farmers to borrow from informal sources.

The problems of small and marginal farmers, in general, are of low investment, low production and low income. Because of low income, they are not able to either raise their own savings or borrow credit for adoption of improved technology on their farms. In the past, because of low income and, thereby, low repayment capacity, the share of the credit availed by the small and marginal farmers, from institutional sources was very low. Therefore, they have to turn mostly to village money lenders who charged exorbitant rates of interest and never cared for the productive utilization of credit. However, financial institutions expended their business in the agriculture sector to help farmers across the farm size groups. In view of the aforesaid, an attempt has been made in this paper to examine, the impact of crop loan on crop productivity, net farm income and human labour employment to small and marginal farmer borrowers of Prathama bank, the first R. R. B. of India.

METHODOLOGY

Sampling design

The Prathama bank engaged in financing agriculture was selected purposively for the study being the first Regional Rural Bank of India. Out of total 70 districts of Uttar Pradesh, one district namely Moradabad was also selected purposively on the basis of having maximum number of Prathama Bank (RRB) branches in operation. Out of 13 blocks in district, one block namely Thakurdwara was selected randomly for the study. Four villages, in the operational area of Prathama bank, were selected randomly out of total 152 villages. A separate list of all the small and marginal borrower farmers from all the four villages was prepared. Finally 20 small and 20 marginal farmers in probability proportion to their number in the four sample villages were selected randomly. Thus present study is based on 40 borrower farmers.

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Data and its sources

The study was based on primary as well as secondary data. The relevant primary data was collected on well structured pre tested schedules from the sample farmers through personal interview. Secondary data was collected from various publications of the bank, block development office, district statistical office and other related sources. The relevant data procured for the study relates to the agricultural years 2006-07 and 2007-08.

Analytical Framework

To assess the impact of crop loan on crop productivity, net farm income and employment of the sample borrowers 'Before and After' approach was used. Mean values of crop productivity (qt/ha), net farm income (Rs./ha) and employment (man days/ ha) were calculated for the two periods across the farm size groups to compare the difference therein using descriptive statistics. Test statistics 't-test' was applied to test the significance of the difference in the mean values of the variable, if any, between the two periods. For the t-test, following hypotheses were formulated,

1. There is no significant difference between the crop productivities of before and after loaning periods.
2. There is no significant difference between the net farm incomes obtained during before and after loaning periods.
3. There is no significant difference between the human labour employment generated through crop production during before and after loaning periods.

In addition, per cent change between before and after situation was calculated in respect of productivity, net farm income and employment.

RESULTS AND DISCUSSION

Operation holdings of borrower farmers

Size of operational holding plays an important role in enhancing the enterprise income as well as size of farm business. Table 1 indicates the average operational size of land holding of the sample farmers. In the study area, it was found that all the sample farmers were operating irrigated land as a whole. The table revealed that marginal and small farmers possessed operational holding, on an average of 0.58 hectare and 1.27 hectares, respectively. The average operational holding of small farmers was more than double to that of marginal farmers.

TABLE 1—AVERAGE SIZE OF OPERATIONAL HOLDING OF SAMPLE FARMERS

(Hectare)

Attributes	Category of farmers			
	Marginal		Small	
	Irrigated	Unirrigated	Irrigated	Unirrigated
Owned Land	0.56	—	1.27	—
Leased-in Land	0.02	—	—	—
Leased-out Land	—	—	—	—
Total Operated land	0.58	—	1.27	—

Table further revealed that all the sample farmers were operating totally irrigated area across the two farm size groups and no leased-in area was found to be operated by small farmers unlike marginal farmers.

Impact of crop loan on crop productivity, net farm income and human labour employment

Cropping pattern of sample farmers

Borrower marginal farmers were found growing only four major crops namely paddy, wheat, mustard and sugarcane, whereas, small farmers were growing two more major crops viz., maize and potato. Fodder crop was also found to be grown on sample borrowers' farms in very small area but for impact assessment of crop enterprise on the two farms this crop was not considered. The impact on fodder production was indirectly examined through increase in income of livestock. The existing cropping pattern along with average size of land holding under both categories of farmers during before and after loaning periods have been presented in table 2. It is revealed from the table that paddy and wheat were the main cereal crops grown in the study area. Other crops grown were sugarcane, mustard, potato, maize and fodder. It is also revealed from the table that paddy was grown in the Kharif season on 43.93 per cent and 38.28 per cent of gross cropped area operated by marginal and small farmers, respectively. In Rabi season,

44.86 per cent of gross cropped area was allocated under wheat crop by marginal farmers, whereas, it was 38.74 per cent on small farms. The area under mustard on marginal and small farms was 0.93 per cent and 1.94 per cent of the gross cropped area, respectively. In case of sugarcane, it was 8.41 per cent and 14.41per cent of gross cropped area on marginal and small farms, respectively. Potato and maize crops were grown only by small farmers during the study period. Cropping intensity of 184.48 per cent on marginal farms was little higher than that on small farms (174.80 per cent).

TABLE 2—Cropping Pattern on Sample Farms

Crop season	Crop	Area under crop (hectare)			
		Marginal farms		Small farms	
		After loan	Before loan	After loan	Before loan
Kharif	Paddy	0.47 (43.93)	0.47 (43.93)	0.85 (38.28)	0.85 (38.28)
	Fodder	0.02 (1.87)	0.02 (1.87)	0.09 (4.05)	0.09 (4.05)
	Maize	— —	— —	0.01 (0.45)	0.01 (0.45)
Rabi	Wheat	0.48 (44.86)	0.48 (44.86)	0.86 (38.74)	0.86 (38.74)
	Mustard	0.01 (0.93)	0.01 (0.93)	0.043 (1.94)	0.043 (1.94)
	Potato	—	—	0.048 (2.16)	0.048 (2.16)
Sugarcane		0.09 (8.41)	0.09 (8.41)	0.32 (14.41)	0.32 (14.41)
Gross cropped area		1.07	1.07 (100)	2.22 (100)	2.22 (100)
Cropping intensity		184.48	184.48	174.80	174.80

Figures in parentheses indicate percentage area of gross cropped area.

Thus, it was found that after taking loan, the type of crops grown and per cent area allocated under them remained same on both the categories of farms i.e. marginal and small. The reason might be the allocation of particular piece of land for specific crop due to small holdings operated by the farmers of both the categories during the study period. Marginal farmers allocated proportionately more area under cereals compared to that of small farmers in both the periods.

Input use by sample farmers

The levels of various inputs used by marginal and small farmers in the crops grown are presented in the tables 3 and 4, respectively.

TABLE 3—Per Farm Average Input use by Marginal Farmers

Sl No.	Crops	Period	Seed (kg)	Fertilizer (kg)	Plant Protection Chemicals (Rs.)	Irrigation (number)
1.	Paddy	After loan	10.69(12.17)	94.12(26.59)	237.70(21.95)	5.95(19)
		Before loan	9.53	74.35	194.91	5.0
2.	Wheat	After loan	60.05 (3.77)	104.58(12.83)	228.19(21.05)	4(8.10)
		Before loan	57.87	92.69	188.51	3.7

TABLE 3—PER FARM AVERAGE INPUT USE BY MARGINAL FARMERS—*Contd.*

Sl No.	Crops	Period	Seed (kg)	Fertilizer (kg)	Plant Protection Chemicals (Rs.)	Irrigation (number)
3.	Sugarcane	After loan	398(6.42)	15.85(13.38)	112.32(85.13)	5(11.11)
		Before loan	374	13.98	60.67	4.5
4.	Mustard	After loan	0.082(3.79)	3.22(38.79)	15.93(314.84)	3.5(6.06)
		Before loan	0.079	2.32	3.84	3.3

Figures in parentheses indicate percentage increase in the input use after loan

After crop financing quantity of seed was applied at higher rate in all the crops than that of before loaning period on marginal farms, which ranged from 3.77 per cent (wheat)to 12.17 per cent (paddy). Similarly fertilizer application increased from 12.83 per cent in wheat crop to 13.38 per cent in sugarcane crop. Per farm expenditure of on plant protection chemicals also increased after loaning in almost all the crops which ranged from about 21 per cent in paddy and wheat crops to as high as about 315 per cent in mustard crop.Number of irrigation also increased to the extent of about 6 per cent in mustard crop to 19per cent in paddy crop after loaning.

Like marginal farmers, small farmers also increased the level of all the major inputs in almost all the crops after loaning with varying intensity (Table 4). Highest increase in the seed rate was found in potato crop (38.70 per cent) followed by maize crop (15.78 per cent). Highest increase in the fertilizer use was observed in potato crop which was to the tune of 30.56 percent. Expenditure on plant protection chemicals also increased from 1.53 per cent in mustard to more than 77 per cent in maize crop. Number of irrigation increased in all the crops on small farm after loaning.

TABLE 4—PER FARM AVERAGE INPUT USE BY SMALL FARMERS

SI No.	Crops	Period	Seed (kg)	Fertilizer (kg)	Plant Protection Chemicals (Rs.)	Irrigation (number)
1.	Paddy	After Ioan	19.14(4.93)	168.45(6.69)	510.4(24.34)	5.9(13.46)
		Before loan	18.24	157.89	410.48	5.20
2.	Wheat	After loan	107.50(3.57)	189.20(7.63)	382.7(12.56)	4.0(8.10)
		Before loan	103.79	175.79	340.00	3.70
3.	Sugarcane	After loan	3600(1.12)	57.88(2.70)	266.6(16.14)	5.3(6.0)
		Before loan	3560.00	56.36	229.55	5.0
4.	Potato	After loan	43(38.70)	9.40(30.56)	30.96(19.44)	4.6(15.0)
		Before loan	31.00	7.20	25.92	4.0
5.	Mustard	After loan	0.236(9.52)	10.27(10.66)	13.62(1.53)	4.9(22.50)
		Before loan	0.210	9.28	12.09	4.0
6.	Maize	After loan	0.88(15.78)	4.38(23.03)	15.51(77.65)	3.5(16.66)
		Before loan	0.76	3.56	8.70	3.0

Figures in parentheses indicate percentage increase in the input use over before crop loaning period.

A perusal of these tables reveals that there had been an increase in the application of quantities of various inputs such as seed, fertilizer, number of irrigation, expenditure on plant protection measures, etc. after crop financing, which

ultimately helped in raising the productivity of crops. Findings indicate that crop loaning increased the level of inputs use in almost all the crops across the farm size groups, implying that farmers were using less quantity of agro-inputs due to paucity of funds before financing.

Impact of crop loan on crop productivity

The impact of the crop loan on crop productivity of different crops was evaluated by comparing the mean values of productivity of various crops between the two periods i.e., before and after loaning. Two samples mean 'T' test was applied to test the significance of difference in the mean values of variables during the two periods. Four major crops viz., paddy, wheat, sugarcane and mustard were grown by marginal farmers and the impact of crop loan on crop productivity was studied under each crop separately. Table (5) gives the calculated mean values of crops yields at farmer's field obtained for before and after loaning periods.

TABLE 5—IMPACT OF CROP LOAN ON CROP PRODUCTIVITY

(Qt/ha)

Sl. No.	Crop	Farm size group			
		Marginal		Small	
		After loan	Before loan	After loan	Before loan
1.	Paddy	56.70 (20.38)*	47.10	59.06 (12.28)*	52.60
2.	Wheat	42.28 (16.28)*	36.36	38.78 (9.73)*	35.34
3.	Sugarcane	659.41 (14.03)**	578.23	628.75 (9.80)	572.60
4.	Potato	—	—	206.87 (28.54)**	160.93
5.	Mustard	15.46 (9.95)	14.06	13.61 (12.29)	12.12
6.	Maize	—	—	20.80 (13.66)	18.30

* and ** significant at 5 per cent and 10 per cent levels of significance, respectively. Figures in the parentheses indicate per cent increase over before loaning period.

From the table (5), it can be clearly observed that on marginal farms there was a considerable increase in the productivities of all the crops over before loaning period. There was a significant difference in the productivities of paddy, wheat and sugarcane crops between the before and after loaning periods. Paddy yield of 56.70 qt/ha was obtained after loaning period indicated an increase of 20.38 per cent over before loaning period. The productivity of wheat crop increased significantly by 16.28 per cent over before loaning period to reach the level of 42.28 qt/ha in after loaning period. Like paddy and wheat crops sugarcane crop also registered a significant increase in its productivity during after loaning period by 14.03 per cent. Unlike other major crops no significant increase was observed in the productivity of mustard crop on marginal farms.

Six crops viz., paddy, wheat, sugarcane, potato, mustard and maize were grown by small farmers of the study area. Table (5) also depicts the calculated mean values of productivities of these crops during before and after loaning periods on the small farms. Perusal of the table reveals that there was a significant difference in the productivities of paddy crop during the two periods. An yield of 59.06 qtls./ha. was obtained during after financing period against the yield of 52.60 qt/ha, before financing, indicating an increase of 12.28 per cent in the productivity of paddy. A considerable significant increase of 9.73 per cent in productivity was observed in the wheat crop. Unlike on marginal farms no significant increase was found in the productivity of sugarcane on small farms. Among all the crops productivity of potato registered highest significant increase i.e. to the tune of about 29 per cent to touch the productivity level at 206.87 quintals against only about 161 quintals before crop financing. Like sugarcane crop the productivities of mustard and maize after crop financing were not increased significantly.

It can be concluded from the findings on differences in the crop productivities between the two periods i.e. before and after crop financing on both the farms (marginal and

small) that overall productivity of the crops increased in the study area after crop financing. This increase can mainly be attributed to the intensive use of inputs like high yielding varieties (HYV) seed, fertilizer, irrigation and plant protection chemicals after crop financing among almost all the crops across both the size group of farms i.e. marginal and small. The results clearly indicate that credit played a vital role in increasing crop productivity through increased use of various agro-inputs.

Impact of crop loan on net farm income of sample farmers

The sources of income of the sample farmers under study were crop production and rearing of livestock only. Under livestock only cows and buffaloes were maintained. In view of this situation, the term 'farm income' as used in the present study refers to income generated through crops and livestock enterprises only. The level of Gross return, Gross cost and net return obtained for each crop and livestock on both the categories of farms i.e. marginal and small farms are presented in table 6 and 7, respectively.

Cost of and returns from crop and livestock on marginal farms

The level of gross return, gross cost and net return obtained at farm level for each crop and livestock on marginal farms are presented in table 6 for the two periods. A perusal of table 6 reveals that major crops grown on marginal farms were paddy, wheat, sugarcane and mustard. The level of net income obtained, before crop financing, from all the crops was only Rs. 5497 which contributed 47.91 per cent of the net farm income received by marginal farmers during the period, whereas, major share in the net farm income was contributed by livestock (52.09 per cent). Among all the crops major share in the total net income i.e. 28.08 per cent was contributed by sugarcane followed by paddy (13.32 per cent) and wheat (5.73 per cent). A reverse picture has been observed about the share of crop and livestock in the net farm income of the marginal farmers after crop financing. Unlike before financing major share to net farm income after financing was contributed by crop production which was more than 60 per cent. As compared to before financing the proportionate share of sugarcane as well as mustard reduced while shares of paddy and wheat increased. Net returns from paddy and wheat crops increased significantly after crop financing to the tune of 195 and 423 per cent, respectively.

An analysis of the net return by various crops before and after crop financing indicate that the level of net farm income obtained through various crops and livestock was significantly higher as compared to the net returns obtained from the same enterprises before crop financing.

TABLE 6—COSTS OF AND RETURNS FROM CROP AND LIVESTOCK PRODUCTS ON MARGINAL FARMS.

(Rs./farm)

Sl. No.	Sources of income	After crop financing			Before crop financing		
		Gross Return	Gross Cost	Net income/ Return	Gross Return	Gross Cost	Net income/ Return
(A)	Crops						
(i)	Paddy	17989	13490	4498 (22.52) (194.37)*	13764	12236	1528 (13.32)
(ii)	Wheat	16336	12900	3436 (17.21) (422.98)*	12422	11764	657 (5.73)
(iii)	Sugarcane	7875	3906	3970 (19.88) (23.22)	6773	3552	3222 (28.08)
(iv)	Mustard	324	223	101 (0.51) (12.22)	279	189	90 (0.78)
Total from crops		42524	30519	12005 (60.12) (118.39)*	33238	27741	5497 (47.91)

TABLE 6—COSTS OF AND RETURNS FROM CROP AND LIVESTOCK PRODUCTS ON MARGINAL FARMS—*Contd.*

(Rs./farm)

Sl. No.	Sources of income	After crop financing			Before crop financing		
		Gross Return	Gross Cost	Net income/ Return	Gross Return	Gross Cost	Net income/ Return
(B)	Livestock	22360	14399	7961 (39.88) (33.21)*	19078	13102	5976 (52.09)
Total (A+B)		64884	44918	19966 (100) (74.03)*	52316	40843	11473 (100)

Note: Average farm size was 0.58 hectare.

Figures in parentheses ( ) show per cent contribution to annual net income by crops and livestock.

Figures in parentheses { } show per cent increase in net income after crop financing.

* Significant at 10 per cent level of significance.

Table 6 further reveals that raising of livestock on marginal farms was an important enterprise as it contributed nearly 40 per cent of the net farm income earned by farmers after crop financing against its level of more than 52 per cent during before crop financing period. The perusal of the table also reveals that after financing the average per farm income of marginal farmers significantly increased by about 75 per cent to register the level of Rs. 19966.00 compared to that of only Rs. 11473.00 during before financing. Though, the net income from crops and livestock both increased significantly after crop financing but the extent of increase was much high in crop production i.e. to the tune of 118.39 per cent as compared to only about 34 per cent increase in the net income from livestock, indicating that the scheme of crop financing exercised a positive role in raising the income of the farmers.

Cost of and returns from crop and livestock on small farms

Per form cost of and returns from crops and livestock on small farms are presented in the table 7. The table reveals that paddy, wheat, sugarcane, potato, mustard and maize crops were grown as major crops on small farms.

TABLE 7—COSTS OF AND RETURNS FROM CROP AND LIVESTOCK PRODUCTS ON SMALL FARMS

(Rs./farm)

Sl. No.	Sources of income	After crop financing			Before crop financing		
		Gross Return	Gross Cost	Net income/ Return	Gross Return	Gross Cost	Net income/ Return
(A)	Crops						
(i)	Paddy	33946	24852	9094 (26.98) (98.95)*	27291	22720	4571 (25.80)
(ii)	Wheat	24224	24075	150 (0.44) (106.02)*	19086	21576	-2490 (-14.11)
(iii)	Sugarcane	26340	13806	12534 (37.18) (88.94)*	19212	12579	6634 (37.45)
(iv)	Potato	3916	2541	1372 (4.07) (99.71)*	2923	2236	687 (3.88)
(v)	Mustard	1389	737	653 (1.93) (54.01)	1145	720	424 (2.39)

TABLE 7—COSTS OF AND RETURNS FROM CROP AND LIVESTOCK PRODUCTS ON SMALL FARMS—*Contd.*

(Rs./farm)

Sl. No.	Sources of income	After crop financing			Before crop financing		
		Gross Return	Gross Cost	Net income/ Return	Gross Return	Gross Cost	Net income/ Return
(vi)	Maize	176	183	–6 (0) (45.45)	158	169	–11 (0)
Total from crops		89991	66194	23797 (70.6) (142.46)*	69815	60000	9815 (55.41)
(B)	Livestock	25531	15619	9912 (29.40) (25.47)*	22766	14866	7900 (44.59)
Total (A+B)		**115522**	**81813**	**33709** **(100)** **(90.28)***	**92581**	**74866**	**17715** **(100)**

Note: Average farm size was 1.27 hectares.

Figures in parentheses ( ) show the per cent contribution to annual net income by crops and livestock.

Figures in parentheses { } show per cent increase in net income after crop financing.

* Significant at 10 per cent level of significance.

It is observed that small farmers were growing potato and maize crops in addition to the crops grown on marginal farms. The table depicts that out of the net farm income of Rs. 33709 received by small farmers, after crop financing, 70.6 per cent i.e. Rs. 23797 was generated through the crop production. Among the various crops taken, sugarcane contributed highest i.e. to the tune of 37.18 per cent to the net farm income followed by paddy (about 27 per cent). Unlike marginal farms much fluctuation has not been observed in the proportionate share of all the crops except wheat in the net farm income during both the periods.

The proportionate contribution of wheat in the net farm income before financing which was negative to the extent of 14.11 per cent had positively contributed to net farm income after crop financing. Paddy and sugarcane both crops contributed to net farm income with almost same extent in proportionate term in the two periods. During after crop financing period, among all the crops grown on small farms paddy, wheat, sugarcane and potato registered significant increase in their net incomes/ returns over before crop financing period. The contribution of maize crop in terms of percentage to total net farm income was almost negligible during both the periods, on small farms. Like marginal farms livestock played an important role in increasing net farm income for the borrower small farmers also. The contribution of livestock in the net farm income reduced to 29.40 per cent against its share of 44.59 per cent during before crop financing. The level of net farm income received by the farmers after crop financing significantly increased to Rs. 33709, which was more than 90 per cent higher than that of before crop financing period.

To reach the level of Rs. 33709 net farm income after crop financing the net income from crops significantly increased by 142.46 per cent and that of from livestock also increased significantly but only by 25.47 per cent. It can be concluded that after financing the lion's share was contributed by crop production enterprise to the net farm income, as on marginal farms. The overall picture of net farm income on small farms also indicated that crop financing was found to be helpful in raising the net farm income of the small farmers. As the financing was made for crop production therefore, net income from crop increased due to adoption of improved crop management practices at a higher level. The increased quantity of by-product and other fodder as well as increase in income from crop enterprise helped to increase the income from livestock reared on the borrower farms.

Impact of crop loan on human labour employment in crop production on marginal and small farms

The levels of human labour employment generated on both the categories of farms i.e. marginal and small are depicted in table 8. A perusal of the table indicates that after crop financing human labour employment in crop production has increased on both the farms. As a whole 17 man days additional employment was created significantly

after crop financing on marginal farms. In proportionate term this increased employment was estimated as 16.19 per cent. Like marginal farms the significantly increase in the human labour employment as a whole in crop production also observed on small farms. After crop financing employment increased by 7.70 per cent (19 man days) from its level of 247 man days per farm during before crop financing period on small farms. In proportionate term increase in human employment on small farms was less than that on marginal farms.

TABLE 8—HUMAN LABOUR EMPLOYMENT IN CROP PRODUCTION ON MARGINAL AND SMALL FARMS

(Man days/farm)

SI. No.	Name of the crop	Marginal farmers		Small farmers	
		After loan	Before loan	After loan	Before loan
1.	Paddy	55	47	98	92
2.	Wheat	45	39	85	79
3.	Sugarcane	20	17	60	57
4.	Potato	—	—	12	10
5.	Mustard	2	2	8	7
6.	Maize	—	—	3	2
Total		**122**	**105**	**266**	**247**
Overall per cent increase		(16.19)*	—	(7.70)*	—
Average farm size (ha)		0.58	0.58	1.27	1.27

* Significant at 10 per cent level of significance.

The overall scenario of human labour employment on marginal and small farms during before and after crop financing periods indicated that there was a significant increase in human labour employment after crop financing on both the size of farms. Thus it can be concluded that there has been some positive impact of crop financing in creating additional human labour employment on both marginal and small farms. It can be concluded that the crop financing had positive impact on crop productivity, net farm income and human labour employment on marginal and small farms in the study area.

CONCLUSION AND POLICY IMPLICATION

Major share of income in the total family income was contributed by crop production which was to the tune of 34.58 per cent and 40.21 per cent in the families of marginal and small farmer borrowers, respectively. Average operational holding of marginal farmers was 0.58 hectare against 1.27 hectares of small farmers. Crop financing by Prathama bank led to increase in the levels of almost all the agro-inputs and hence, increased crop productivity on borrower farms with varying magnitude. The overall picture of net farm income on sample farms also indicated that crop financing was found to be helpful in raising the net farm incomes of both the size group of farmers. These increases were 74.03 per cent on marginal farms and 90.28 per cent on small farms. Human labour employment in crop production was also found to be increased on both the farms. On the marginal and small farms the employment level significantly increased by more than 16.19 per cent (17 man days) and 7.70 per cent (19 man days) per farm, respectively after crop financing. Crop financing had a positive impact on crop productivity, net farm income and human labour employment on marginal and small farms in the study area mainly due to adoption of improved crop management practices which also led to increase in the livestock productivity.

Through crop loan facility the borrower farmers could be able to apply more amounts of purchased agro-inputs into crop production on their farms as compared to that of before financing period. Consequently they worked in advance stage of production and acquired more yield and net income from different crops as well as from their livestock. Therefore, credit widening and deepening efforts should be made by improving credit absorption capacity through hassle-free loaning process, augmentation of technology flow and providing supporting infrastructure to the small and marginal farmers with inadequate funds for crop production.

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Survival Strategy of Marginal Farmers: Evidences from Rural Bihar

RASHMI JHA* AND R. R. MISHRA**

Introduction

Small and marginal farmers are the backbone of Indian agriculture with a significant potential role in enhancing food security. The continuous division and fragmentation of holdings has increased the number of smaller size of holdings (Indian Economy. 2010-11). As a result of this not only is the number of such holdings increasing, the. area cultivated in these groups is also expanding. Smal1 landholders have dominated the Indian agriculture in the past; the trend is likely to continue in future as well. A study on small farms indicated that for the country as a whole, smal1 farms constitute 83.5 per cent of the total holdings (Vyas, 2011). Small and marginal farmers taken together own 43 per cent of the lands (compared to 16.3 per cent in 1953-54) and produce one-half of the output (Agriculture Census, 2005-06). The average size of landholding also declined from 2.69 ha in 1960-61 to 1.55 ha in 1990 and to 1.34 ha in 2000-01. In case of small landholders, the average size is as low as 0.67 ha (Joshi, et aI, 2006).

These small and marginal farmers face a plethora of problems. Several studies have indicated the multitude of problems faced by these farmers as a disadvantaged (socio-economical1y, educationally, politically and otherwise) group in the Indian rural society (Kothai, 2011). The viability and sustainability of such tiny holdings is doubtful, particularly in view of the ongoing process of globalisation.

The situation is not much different in case of Bihar. The state owns about 3 per cent of the total land in the country, while it is serving around 8 per cent of entire nation's population. Around 75 per cent of the rural and 10 per cent of the urban population depend on agriculture for their livelihood in the state. Fast growth of population and increasing non-agricultural usage of land are resulting in reduced size of holdings. The average size of land holding with the households has slashed from 0.78 ha in 1995-96 to 0.43 ha in 2005-06 while that in case of marginal farmers has declined from 0.34 ha to 0.25 ha during the same period.

However, the number of marginal farm households has increased from 11344173 (80.14 per cent of the total households) in 1995-96 to 11485499 (89.54 per cent of the total households) in the year 2005-06 (Agricultural Census, 1995-96 and 2005-06).

Evidences indicate that small and marginal farmers are unable to derive subsistence from their small and tiny landholdings as their land is not sufficient to earn adequate income to maintain their family (Rajshekhar, 1995, Pandey and Singh, 2003). Consequently in the recent times farming in India has become non-viable especially for small and marginal farmers.

In the light of the above discussion it was considered worthwhile to undertake the study with the main objective of analyzing income pattern of the smallholders. .

Methodology

The study identified the various sources of income of the marginal farmers. It is based on primary data collected by survey method from 60 marginal farmers randomly selected from three villages namely Harpur Mahmada, Birauli Khurd and Narayanpur Khairi located in Pusa block of Samastipur district of Bihar for the year 20 11-12. Average, per centage, etc were used for analysis of the data. However, for analysing viability of the farms, discriminant function was used.

For the sake of explanation the selected marginal farm households were grouped into three categories on the basis of their size of holdings: lower marginal farm households owning less than one acre of land, semi-marginal farm households owning 1-2 acres of land and higher marginal farm households owning more than 2 acres of land.

Similarly, sources of income were grouped into three categories: on-farm sources including farming on owned land, dairy and goatry, off-farm sources which include hiring-out labour on others' farms and non-farm sources including business, service and other miscellaneous sources.

Discriminant function analysis

Discriminant function analysis, which is a statistical technique used to differentiate between two or more classes, based on the common variables, was used for analysis of data. The discriminant function helps in measuring the net effect of a variable by holding the other variables constant. The sample farmers were categorized into two groups on the basis of economic surplus left with a farm household after deducting the farm and domestic expenditure from the gross returns from agriculture of the

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respective farm household. The farmers having positive economic surplus were grouped as viable farmers and the farmers with negative economic surplus were categorized as non-viable farmers. The linear discriminant function of the form of Equation (1) was applied to find the relative importance of different variables in discriminating between these two groups of farms, viz. viable farms and non-viable farms.

$$Z = \sum_{t-i}^{n} L_i X_i \quad ...(1)$$

where,

Z = Total discriminant score for viable and nonviable farms,

X_i = Variables selected to discriminate the two groups (i = 1,2, 8), like

X_1 = Education in years,

X_2 = Family size in numbers,

X_3 = Farm size in acres,

X_4 = Total fixed investment in rupees,

X_5 = Income from off-farm and non-farm sources in rupees,

X_6 = Domestic expenditure in rupees,

X_7 = Value productivity from crops in Rs/acre,

X_8 = Net income from dairy in rupees and

L_i = Linear discriminant coefficients of the variables estimated from the data, (i=l, 2..., 8)

The method seeks to obtain coefficients (L_i's) such that squared differences between the mean Z score for one group and mean Z score for other group is as large as possible in relation to the variation of the Z scores within the groups.

Mahalanobis D^2 (Radha and Chowdhry, 2005) statistics was used to measure the discriminating distance between the two groups,

$$D^2 = \sum_{t-1}^{n} L_i d_i \quad ...(3)$$

where, L_i is the linear discriminant coefficient and d_i is the mean difference of the two categories for the i^{th} variable.

Findings

The present paper aims at identifying various sources of income to the marginal farm, households and analysing the extent of income from these sources. The paper is divided into four sub-sections as follows.

Pattern of earnings of the sample households

The per day earnings as well as the income of the sample households from on-farm, off-farm and non-farm sources depict wide disparities which has been shown in Table 1. On an average, the farm households earned a sum of Rs 562.78 per day. Within households, lower marginal farm households earned less (Rs. 386.06 per day). The per day income of semi-marginal households was almost double the daily earnings of lower marginal households and it was almost one and half times in case of households w\th more than two acres of land.

TABLE 1—PATTERN OF EARNINGS OF SAMPLE HOUSEHOLDS

(Rs/household/day)

Farm size / Sources of income	On-farm	Off- farm	Non-farm	Total
Lower marginal farm households	440.86	174.91	297.76	386.06
Semi-marginal farm households	701.21	—	839.56	771.11
Higher marginal farm households	615.93	150.00	509.31	559.25
Pooled	558.33	169.19	226.80	562.78

A comparison of per day earnings from on-farm, off-farm and non-farm sources revealed that it was higher in case of on-farm sources (Rs 558.33 per day per annum) than that from off-farm and non-farm sources (Rs 169.19 and Rs 226.80 per day per household). However, per day earnings from non-farm sources was higher than that from on-farm sources in case of semi-marginal farm households. It could be because of higher income from non-farm sources mainly from business. Off farm income was almost the same within households pointing out the fact that agricultural wages remained almost the same.

Income pattern of the sample households

Income pattern of a household gives an idea about the economic status of the household. It also indicates the proportion of income accrued to the household from various sources.

The various sources of income to the sample households were categorised as on-farm, off-farm and non-

farm sources (Table 2). The overall income earned by a sample household was estimated to be Rs. 327884.51 per year. Out of this, 58.62 per cent was generated from on-farm, 1.08 per cent from off-farm and 40.30 per cent from non-farm sources amounting to Rs 192217.47, Rs. 3531.00 and Rs. 132136.04, respectively.

TABLE 2—INCOME PATTERN OF THE SAMPLE HOUSEHOLDS

(Rs/year)

	Sources of income (per household)				Income per
	On-farm	Off- farm	Non-farm	Total	earning member
Lower marginal farm households	154284.09 (76.98)	6034.29 (3.01)	40105.72 (20.01)	200424.10 (100.00)	39189.07
Semi -marginal farm households	205924.26 (44.99)		251782.96 (55.01)	457707.21 (100.00)	82152.58
Higher marginal farm households	262607.65 (64.92)	3900.00 (0.96)	137987.18 (34.11)	404485.83 (100.00)	73300.56
Pooled	192217.47 (58.62)	3531.00 (1.08)	132136.04 (40.30)	327884.51 (100.00)	61305.92

Figures in the parentheses indicate percentage

Farm-size-wise analysis of income pattern revealed that households with less than one acre of owned land generated more than three-fourths of their income (Rs 154284.09) from on-farm sources, a considerable proportion (20.01 per cent i.e. Rs 40105.72) from non-farm sources and a smaller proportion (3.01 per cent i.e. Rs 6034.29) from off-farm sources. Heavy dependence of this farm size group on on-farm sources was observed as majority of them used to lease-in land from absentee landlords in the village and used it for crop production. Moreover, most of the household heads were illiterate or had a low level of education and they, therefore, were not able to find a suitable work for themselves in the job market.

On the other hand, sample households with landed property varying between one acre and two acres, generated major proportion of their income (55.01 per cent i.e. Rs 251782.96) from non-farm sources and 44.99 per cent (Rs 205924.26) of their annual income from on-farm sources. On-farm sources were important from the point of view of income accrued to the households in this case. However, major share of income in this case came from non-farm sources as many of these households were engaged in service or business in addition to agriculture. They preferred to go for service or business or crop production even by leasing-in land from others rather than working as agricultural labourers on others' farms. This also explained the complete absence of off- farm activities as a source of income.

In case of households belonging to higher marginal farm size group, major share of income was generated from on-farm sources (64.92 per cent i.e. Rs. .262607.65) and a substantial proportion of income (34.11 per cent i.e. Rs 137987.18) was earned from non-farm sources. Relatively higher farm size enabled them to concentrate on on-farm sources leading to higher income from these sources.

The income per earning member of the sample households was calculated to be Rs 61305.92 per annum. It was Rs 39189.07, Rs 82152.58 and Rs 73300.56 in case of lower marginal, semi-marginal and higher marginal farm size groups, respectively.

The total income as well as income per earning member was found to be higher on semi-marginal farm households because of higher income to these households from non-farm sources.

Components of on-farm, off-farm and non-farm income

Different components of income presented in Table 3 revealed that major portion of farm households' on-farm income (59.08 per cent) was generated by farming (crop production) and a substantial portion of it (40.43 per cent) was generated from dairy. Goatry contributed very small portion (0.49 per cent) to the households' on-farm income. Out of the various components of non-farm income, income from business and service emerged as important components contributing 56.58 per cent and 35.47 per cent to the annual non-farm income of the households, respectively.

TABLE 3—COMPONENTS OF ON-FARM, OFF-FARM AND NON-FARM INCOME

(Rs/household/year)

	On-farm income				Off-farm	Non-farm income			
	Farming	Dairy	Goatry	Sub-total	Income	Service	Business	Other non-farm sources	Sub-total
Lower marginal farm households	81717.67 (52.97)	71387.86 (46.27)	1178.57 (0.76)	154284.09 (100.00)	6034.29	—	24221.43 (60.39)	15884.29 (39.61)	40105.72 (100.00)
Semi -marginal farm households	138506.17 (67.26)	66951.43 (32.51)	466.67 (0.23)	205924.26 (100.00)	—	82694.86 (32.84)	167045.24 (66.34)	2042.86 (0.81)	251782.96 (100.00)
Higher marginal farm households	146999.4 7 (55.98)	114335.45 (43.54)	1272.73 (0.48)	262607.26 (100.00)	3900.00	97760.00 (70.85)	27218.18 (19.73)	13000.00 (9.42)	137978.18 (100.00)
Pooled	113561.97 (59.08)	77708.83 (40.43)	946.67 (0.49)	192217.47 (100.00)	3531.00	46865.87 (35.47)	74759.17 (56.58)	10511.00 (7.95)	132136.04 (100.00)

Figures in the parentheses indicate percentage.

Within various farm size households, farming accounted for a little more than 50 per cent of the total on-farm income in case of lower marginal farm households closely followed by income from dairy (46.27 per cent) and goatry (0.76 per cent). As they had a little land, they heavily depended on dairy for income. Business emerged as an important source of non-farm income generating 60.39 per cent of total non-farm income to the households. The rest 36.61 per cent of non-farm income was generated through sources other than business and service i.e. through working as non-agricultural labour. A low level of literacy among the households of this farm size group may be the reason for working as labours and being absent from the service sector.

In case of semi-marginal farm households, nearly two-thirds of the on-farm income was generated from farming, around one-third of that from dairy and a negligible proportion of on-farm income (0.23 per cent) was earned from goatry enterprise. Outof the non-farm sources, income from business accounted for the major share contributing 66.34 per cent to non-farm income followed by income from service (32.84 per cent) and from other non-farm sources (0.81 per cent) in this case. Many households of this group had their own flourishing business such as retail medicine shop, some of them acted as agents of non-banking business houses earning a handsome profit, some of them had retail grocery shop in the village itself, earning a handsome margin from the business. This was probably the reason for generation of higher proportion of income from business in case of semi-marginal farm households.

Households with more than two acres of land earned major share (55.98 per cent) of their on-farm income from farming followed by income from dairy (43.54 per cent). In this group of households, service was identified as a major source of non-farm income, generating 70.85 per cent of total non-farm income.

Economic surplus and viability of farms

The economic surplus generated on sample marginal farms has been shown in Table 4. The economic surplus was calculated by deducting the domestic expenditure from the total farm business income from crops, dairy and goatry of the selected farm households.

The distribution of sample farms into viable and non-viable categories has been presented in Table 5. Out of the total 60 sample marginal farms, 36 (60.00 per cent) were found to be viable while remaining 24 (40.00 per cent) were observed to be non-viable.

TABLE 4—ECONOMIC SURPLUS FROM CROPS, DAIRY, GOATRY AND OVERALL AFTER INCLUDING OFF-FARM AND NON-FARM INCOME

Particulars	Rupees/household/year
Farm business income from crops	113562.00
Farm business income from dairy	77708.83
Farm business income from goatry	946.67

TABLE 4—ECONOMIC SURPLUS FROM CROPS, DAIRY, GOATRY AND OVERALL AFTER INCLUDING OFF-FARM AND NON-FARM INCOME—*Contd.*

Particulars	Rupees/household/year
Total farm business income from crops and dairy	192217.50
Domestic expenditure	158333.20
Economic surplus from crops, dairy and goatry	33884.27
Off-farm income	3531.00
Non-farm income	132136.00
Total income from off-farm and non-farm sources	135667.00
Overall economic surplus	169551.30

TABLE 5—DISTRIBUTION OF SAMPLE FARMS INTO VIABLE AND NON-VIABLE CATEGORIES ON THE BASIS OF ECONOMIC SURPLUS

Particulars	Number
Viable households	36 (60.00)
Non-viable households	24 (40.00)

Figures in the parentheses indicate percentage

Contribution of Selected Factors in Discrimination

The findings of discriminant function analysis on sample farms in the study area have been presented in Table 6.

It can be seen from the table that total fixed investment, income from off-farm and non-farm sources, domestic expenditure and net income from dairy contributed significantly (26.14 per cent, 20.50 per cent 23.13 per cent and 28.48 per cent, respectively) towards the total distance between the two types of farms, i.e. viable and non-viable. Out of this, net income from dairy turned out to be the most important contributing factor followed by total fixed investment, domestic expenditure and off-farm income.

TABLE 6—FACTORS OF DISCRIMINANT FUNCTION ON SAMPLE FARMS

Items	Mean		Mean difference	Discriminant coefficient	Discriminating distance	Per cent contribution to the total distance
	Viable	Non-viable				
Xl Education (years)	9.53	6.38	-3.15	0.106	-0.3339	1.16
X2 Family size (No.)	5.86	5.79	-0.07	-0.098	0.00686	-0.02
X3 Farm size (acres)	1.34	1.11	-0.23	-0.319	0.07337	-0.26
X4 Total fixed investment (Rs)	108201.10	33236.67	-74964.43*	0.0001	. - 7 .496443	26.14

TABLE 6—FACTORS OF DISCRIMINANT FUNCTION ON SAMPLE FARMS—*Contd.*

Items	Mean		Mean difference	Discriminant coefficient	Discriminating distance	Per cent contribution to the total distance
	Viable	Non-viable				
X5 Income from off-farm and non-farm sources (Rs)	159187.56	100386.25	-58801.31 *	0.0001	-5.880131	20.50
X6 Domestic expenditure (Rs)	184869.80	118528.30	-66341.50*	0.0001	-6.63415	23.13
X7 Value productivity from crops (Rs/acre)	26978.37	23174.52	-3803.85	0.0001	-0.380385	1.33
X8 Net income trom dairy (Rs)	82949.44	1264.58	-81684.86*	0.0001	-8.168486	28.48
D-square					-28.68176	100.00

*indicates significance at one per cent level.

Conclusion

Agriculture has to be strengthened in the study area by ensuring timely availability of seed of suitable varieties of different crops and other inputs like fertilizers, plant protection materials, diesel, etc. Infra-structural facilities like roadways, railways, electricity, etc have to be developed which will be helpful in production of various crops and their marketing.

Possibilities of establishing agro-based industries using locally grown crops as their raw materials should be explored and exploited. Creation of other small and cottage industries in the rural areas will provide the rural masses with non-farm employment opportunities thereby augmenting their income.

Programmes like MNERGA will also provide non-farm income generating opportunities to the rural people. Imparting training to rural youth will also be beneficial to them as that will enable them to find suitable employment in the job market.

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How Important is Off-farm Income for Farmers in India?

BRAJESH JHA*

According to Agriculture Census 2005-06 out of total agriculture holdings of 1.29 lakh, in India 19 per cent are small and 65 per cent are marginal farmers. Nevertheless marginal farmers with land holdings between 0.01 to 0.4 hectares at times referred as sub-marginal farmers are as high as 40 per cent of total agriculture holdings in the country. A glance to different issues of Agriculture Census suggests that numbers of small and marginal farmers are increasing in the country. Such large numbers of small and marginal farmers have been the consequences of lop-sided development of economy. Income from crop-husbandry alone is not sufficient for livelihood of bulk of these farmers; the mixed farming has therefore been a way of life of an average Indian farmer. Farmers are increasingly diversifying into non-farm activities for their livelihood. Inspite of the multiplicity of sources of income more than one-third of rural poor are farmers (NSSO 2006). There are also evidences of farmers, lacking sufficient off-farm income opportunities in their vicinity, migrating for their livelihood. While migrating, farmers often leave their land holdings under certain sub-optimal arrangements that affect farm level productivity in the country.

The marginal and small farmers now account for more than 40 per cent of operated area under agriculture. Adequate income on these farms is therefore important not only for an average farmer's livelihood but also for the growth of agriculture in the country. The small farms have certain advantages. The intensity of livestock per unit of land is higher on small farms (Jha 1996); such farms not only enrich soil health but also improve nutrition security of farm family. The small farms are thus important for sustainable growth of agriculture in the country. Since farm is an independent economic and political unit, large numbers of small farms are good for the health of a democratic society. In this backdrop the present paper attempts to understand the reasons for poverty of farmers despite of multiplicity of livelihood of an average farmer. The next section of this paper looks into different sources of household income of an average farmer. This section highlights importance of off-farm income of farmers. Policy to improve off farm income of farmers is discussed subsequently in Section III.

Section II. Household Income of an Average Farm

The present section looks into sources of household income of farmers of different land sizes. The section in particular highlights importance of off-farm income of farmers and also attempts to understand possible reasons for poverty of farmers, inspite of the multiple sources of household income. The sub-section, in particular, illustrates reasons for decline of profitability from agriculture and allied activities.

2.1 Multiple Sources of Household Income of an Average Farmer

The NSS Situation Assessment of Farmers, 2005, provides information on sources of household income of farmers. Figure 1 presents contribution of different sources of income on the farm households of different land size classes. Different sources of household income are: wages as obtained from casual work, income/receipts available separately from cultivation of crops, farming of animals and non-farming business. In Fig. 1, farmers, on the basis of size class of land, are large (more than 10 hectare), medium (4-10 hectare), semi-medium (2-4 hectare), small (1-2 hectare), and marginal (less than one hectare). Fig 1 presents farm households of different land sizes on the basis of sources of income. With the increased pressure on land, numbers of marginal farmers are increasing. These farmers are particularly important for studying dependence of farmers on off-farm income. The NSS 2005 therefore categorizes marginal farmers of less than one hectare into three groups: 0.41-1.00 hectare, 0.01-0.40 hectare and less than 0.01 hectare. Figure shows that as the size of land holding decreases, contribution of crop husbandry decreases and income from wage and non-farm business increases. Practicing animal husbandry is an important source of income for small and marginal farmers.

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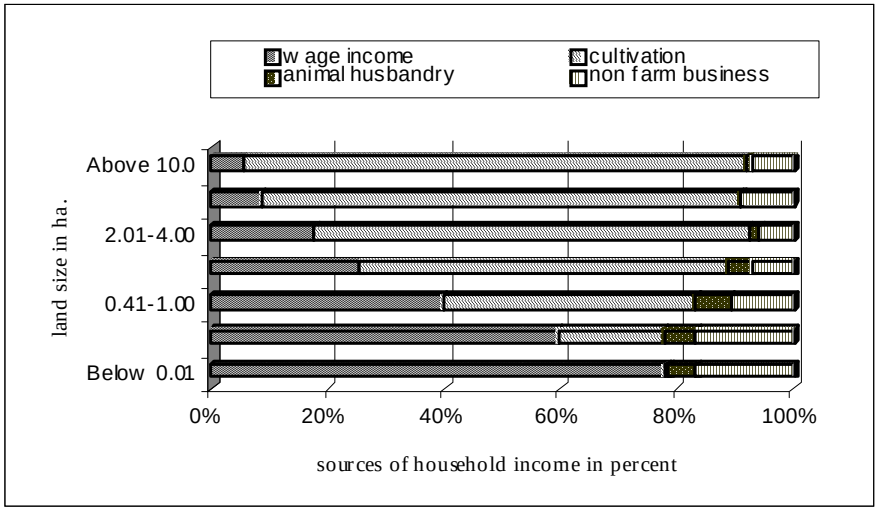
Fig 1. Sources of Farm Household Income by the Land Size Categories



Source: Author's computation based on NSS Report No. 497

The contribution of farm animals in household income started decreasing with the increase of size class of land; the above contribution declined significantly on the medium and large farms. It is widely recognized that in India rearing of cattle on small farms is profitable, largely with the surplus family labour. As the size of land holding increases, surplus family labour available for cattle rearing decreases. Therefore, intensity of farm animals on the medium and the large farms is low. The farmers with the marginal holdings however earn a significant proportion of their household income from wages. The contribution of non-farm business in the household income of farmer decreases with the increase of land size until the semi-medium farmers. Subsequently for the medium and the large category of farmers the share of non-farm business has started increasing. One may note that the increase in non-farm income of farmers in the medium and large category is possibly a result of employment in the formal sector. Employment in such sector requires certain level of education and similar other enabling conditions. In the rural setup medium and large farmers to some extent can afford to enable their children with the above capabilities. The non-farm business for the lower size class of holdings is possibly a distress-induced diversification. Examples of development-induced rural diversification are employment in relatively high wage sector.

The casual work for wages can be in agriculture or non agricultural activities, but not on the owned farm. Income from wages and receipts from non-farm businesses are together grouped as off-farm income of farmers and the same is discussed below. At all India level, 50 per cent of household income of an average farmer is originating from off-farm income. The situation varies across states. Table 1 presents states on the basis of dependence of an average farm on off-farm income. In Rajasthan, Kerala, Tamil Nadu, and West Bengal, off-farm sources account for 75, 68, 63 and 61 per cent, respectively, of household income of an average farmer. The off-farm income in Meghalaya, Uttaranchal, Punjab and Bihar, accounts for 25, 31, 38 and 39 per cent of household income, respectively. The above examples suggest that resource endowment: natural or acquired, distribution of land, status of non agricultural sector in a state, level of urbanisation and similar other factors are responsible for differential share of off-farm income of farm households in different states of India.

TABLE 1—STATES ON THE BASIS OF DEPENDENCE OF AVERAGE FARM HOUSEHOLD ON OFF-FARM INCOME

Levels of Off-farm Income	States with values of off-farm in household in per cent in parentheses
More than 50 per cent of FHH income/receipts as off-farm	Arunachal Pradesh (71.9), Chhatishgarh (50.1), Haryana (56.4), Himachal Pradesh (63.6), Jharkhand (54.7), Kerala (68.2), Manipur (64.3), Orissa (66.8), Rajasthan (75.7), Tamil Nadu (62.9), West Bengal (60.8)
Less than 50 per cent of FHH income/receipts as off-farm	Andhra Pradesh (48.8), Assam (38.8), Bihar (38.6), Gujarat (39.7), Jammu and Kashmir (48.8), Karnataka (46.6), Madhya Pradesh (46.2), Maharashtra (42.8), Meghalaya (25.2), Mizoram (35.7), Nagaland (47.5), Punjab (38.3), Sikkim (46.2), Tripura (46.3), Uttar Pradesh (45.5), Uttaranchal (31.3)

NOTE: Off- farm income consists of income from wages and non-farm business of farm households as reported in NSS Report No. 497 entitled Income Expenditure and Productive Assets of Farm Households 2005

The discussions above in brief present different sources of on- and off-farm income of farmers at the country level. This further illustrates relative importance of off-farm income in different states of the country. Inspite of the multiple sources of income of farmers the NSSO 2004-5 shows that around 20 per cent of rural people in the lowest expenditure class (less than 235) are farmers (persons self employed in agriculture). The NSS Situation Assessment of Farmers (SAF), 2005 shows that average monthly expenditure of farm households is significantly higher than average monthly income of households of farmers of less than 4 hectare.[1] There are also numerous studies to suggest that small farms in the large part of country are not viable (Jha 2001). Table 2 shows that a significant per cent of rural poor are self-employed agriculture households, alternately cultivator. Agriculture labour is widely accepted as the most important constituents of rural poor; the same is also evident from Table 2. In this backdrop it is important to understand possible reasons for low income on small farms. This will illustrate reasons for poverty inspite of multiple sources of income of an average farmer.

TABLE 2—PER CENT DISTRIBUTION OF HOUSEHOLDS ACCORDING TO MONTHLY PER-CAPITA EXPENDITURES OF HOUSEHOLD CLASSES IN RURAL INDIA 2004-05

Expenditure class (Rs.)	Self - employed in		Agricultural labour	Other Labour	Other hhs (incl. n.r.)
	Agriculture	Non-agri.			
Less than 235	19.2	8.5	45.0	10.2	17.1
235-270	26.3	10.5	47.2	10.2	5.8
270-320	25.4	13.4	43.8	11.3	6.0
320-365	28.8	14.7	37.5	12.3	6.7
365-410	33.5	15.3	33.1	11.8	6.4
410-455	35.0	16.0	29.5	13.1	6.3
455-510	38.1	15.3	27.3	11.6	7.6
510-580	39.2	17.2	23.9	10.8	8.8
580-690	41.8	17.7	19.5	9.8	11.1
690-890	42.8	16.7	14.6	10.4	15.5
890-1155	42.4	17.4	9.3	9.1	21.9
1155 & above	33.7	16.9	4.2	8.1	37.2
Ave MPCE (Rs.)	573	576	424	512	645

Source: NSSO Report No. 515

2.2 Reasons for Decreasing Profitability of Agriculture and Allied Activities on Small Farm

There are many reasons for decreasing profitability of agriculture on small farms in the large part of country. Several factors directly or indirectly affect profitability of small farms. These factors can broadly be grouped as market-, technology- and resource-related constraints. In the market related constraints unequal exchange of small farmers with buyer of agri-output market and seller of agri-input market is well documented. The marketing disadvantage for small farmers is also on account of high cost of transaction of produce since small farmers have low marketed surplus. The small farmers have less capability to withstand adverse situations; they are more prone to external pressures. These pressures can be in the form of depletion of resource base, decreasing productivity following changes in climatic factors. The external pressures can also be in the nature of increased monetization of rural economy, lower price of produce in dearth of poor intermediation of small with the market, and similar other factors. In an open economy small farmers are also exposed to the volatility of world prices. The volatility in domestic prices has increased following integration of domestic and world market in the country.

Though biochemical technology is widely perceived as scale neutral; there are other technologies which are highly biased against the small farmer. Technologies for the present discussion are grouped as mechanical, natural

[1] In the NSSO Situation Assessment of Farmer's survey for year 2003-04 farmer's expenditures is often argued to be on the higher side and income of farmers is generally considered on the lower side of the results of similar studies on the subject. The merits of the NSS-SAF cannot be overemphasized as it is based on samples of farmers drawn from different parts of India.

resource management related and knowledge-intensive technology. Many of the knowledge-based technologies are accessed through radio, cell phone and TV. Bulk of small and marginal farmers are in possession of the earlier of the two goods. In addition to the above, access to knowledge-based technology also requires certain level of education. The management of natural resource has wide range of technological options; it ranges from drip to submersible technologies. While drip is relatively scale neutral; submersible technology is not only scale biased but this has also emerged as an important source of interpersonal inequity in the large part of India (Jha 2000). The mechanical technology is highly scale biased. The importance of mechanical technology has increased particularly with the high cost of labor following NREGS in the rural India. Technology generating institutions at times are also biased against the small since they bring limited technology for small farmers and producers. The knowledge disseminating institutions especially extension agencies also ignore small farmers as their targets are mostly to achieve certain amount of production/ productivity from the field.

For a large group of marginal farmers, household income remains inadequate despite of the adoption of certain technologies. The mixed farming has therefore been a way of life for Indian farmers. The mixed farming is based on complementary relationship between crops and livestocks. The complementary relationship that thrives with the use of inputs from one sub-system to another appears to have been weakening on several accounts (Jha et al 2009). There are also evidences from various regions of country that complementary relationship between crop and dairy enterprises is giving way to competitive relations. This competitive relationship is on various accounts. With the change in crop-livestock relationship cost of milk production is increasing. It appears that despite of increase in price of milk for consumers, price- incentive for farmers might not have increased significantly in the above period. Though demand for milk is increasing at a rapid pace; various factors limit the growth of milk production in typical mixed farms of rural India. Some of the above phenomenon needs to be reversed with timely interventions in sectors related to livestock to further increase the role of animal husbandry in increasing income opportunity for farmers. There are also examples of farmer earning sufficient household income with the highly integrated farm. Such integration of farm is with some of the followings: fisheries, poultry and similar other birds, insects like Api- and seri-cultures. The instances of highly integrated farms are few.

As is apparent from the above discussions, the household income from agriculture and allied activities are often not sufficient for marginal and sub-marginal farmers. They obtain significant part of their household income from wages in either agriculture or non-agriculture sector. Many farmers also earn significant amount of income from self-employment in their own non-agriculture enterprises. A sufficient off-farm income for farmers however requires that there is growth of productive employment in rural non farm sector. The growth of productive employment warrants development-induced rural diversification; unfortunately it is the distress-induced rural diversification that is prevailing in the large part of country.

The developmental experiences from different regions of country suggest that growth in one of the following industries: agriculture, manufacturing and tourism is important for the growth of productive employment in rural non-farm sector (Jha 2008a). The growth in one of the above sector infact triggers growth in other sectors of rural economy. The trigger effect of agriculture on rural non farm sector has however weakened in the recent period on several accounts (Jha 2007b). In the selected districts/regions of country tourism has potential to trigger growth of rural economy. Therefore manufacturing becomes important for the large part of rural economy; but productivity of manufacturing in rural sector as is evident with the NSSO survey results of unorganised manufacturing is very low (Box 1). The gap also suggests potential of manufacturing in rural sector.

Box 1: Gross Value Added (GVA) per worker in Unorganised Manufacturing (in 000' Rs.), 2005-06

Enterprises	Rural	Urban	All
OAME	10.4	16.3	11.3
NDME	26.9	43.4	36.5
DME	41.9	65.3	55.1
ALL	16.2	38.2.	24.0

Source: NSS Report No. 526

The discussions above in brief suggest that small farmers depend on multiplicity of activities for their livelihood; yet bulk of these farmers is poor. This essentially warrants increase in income from different household activities of an average farmer. The small holding agriculture provides limited scope of increasing income from crop husbandry especially in a large part of rain-fed regions of country; though crop husbandry with certain high value crops has been exception. The land saving enterprises such as livestock has been contributing to the household income of farmers, but complementary relationship between these enterprises has started weakening in the country. There are also evidences of highly integrated farm providing enough income from small pieces of land. Most of such evidences are individual-driven and are scarce. In this backdrop policies that may increase on- and off-farm income of farmers will be important. The next section therefore discusses economic

policies to increase off farm income of farmers in the country.

Section III: Policy for Improving Off-Farm Income of Small Farmers

In the current process of economic growth in the country there are two distinctly different ways of increasing off-farm income in farm households. First, it is by migration of family members in search of livelihood and increased remittances for farm family. Second, it is by increasing off-farm income of farmers. The off-farm income of farmers arises from sectors other than agriculture in the rural vicinity; the same is loosely referred as rural non farm sector. Though either of the above sources of income is important for off-farm income of farmers; the role of remittance is on rise in the recent period. Remittances led growth in off-farm income is however leading to several kinds of problems in rural as well as urban sector. In rural India absentee land-lords associated with sub-optimal arrangement of land tenures, feminization of agriculture, are some examples; neither of the above is good for the growth of agriculture in the country. The migration of rural workers to urban centres also besets with different kinds of problems like deterioration of already fragile civic amenities, inhuman living conditions of workers in urban sector. Unless there is more explicit industrial and urban policy that accommodate these migrant workers and provide reasonable life to them in urban vicinity; the current pattern of city-centric growth and remittance-led increase in off farm income is not welfare enhancing. The ill effects of the above pattern of growth on agriculture are often underestimated. The present paper therefore argues for off-farm income in rural vicinity, this has numerous advantages over the earlier. The MGNREGS and similar rural works programme is also helping farmers in earning off farm income; this can at best be our medium term strategies. The next sub-section illustrates policy that will increase off-farm income opportunities of farmers. The policy recommendations are discussed below under three headings:

- Macroeconomic Policies
- Rural Sector specific Policies
- Institutions and Incentives for Rural Sector
- Active Labour Market Policies

3.1 Macroeconomic Policies with Important Implications for Rural Sector

Historically there have been several fiscal and monetary incentives that may have played a role in encouraging excessive use of capital relative to labour in rural sector. Some of these measures were originally conceived as instrument for encouraging investments and productivity of industries. An indirect effect of such measures has, however, been to distort the relative prices of critical factors of production. The subsidy for tractor during the earlier decades of green revolution is an example of the above policy distortion in India. One possible way of correcting the bias against labour intensive production is to subsidize labour intensive rural enterprises. This can be in different forms; investment subsidy on condition of realizing a targeted level of employment per unit of investment is one example. This may encourage concentration of certain labour intensive industries in the rural areas.

The importance of trade policy has increased with the globalization of economy. The opening up of trade for agriculture commodities has been instrumental in increasing cropped area under high value horticulture commodities. Similarly, reduction of import duties in manufactured goods has increased import of same from low cost producing countries like China. The opening of economy has also made the policy of Reservation of Industries for Small Scale Sector obsolete. The small scale industries had better spatial distribution and it was encouraging growth of rural non farm sector in the country. The Micro Small and Medium Enterprise (MSME) Development Act, 2006 though aims to replace the SSI Act, 1967 is reported to have led to urban biased growth of micro and small enterprises.

Fiscal policy has also been instrumental in transferring resources to rural sectors[2]. Many government programmes attempt to increase income of small farmers. Few of these however suffer from different kind of implementation related problems. Efficiency of public expenditure on these programmes and the growing wedge between outlays and outcomes of these programmes have been a matter of concern in the recent period. Many of the above concerns at micro-level can be addressed through the effective district plan. With the convergence of various developmental programmes in the district plan efficiency of public expenditure is bound to increase. The chances of such convergence are more with efficient district plan involving panchayati raj institution.

3.2 Policies related to Specific Sectors important for Rural India

This paper argues that for sufficient growth of off-farm income in rural vicinity, growth not only in the non-farm but also in the farm sector is important. Rural non-farm sector again includes several heterogeneous non-farm activities that have different demand and supply conditions in their respective input and output markets.

[2] A significantly higher amount of public resources is being transferred to rural sector after the year 2004-05. (Source: Economic Survey, several issues)

The industry-specific policy is, therefore, important to discuss the growth of off-farm income for farmers in the country. According to the CSO classification there are nine industries; the present subsection briefly discusses agriculture, manufacturing, business and services in particular.

3.2.1 Agriculture and Allied Activities

It is often difficult to isolate the government policy that will increase pro-small farmer growth in agriculture. Policy that has potential to increase factor productivity growth in agriculture will help small farmers in improving their on- and off-farm income. In the above context policies that rationalize farm input prices are important. Once chemical input reflect its actual price (shadow price), farmers will be encouraged to adopt various resource conserving technologies that may promote low-external input sustainable agriculture. Such policies may also encourage use of bio-fertilizers and bio-pesticides. Since production of many of these bio-fertilizers are labour-intensive, these fertilizers can be produced efficiently on small farms. Rationalization of farm output price may encourage shift from crop to horticulture and plantation crops. A higher value of output per unit of land in these commodities requires increased vertical integration of farm with the processing units and efficient markets. Suitable infrastructure and institution that reduces inefficiency in the post harvest operations will also increase productivity per unit of land[3].

Indian agriculture is changing in many ways. Agriculture is becoming knowledge intensive and also market responsive. In this context, a person who can disseminate knowledge on both production and marketing aspects of agricultural commodities are desired. With the fragmentation of land holdings need for service providers of lumpy goods like tractors have also increased in the rural economy. Feminization in agriculture has increased there are also evidences of disguised and seasonal unemployment of female workers in rural India. Rural enterprises based on primary resources are therefore desired for females. Examples of such enterprises are production of herbal medicines, cosmetics, tissue culture, floriculture, agro-processing at primary level, adoption of non-conventional energy sources, extraction of vegetable dyes.

Livestock sub-sector is growing faster than many other sub-sectors of agriculture. A regime of favourable price accompanied with the desired changes in the structure of livestock population has brought about the above changes in the growth of the livestock economy. Livestock-based rural livelihoods have emerged important with increase in number of small and marginal farmers. The demand side impetus for growth of the livestock sector in the country remains strong. The constraints are however appearing on the supply side of milk and milk products on several accounts. The decline and degradation of common pool resources, weakening of complementary relationship between crop and livestock sector are some of the important reasons. The lesser exploited allied sector activities like apiculture, sericulture, rearing of birds and small ruminants remain important on small farms largely dominated by females.

3.2.2 Manufacturing, Business and Services

Industry, business and services (IBS) in rural sector was loosely referred as Rural non-farm sector (NABARD 1992). Industry referred above is essentially Manufacturing. The IBS sector is the prime source of off-farm income of farmers. In the development literature broad strategies to increase growth of rural non-farm employment are followings. First, the agriculture-led development paradigm presumes that with the increase of productivity in agriculture, growth in manufacturing and similar other sectors of rural economy would take off. Second, the urban and export-led growth of rural non-farm employment presumes that as structural transformation proceeds, share of agriculture in rural employment and income declines, and that of other sectors of rural economy increases in the country. The second strategy is becoming important in the recent period following rural transformation in some of the East Asian Countries with the adoption of the above strategy. Growth in these countries is largely manufacture-driven as international demand for cheap manufactured product produced in these countries has emerged important. Subsequent integration of these units with rural hinterland has encouraged growth of rural non farm sector as well. Contrary to the above, the service-led growth has by and large excluded rural India.

In a diverse country like India, strategies for increasing productive employment in the rural sector must vary across regions. The present study, while recognizing pivotal position of agriculture in rural transformation, suggests for a manufacturing- and tourism-led growth of rural non-farm sector in the country. Manufacturing, in particular, is important for a broad-based growth of productive employment in rural India. Though there have been numerous public institutions to encourage rural manufacturing, these institutions have failed to reduce the burgeoning productivity gap between rural and urban manufacturing (Box 1). The infrastructure and institutions

[3] Some young friends started an enterprise named Star Agri Warehousing and Collateral Management. The company has four revenue streams from procurement, warehousing, collateral management and credit. In the recent years they have also ventured into general and commodity insurance in collaboration with the Oriental insurance. The usefulness of such enterprises can be assessed from the fact that this company has registered more than 50 percent growth in the last five years (Source: Hindustan Times 2010, www.Hindustantimes.com, www.staragri.com).

so created also failed to check flight of manufacturing away from the rural sector. The present study, therefore, argues for sufficient incentives to encourage manufacturing in the rural vicinity. The sectoral policies in brief argue that growth in agriculture, manufacturing and tourism would trigger growth of productive employment in other sectors of the rural non-farm economy like utilities, trade, business and services.

3.3 Institutions and Incentives for Productive Rural Employment

Rural enterprises are often characterised as small and scattered production units spread across space. Such small entrepreneurs need to form a group to intermediate with the market. The cooperatives have long been believed as an institution for intermediation of farmers with different kind of market. The cooperatives have however achieved limited success in the country. The self help group in the recent decades has emerged important. In the neo-liberal framework role of private sector cannot be overemphasized. However hybrids of institutions have also emerged over the years. Examples of institutions of different kind range from producers group to producers companies. Both Government and voluntary organizations have played important role in spread of such groups and companies in different part of country.

The rural non farm sector consists of heterogeneous industries. In dearth of coordination between different institutions and sectors of rural economy the growth of such sector suffers. In this context Government of Rajasthan initiated Rural Non-Farm Development Agency (RUDA) in 1995 to promote Rural Non-Farm Enterprises (RNFEs). The agency like RUDA promotes integrated development of industry, business and services in rural sector; development of such institutions is important for the growth of off-farm income of farmers in the country. The role of State in increasing capabilities of workers with better education and health facilities cannot be overemphasized. Nonetheless, since bulk of farmers are small, poor and are in the unorganized sector without a reliable safety nets; the role of State in protecting such farmers from contingencies such as illness, accident, untimely death of bread-winner and old age becomes important. Though Union Government's expenditure on the above accounts has increased significantly in the recent years; but these efforts are largely perceived inadequate. There is also need to involve private sectors, voluntary organizations, various interest groups in extending some of the above facilities.

Voluntary organizations are also important in strengthening participatory development. The National Policy on Voluntary sector (2007) envisages government collaboration with voluntary organizations in poverty alleviation, skill promotion and entrepreneurship development. Several multilateral organizations are also encouraging participation of alternate institutions for rural development. Implementation of development programmes often suffers from inadequate understanding of local situation, lack of participation of targeted groups in development process and similar other reasons. The panchayati raj institution (PRI) a bottom-up approach in development planning is often believed to address many of the implementation related concerns.[4] It is being strengthened in the successive Five Year Plan.[5] The Right to information Act, 2004, and provision of social audit in the selected development programmes like National Rural Employment Guarantee Scheme (NREGS) has further improved implementation of development programme by encouraging transparency.

3.4 Active Labour Market Policies

Growth has limited trickle-down effect on certain sections of society generally left out of the developmental process (Lipton 1983). The direct employment generation programmes (EGP) have, therefore, become part of our development planning in the last few decades. The importance of such programmes further increases with the high incidence of seasonal and disguised unemployment of small and marginal farmers in rural economy. The wage-based rural works programmes provide supplementary employment to stave off seasonal unemployment. The National Rural Employment Guarantee Scheme (NREGS) a rural work programme guarantees employment of one person in a household for a minimum of 100 days on asset creating public works. Such programme if implemented at distress wage will affect other sectors of economy in a limited way. The increase in expenditure on such programmes is often associated with decrease of public expenditure in the social sector (Mahendra Dev 2000). The paper argues that programmes like the above may not substitute the development programme. It may not be implemented in a way that the programme effects the growth of real sectors of economy. In brief, direct employment generation program can only be subservient to the development programme. This may also be construed as a short to medium run programme *adhoc* to the development programs only.

CONCLUSIONS

The discussions above suggest that inspite of multiplicity of sources of household income of farmers, a significant proportion of farmers particularly small and marginal farmers are poor. This clearly warrants increase

[4] The 73rd amendment of the constitution makes three-tier elected bodies mandatory for all state governments.

[5] The Eleventh Five Year Plan further mandates every Annual State Plan to be consolidated from district plans and each district plan has to be approved by the district planning committee (DPC).

in levels of incomes on these farms. Considering the small size of holdings of marginal farmers, crop husbandry provides limited scope for increasing the household income and land saving enterprises therefore becomes important. At times different allied activities also require certain amount of land for complementary relationships with crop sector. On several accounts complementary relationship between crop and allied activities are weakening. In the emerging situation off-farm income becomes important for livelihood of many farmers especially small and marginal, which together account for a significant percent of cultivated land in India. The off-farm income of these farmers not only helps them in escaping poverty, but also leads to growth of agriculture in the country.

For adequate growth in off-farm income opportunities for farmers in a region, it is important that one of the following sector: agriculture, manufacturing and tourism grows at considerable rate. The growth in one of the above will trigger growth in other sectors of rural economy. Inspite of the pivotal role of agriculture in the growth of rural non farm sector in the historical years; its role is decreasing in the recent period. The possibility of tourism-led growth of rural economy exists in the selected pockets of country. A robust growth in rural manufacturing is therefore essential for a broad-based growth of rural economy. The productivity of manufacturing in rural sector has been extremely low. Policy intervention to increase growth of productive employment in manufacturing is therefore desired. Any attempt to increase productive employment and income in rural sector requires special kind of institutions; the rural non-farm development agencies (RUDA) in Rajasthan, *Kudumbshree* in Kerala are some examples of need-based innovations in rural institutions.

In addition to above some out of the box thinking for small land holders that may help pleasant exit of some sub-marginal farmers and simultaneous increase in the size of land holdings of farmers interested in agriculture is desired. Such changes can be brought about in different ways; each one needs to be discussed thoroughly. For the time being many of the land related pending works like updation and computerization of land records, easy access to land related documents, will help in development of land markets at decentralized levels. A robust land market may address some of the above concerns related to unviable holdings.

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Impact of NREGA on Wage Rates, Food Security and Rural Urban Migration in Punjab*

Introduction

Despite robust economic growth in the recent times, India faces the problem of widespread unemployment, especially in the rural areas. Rural employment during 1993-94 and 1999-2000 grew at just 0.6 per cent per annum, much below the rate of rural population growth during this period. The decline largely owed to the fall in agricultural growth of labour-intensive food crops, extensive mechanization, increased pressure on land causing a decline in land to man ratio and curtailment of rural development expenditure over time. Recent rise in the world food prices has further fuelled the distress in Indian economy by decreasing disposable incomes of the poor and thus affecting their consumption patterns. The decline in employment opportunities and fall in real incomes owing to rising prices highlight the distress amongst the poorest strata of Indian economy in general and rural economy in particular. Such distress appeared toworsen further with ever-increasing backlog of unemployment. Therefore, it becomes essential to provide gainful wage employment opportunities to the rural poor. Keeping this in view, The National Rural Employment Guarantee Act (NREGA) was passed in 2005 to provide a minimum guaranteed wage employment of 100 days in a financial year to every willing rural household and was implemented in the entire country in three phases. In 2010-11, the program provided 1.45 billion man days of employment to 41 million rural households in India. While the females accounted for 50.3 per cent of such employment, the share of SC and ST households was approximately 50 per cent.

Such an attempt is not new in the history of wage employment in India. Some of the earlier programmes taken in this direction include Rural Works Programme (RWP, 1960's), Crash Scheme for Rural Employment (CSRE) in 1971, Food for Work Programme (FFWP) in 1977, National Rural Employment Programme (NREP) in 1980, Rural Landless Employment Guarantee Programme (RLEGP) initiated in 1983, Jawahar Rozgar Yojana (JRY) in 1989, Employment Assurance Scheme (EAS) in 1993, Sampoorna Grameen Rozgar Yojana (SGRY) in 2001 and National Food for Work Programme (NFFWP) in 2004. Despite huge spending on all such programmes, the achievement on poverty reduction has not been faster enough as expected. These limitations of the wage employment programmes necessitated to look for some other sort of employment model with the potential to increase incomes of the poor, improve rural income distribution and reduce household poverty. The National Rural Employment Guarantee Act was started in India in 2006 with perhaps the same objective.

It comes out clearly that apart from the objective of providing guaranteed employment to the rural poor for a specific number of days, NREGA has many other dimensions, which can directly or indirectly influence the rural livelihoods, income, employment and income distribution. It has many other socio-economic aspects such as woman empowerment, child care, economic growth, etc. which need to be studied in detail for assessing the overall significance of this initiative. While the implementation of NREGA can be assessed by a selected list of physical indicators in a region, it is important that an insight is obtained with regard to a comprehensive achievement on various socio-economic indicators. With this backdrop the present study was carried out in Punjab with the following specific objectives:

(i) Measure the extent of manpower employment generated under NREGA, their various socio-economic characteristics and gender variability in all the districts implementing NREGA since its inception in the selected states.

(ii) Compare wage differentials between NREGA activities and other wage employment activities and analyze the effect of NREGA on the cost of agricultural production.

(iii) Study the effect of NREGA on the pattern of migration from rural to urban areas.

(iv) Find out the nature of assets created under NREGA and their durability.

(v) Identify the factors determining the participation of people in NREGA scheme and study whether NREGA has been successful in ensuring better food security to the beneficiaries.

(vi) Assess the implementation of NREGA and to suggest suitable policy measures to further strengthen the programme.

The study was a part of a macro study carried out at all-India level, in 18 major states of the country. In Punjab, the study was based on both the primary and secondary data. Multi-stage random sampling procedure was followed for collecting the primary data for the study. For the current study, five districts were selected for conducting the study

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on the basis of the stage of implementation of NREGA in these districts. These districts were (i) Hoshiarpur from the first stage of implementation, (ii) Jalandhar and Amritsar from the second stage of implementation and (iii) Ferozepur and Mansa from the third stage of implementation. At the second stage, two villages were selected from each of the selected districts making a total of ten villages for the study. These villages were selected on the basis of their distance from the district headquarter or nearby town. The first set of villages were selected within a distance of five kilometers of the district headquarter and the others were selected farther from that. Finally, in each village, 20 households participating in NREGA and 10 not participating in NREGA were selected, making a total of 300 households for the data collection. The detailed information was collected on demographic profile of the households, major occupation of the household, household incomes, consumption and variability in income and consumption. Further, the information was also collected on the determinants of participation in NREGA activities, work profile, wage structure and migration issues under NREGA. In order to estimate the determinants of participation in NREGA activities, the binary logistic regression model was estimated with participation in NREGA activity being the dependent variable in the binary form. The secondary data were collected from the website of The Mahatma Gandhi National Rural employment Guarantee Act 2005 (www.nrega.nic.in) of the Ministry of Rural Development, Government of India. The data pertained to employment generation, caste differentials, various categories of projects completed under NREGA such as rural connectivity, water conservation and harvesting, micro irrigation, irrigation facilities, renovation of traditional water bodies, etc. Information on various parameters of social auditing and inspection, payment processes, unemployment allowances and other important variables was also collected.

2. Manpower Generation and Socio-Economic Characteristics of NREGA

In Punjab, a cumulative number of more than 8 lakh job cards were issued by 2010-11 (Table 1). The number of job cards issued was 6.36 lakh by 2008-09 which then increased substantially to about 8.05 lakh by 2009-10 (an increase of more than 26 per cent). There was a small increase of 2.63 per cent in the number of job cards issues during 2009-10 to 2010-11. The proportion of scheduled caste households in the total number of job cards issued remained above 76 per cent, indicating that job cards were being issued largely to the poor rural households with larger concentration of the scheduled castes.

TABLE 1—ISSUING OF JOB-CARDS, DEMAND FOR EMPLOYMENT, EMPLOYMENT PROVIDED THROUGH NREGA IN PUNJAB

Particular	Cumulative No. of Households issued job cards				Cumulative No. of households		No. of households working under NREGA during the reporting month[4]
	SCs[1]	STs[1]	Others[1]	Total[1]	Demanded Employment[2]	Provided Employment[3]	
2008-09	487641	185	148460	636286	26595	25589	13978
	(76.06)	(0.03)	(23.33)	(100.00)	(4.18)	(96.22)	(54.63)
2009-10	612486	300	192512	805298	249620	247852	87967
	(76.06)	(0.04)	(23.91)	(100.00)	(30.99)	(99.29)	(35.49)
2010-11	629111	297	197142	826550	287775	286786	70974
	(76.11)	(0.04)	(23.85)	(100.00)	(34.82)	(99.66)	(24.75)

Note : Figures in the parentheses represent per cent to (1) total number of job cards issued, (2) total number of households which demanded employment and (3) total number of households which were provides employment under NREGA.

Source : www.nrega.nic.in

The number of job cards increased by 29.9 per cent in Punjab during 2008-09 to 2010-11 with the rate of increase in various districts varying between 10 to 38 per cent. All the districts of Punjab where NREGA was implemented in the last phase registered comparatively higher growth in the number of job cards during the period of 2008-09 to 2010-11. A total of 2.88 lakh job card holders (34.82 per cent) demanded wage employment in 2010-11. Almost all the households demanding employment during a given year (97 to 100 per cent) were provided employment, which seems to be quite encouraging. However, there is need to significantly increase the proportion of households demanding employment from the current levels of about 35 per cent. Based on the previous trend, such proportion is expected to increase with time but the pace of increase needs to be made much faster. As the NREGA is just in the

beginning stage, it is not expected that the lower proportion is due to significant improvement in the economic condition of the rural households, resulting into lower demand for wage employment. Lesser awareness about the proper provisions of NREGA among the rural households, lack of sufficient provisions for employment on demand, etc., may be some reasons for such situation. Some of these issues will be explored in further sections of this report.

The work under NREGA seems to get concentrated in a few months of the year with almost one-fourth of the households getting wage employment during,the reporting month (March of every year) of the year. In most of the districts, such proportion has declined over the last three years, though an increase was observed in Ropar, Faridkot and Muktsar districts. The large-scale concentration of work in just a few months (especially in March) may be due to numerous reasons. Two important reasons may be the compulsion of achieving employment targets during a given financial year and to check the labor shortages (and thus the rise in wages) during the peak agricultural months by shifting the NREGA activities in the villages to non-peak period. However, if the proportion of households demanding employment increases substantially with time, these issues are also expected to get eliminated due to larger compulsions of providing employment, necessitating the spread of employment activities thorough out the year.

In Punjab, 77.16 lakh person days of employment were generated through NREGA activities in 2010-11 (Table 2). The extent of employment generation was more than 15 times the extent of employment generated in 2008-09 at 5.09 lakh person days. It may be due to the fact that the implementation of NREGA works was just picking up in Punjab by 2008-09. The increase in extent of employment generation during 2009-10 to 2010-11 was just about 22.7 per cent.

TABLE 2—EXTENT OF EMPLOYMENT GENERATION THROUGH NREGA IN PUNJAB

Particular	Cumulative person days generated				
	Scheduled Castes	Scheduled Tribes	Others	Total	Women
2008-09	399378	120	109140	508638	148072
	(78.52)	(0.02)	21.46)	(100.00)	(29.11)
2009-10	4784350	3325	1500735	6288410	2121274
	(76.08)	(0.05)	(23.87)	(100.00)	(33.73)
2010-11	5995215	3193	1717346	7715754	2930271
	(77.70)	(0.04)	(22.26)	(100.00)	(37.98)

NOTE : Figures in the parentheses represent per cent to total person days employment generated under NREGA.

Source : www.nrega.nic.in

The share of women in total employment generation has increased during the last three years from 29.11 per cent to 37.98 per cent, which is a good sign. However, there are significant variations in the share of women in total employment generation through NREGA across various districts in Punjab. While the share of women in total employment generation was the highest at 63.31 per cent in Fatehgarh Sahib, it was the lowest at 7.60 per cent in Gurdaspur during 2010-11. There does not seem to be any relationship between the phase of implementation of NREGA and the share of women in total employment generation in a district but there has been a consistent increase in the share of women over time.

Average number of person days generated under NREGA in Punjab was 26.90 in 2010-11 (Table 3). The number was the highest at 44.54 person days in Ropar and the lowest at 18.86 person days in Tarn Taran. Further, the average number of person days generated per household which were issued the job cards was very less at 9.33 in Punjab during 2010-11. These numbers reveal that very little employment generation has occurred with respect to the total requirements. With respect to the households provided employment, the target achievement of employment generation has been just about one-fourth. However, looking at the total number of job cards issued, this achievements appears to be just about nine per cent of the total requirements. Only about 2.02 per cent of the households which were provided employment under NREGA could get employment for complete 100 days in Punjab during 2010-11. This number varied between as little as just 0.19 per cent in Tarn Taran to as much as 4.94 per cent in Fatehgarh Sahib and 5.83 per cent in Ropar. A large number of rural employment opportunities will have to be generated under NREGA, in near future, to achieve its basic objective of providing at least 100 days of employment to every rural household willing to work at the minimum wages.

TABLE 3—ACHIEVEMENTS OF NREGA AGAINST 100 DAYS EMPLOYMENT BENCHMARK IN PUNJAB

Year	Person days generated per employment provided household	Person days generated per job card household	Cumulative No. of households completed 100 days of employment	Households completing 100 days of employment as % of total households provided employment
2008-09	19.88	0.80	206	0.81
2009-10	25.37	7.81	3995	1.61
2010-11	26.90	9.33	5794	2.02

NOTE: Figures in column 1 and 2 are calculated by dividing the total employment generated in person days by total number of households provided employment and issued job cards, respectively, during a particular year.

Source: www.nre.ga.nic.in

The total expenditure on NREGA activities in Punjab increased substantially during the last three years from Rs. 6.87 crore in 2008-09 to Rs. 117.88 crore in 2009-10 and then to 157.44 crore in 2010-11 (Table 4). Two most important activities under NREGA have been rural connectivity and renovation of traditional water bodies apportioning almost two-third of the total expenditure during each of the last three years. However, the cumulative share of renovation of traditional water bodies in the total expenditure has fallen from about 72 per cent in 2008-09 to about 34 per cent in 2010-11, while the share of rural connectivity has increased from 12.45 per cent to 31.42 per cent over the same period. The absolute expenditure on almost all the activities has increased substantially over the last three years. The decline in share of renovation of water bodies indicates that focus has also shifted towards other activities such as rural connectivity, land development, micro-irrigation, drought proofing, etc. There have been slight differences in the significance of these major activities across different districts in the state, which have been highlighted in the following discussion.

TABLE 4—COMPOSITION OF EXPENDITURE UNDER NREGA IN PUNJAB

(Rs. Lakh)

Activity	2008-09	2009-10	2010-11
Rural Connectivity	85.46	4172.30	4946.76
	(12.45)	(35.40)	(31.42)
Flood Control	1.91	342.24	599.67
	(0.28)	(2.90)	(3.81)
Water Conservation & Water Harvesting	34.83	331.48	234.65
	(5.02)	(2.81)	(1.49)
Drought Proofing	6.96	363.00	744.96
	(1.01)	(3.08)	(4.73)
Micro Irrigation	13.30	283.57	713.21
	(1.94)	(2.41)	(4.53)
Provision of Irrigation facility to Land development	—	—	3.73
			(0.02)
Renovation of Traditional Water Bodies	491.03	4960.58	5406.33
	(71.52)	(42.08)	(34.34)

TABLE 4—COMPOSITION OF EXPENDITURE UNDER NREGA IN PUNJAB—*Contd.*

(Rs. Lakh)

Activity	2008-09	2009-10	2010-11
Land development	19.87	911.10	1681.34
	(2.89)	(7.73)	(10.68)
Any Other Activity Approved by MRD	33.57	423.51	426.95
	(4.89)	(3.59)	(2.71)
Rajiv Gandhi Seva Kendra	—	—	986.27
			(6.26)
Total	686.61	11787.78	15743.89
	(100.00)	(100.00)	(100.00)

NOTE: Figures in parentheses are percentages of the respective totals.
Source: www.mega.nic.in

It seems that a very small proportion of the projects undertaken for NREGA in Punjab could be completed in the stipulated time. More than 99 per cent of the projects undertaken in Punjab during 2008-09 fell in the ongoing/ suspended category, though such proportion declined to about 64 per cent in 2009-10 as well as in 2010-11 (Table 5).

TABLE 5—PROGRESS ON WORK COMPLETION UNDER NREGA IN PUNJAB

Name of the project	Work	2008-09		2009-10		2010-11	
	Status	No.	Expenditure (Rs. lakh)	No.	Expenditure (Rs. lakh)	No.	Expenditure (Rs. lakh)
Rural Connectivity		—	0.49	2025	2037.12	2589	2685.92
	Completed		(0.57)	(50.99)	(48.82)	(49.16)	(54.30)
	Ongoing/	183	84.97	1946	2135.18	2677	2260.83
	Suspended	(100.00)	(99.43)	(49.01)	(51.18)	(50.84)	(45.70)
Flood Control		—	—	163	118.12	124	178.37
	Completed			(46.31)	(34.51)	(28.90)	(29.74)
	Ongoing/	5	1.91	189	224.12	305	421.30
	Suspended	(100.00)	(100.00)	(53.69)	(65.49)	(71.10)	(70.26)
Water Conservation		—	—	105	136.29	126	125.63
and Water Harvesting	Completed			(28.93)	(41.12)	(35.20)	(53.54)
	Ongoing/	92	34.83	258	195.19	232	109.02
	Suspended	100.00)	(100.00)	(71.07)	(58.88)	(64.80)	(46.46)
Drought Proofmg		—	—	307	57.32	683	246.36
	Completed			(24.96)	(15.79)	(31.02)	(33.07)
	Ongoing/	65	6.96	923	305.68	1519	498.60
	Suspended	(100.00)	(100.00)	(75.04)	(84.21)	(68.98)	(66.93)
Micro Irrigation		6	0.58	289	97.83	683	312.05
	Completed	(7.23)	(4.37)	(38.43)	(34.50)	(50.11)	(43.75)
	Ongoing/	77	12.72	463	185.74	680	401.16
	Suspended	(92.77)	(95.63)	(61.57)	(65.50)	(49.89)	(56.25)
Provision of		—	—	—	—	2	3.73
Irrigation facility to	Completed					(50.00)	(100.00)
Land development	Ongoing/	—	—	—	—	2	—
	Suspended					(50.00)	

TABLE 5—PROGRESS ON WORK COMPLETION UNDER NREGA IN PUNJAB—*Contd.*

Name of the project	Work Status	2008-09 No.	2008-09 Expenditure (Rs. lakh)	2009-10 No.	2009-10 Expenditure (Rs. lakh)	2010-11 No.	2010-11 Expenditure (Rs. lakh)
Renovation of Traditional Water Bodies		5	4.23	897	1160.51	1041	1502.38
	Completed	(0.68)	(0.86)	(22.80)	(23.39)	(22.73)	(27.79)
	Ongoing/	735	486.80	3037	3800.07	3538	3903.95
	Suspended	(99.32)	(99.14)	(77.20)	(76.61)	(77.27)	(72.21)
Land development		—	0.99	313	244.17	559	537.34
	Completed		(5.01)	(27.95)	(26.80)	(27.50)	(31.96)
	Ongoing/	69	18.88	807	666.93	1474	1144.00
	Suspended	(100.00)	(94.99)	(72.05)	(73.20)	(72.50)	(68.04)
Any Other Activity		—	0.37	443	309.96	343	232.00
Approved by MRD	Completed		(1.09)	(57.61)	(73.19)	(40.69)	(54.34)
	Ongoing/	169	33.20	326	113.54	500	194.95
	Suspended	(100.00)	(98.91)	(42.39)	(26.81)	(59.31)	(45.66)
Rajiv Gandhi Seva		—	—	—	—	8	131.15
Kendra	Completed					(3.85)	(13.30)
	Ongoing/	—	—	2	—	200	855.12
	Suspended			(100.00)		(96.15)	(86.70)
Total		11	6.33	4542	4161.33	6158	5954.93
	Completed	(0.78)	(0.92)	(36.36)	(35.30)	(35.63)	(37.82)
	Ongoing/	1395	680.28	7951	7626.46	11127	9788.96
	Suspended	(99.22)	(99.08)	(63.64)	(64.70)	(64.37)	(62.18)

NOTE: Figures in parentheses represent the percentage of total of completed and ongoing/suspended works of a particular activity

Source: www.nrega.nic.in

A very small proportion of the undertaken projects could reach completion in Punjab under NREGA. It does not appear that these projects are of long-term nature, requiring more than one year for completion. Projects on micro-irrigation, land development, drought proofing, etc., seem to be of short-term nature but even these were not completed during most of the past three years. This may reflect poor implementation and difficulties in identifying viable employment generation activities under NREGA. The situation in most of the study districts appears to be almost similar to that of the entire state. Though it is very difficult to identify any particular relationship between the work completion and the phase of implementation of NREGA in different districts, districts of Amritsar, Hoshiarpur, Gurdaspur, Muktsar, Kapurthala and Jalandhar have shown relatively better performance. However, if one has to judge the progress of NREGA from the extent of work completion, a significant improvement in work completion is required to make better progress in future.

While only 4581 muster rolls were issued in Punjab during. 2008-09, the number increased to 98011 during 2010-11 (Table 6). Out of the total muster rolls issued in 2009-10 and 2010-11 in Punjab, more than 97 per cent were found properly filled during the social audits. Average number of social audits in Punjab was 1.90 during 2010-11, which is an improvement over the average number of 1.52 during 2009-10. The average number has increased significantly from 2009-10 to 2010-11, reaching almost the minimum prescribed number of at least two social audits per year (one in every six months).

TABLE 6—SOCIAL AUDITING AND INSPECTION OF NREGA WORK IN PUNJAB

Year	Number of Muster Roll		Social Audit			Complaints
	Issued	Filled[1]	Total Gram Panchayats	No. Covered[2]	No. of Social Audits[3]	Issues raised and action taken[4]
2008-09	4581	4112 (89.76)	NA	NA	NA	NA

TABLE 6—SOCIAL AUDITING AND INSPECTION OF NREGA WORK IN PUNJAB—*Contd.*

Year	Number of Muster Roll			Social Audit		Complaints
	Issued	Filled[1]	Total Gram Panchayats	No. Covered[2]	No. of Social Audits[3]	Issues raised and action taken[4]
2009-10	67552	65987 (97.68)	12825	10469 (81.63)	15937 0.52)	6924 (0.43)
2010-11	98011	95461 (97.40)	12825	12624 (98.43)	23984 (1.90)	12553 (0.52)

Note: Figures in parentheses are (1) percentages of total number of muster rolls issued, (2) percentage of total number of Gram Panchayats, (3) percentage of total number of Grarn Panchayats covered under social audits and (4) average number of issues per social audit conducted.
Source: www.nrega.nic.in

A further look at the average number of issues raised per social audit conducted reveals that very few issues were being raised in the social audits. The average number of issues raised in Punjab per social audit was 0.43 and 0.52 in 2009-10 and 2010-11, respectively. The social audits also seemed to operate very effectively as very few issues were coming up in the social audits. However, very few issues may also be due to ineffective conduct of social audit and lack of awareness amongst the people regarding provisions of NREGA. It is very difficult to conclude about the effective implementation of NREGA and social audits with very thin secondary information available, and a lot of primary information is required to derive some meaningful conclusions.

In 2010-11, payments worth Rs. 77.71 crore were processed through the bank accounts and worth Rs. 20.90 crore were processed through post office accounts in Punjab (Table 7). The amount processed through bank accounts was Rs. 22.17 crore in 2008-09 and Rs. 73.63 crore in 2009-10 and the respective amount through post offices was Rs 7.51 crore and Rs 19.44 crore. The wage payments through banks and post offices have increased over time in Punjab. About 61.29 lakh savings accounts were opened in Punjab by 2010-11 out of which about 79 per cent accounts were opened in the commercial banks. More than 70 per cent of the job card holders have been included in the financial system for processing their NREGA payments either through banks or post office accounts. This is a welcome and commendable step towards financial inclusion of the poor. However, its performance has to be reviewed in detail and at greater depths to make any valid conclusion.

TABLE 7—PROCESSING OF NREGA PAYMENT THROUGH BANKS AND POST OFFICES IN PUNJAB

Year	No. of Bank Account Opened[1]		Amount of wages Disbursed through bank Accounts	No. of Post Office Account Opened[3]		Amount of Wages disbursed through post office Accounts	Total Accounts[4]			Total Amount Disbursed (Rs.
	Individual	Joint	Rs. Lakh)[2]	Individual	Joint	(Rs. Lakh)[2]	Individual	Joint	total	Lakh)[2]
					Punjab					
2008-09	108950 (98.62)	1521 (1.38)	2216.62 (74.69)	46585 (97.12)	1381 (2.88)	750.96 (25.31)	155535 (98.17)	2902 (1.83)	158437 (100.00)	2967 (100.00)
2009-10	289093 (92.82)	22373 (7.18)	7362.66 (79-11)	118094 (94.00)	7544 (6.00)	1944.07 (20.89)	407187 (93.16)	29917 (6.84)	437104 (100.00)	9306 (100.00)
2010-11	418002 (89.18)	50738 (10.82)	7771.48 (78.81)	130583 (90.59)	13560 (9.41)	2089.64 (21.19)	548585 (89.51)	64298 (10.49)	612883 (100.00)	9862 (100.00)

Note : Figures in parentheses are perecentages of (1) total number of bank accounts, (2) total amount disbursed, (3) total number of post-office accounts and (4) total number of accounts.
Source : www.nrega.nic.in

Spillover of works seems to be a major problem with more than 3000 works being the spillovers from the previous year and 5084 new works were undertaken during 2010-11. Out of these works, as many as 5396 are expected to spillover to the next year. About 64 per cent of these spill-overs pertained to the renovation of traditional water bodies and 17.36 per cent to the land development followed by rural connectivity (11.96 per cent). Even the new works taken up during 2010-11 largely belonged to these categories with cumulative share of about 78 per cent. Though, amongst the works which are likely to spillover to the next year, the highest proportion pertains to drought proofing (34.69 per cent), renovation of traditional water bodies, land development and rural connectivity also accounted for a significant share of the works likely to spillover with the respective share of 28.61 per cent, 10.88 per cent and 14.84 per cent. The earlier discussion has established that the above three categories of rural works are also the major employment generators for NREGA and very high proportion of spillovers of works in these categories can seriously thwart the generation of larger rural employment opportunities under NREGA.

A total of 6.08 crore employment days were projected to be generated in Punjab from these proposed works. This is more than eight times the employment generated through NREGA in 2010-11 (Table 8). Almost 45 per cent of this project employment will be generated through renovation of traditional water bodies, while rural connectivity will account for 23.34 per cent of the employment generation. Land development, drought proofing and other miscellaneous activities will also account for 5-10 per cent of the employment generation each. These figures seem quite encouraging and if achieved successfully, will lead to sufficient employment opportunities for most of the job card holders to obtain employment for 100 days in Punjab. How such high employment is achieved in the short-term (as projected) is however a big question, as the growth in employment till now does not support such projected growth in employment.

TABLE 8—WORK PROJECTIONS UNDER NREGA FOR PUNJAB IN 2010-11

Work Type	Spillover works from the previous year[1]	New works taken up during the current year	Works likely to spillover to the next year[1]	New works proposed for next financial year	Benefit achieved	Person days to be generated	Estimated cost (Rs lakh)2		
							Unskilled wages	Material costs	Total
Rural Connectivity	359 (16.64)	1799	801 (37.12)	1386860	116279040	14203537	19505.18 (61.97)	11968.5 (38.03)	31473.68 (100.00)
Flood Control and Protection	70 (25.45)	205	90 (32.73)	918	86234.00	1871045	2546.62 (65.23)	1357.38 (34.77)	3904 (100.00)
Water Conservation and Water Harvesting	13 (23.64)	42	70 (127.27)	547	2185167	907450	1243.7 (61.66)	773.42 (38.34)	2017.12 (100.00)
Drought Proofing	54 (15.00)	306	1872 (520.00)	5392	41847	3229650	4387.04 (64.25)	2441.41 (35.75)	6828.45 (100.00)
Micro Irrigation Works	30 (8.38)	328	394 (110.06)	2049	313648	2033220	2735.79 (72.99)	1012.32 (27.01)	3748.11 (100.00)
Provision of Irri-gation facility to Land Owned by	—	—	17	391	1642	296197	402.75 (62.66)	239.98 (37.34)	642.73 (100.00)
Renovation of Traditional Water bodies	1930 (57.29)	1439	1544 (0.46)	9325	55210625	27384239	37427.38 (63.05)	21931.99 (36.95)	59359.37 (100.00)
Land Development	521 (41.55)	733	587 (46.81)	5090	119955	5140396	7002.77 (61.66)	4354.89 (38.34)	11357.66 (100.00)
Any Other activity Approved by MRD	24 (9.41)	231	21 (0.08)	3017	735930	5736688	7923.63 (45.93)	9326.35 (54.07)	17249.98 000.00)
Bharat Nirman Rajeev Gandhi Sewa Kendra	1 (50.00)	1	—	21	33708	46480	60.70 (21.53)	221.23 (78.47)	281.93 (100.00)
Total	3002 (37.13)	5084	5396 (66.73)	1413610		60848902	83235.56 (60.82)	53627.47 (39.18)	136863.03 (100.00)

Note: Figures in parentheses are percentages of 1) total number of works undertaken (new + spillover) and 2) total estimated cost for the respective work types.

Source: www.nrega.nic.in

3. Pattern of Household Income and Consumption: The Effect of NREGA

The rural wage worker households were found to be involved in a variety of employment activities. An average household was found to get employment of around 260 days per annum and the respective numbers were about 255 days per annum and 270 days per annum for the beneficiary and non-beneficiary households (Table 9). Wage employment in the agricultural activities and non-agricultural activities generated about 34.14 per cent and 38.49 per cent of the total employment opportunities for the beneficiary households.

TABLE 9—PATTERN OF EMPLOYMENT AMONGST THE RURAL WAGE WORKING HOUSEHOLDS IN PUNJAB

(man days/household)

Occupational category	Type of household		
	Beneficiary	Non-beneficiary	Overall
Agricultural casual labour	87.12 (34.14)	72.17 (26.73)	.82.14 (31.58)
Non agricultural casual labour	98.23 (38.49)	165.35 (61.24)	120.60 (46.36)
Work for public work programmes other than NREGA	—	—	—
Self employed in non farming	13.48 (5.28)	18.30 (6.78)	15.09 (5.80)
Self employed in agriculture	—	2.46 (0.91)	0.82 (0.31)
Self employed in livestock	2.20 (0.86)	4.72 (1.75)	3.04 (1.17)
Regular/salary job	—	7.00 (2.59)	2.33 (0.90)
Worked as a migrant worker	—	—	—
Worked under NREGA	54.15 (21.22)	— —	36.10 (13.88)
Any other work	—	—	—
Total employment	255.18 (100.00)	270.00 (100.00)	260.12 (100.00)

NOTE : (i) While calculating man days working population excludes dependent, household work, students and others, (ii) For salaried/pensioners the working days are considered as 365 man-days per person per annum, (iii) For self employment in agriculture/livestock, man-days are calculated as (days*number of hours/8), (iv) Figures in parentheses are per cent of the total employment days for each category.

These households also got about 54.15 days of employment under NREGA, which accounted for about 21 per cent of their total employment opportunities. The pattern of employment reveals that the non-beneficiary households are more dependent on wage employment in the non-farm sector as compared to the beneficiary households. NREGA helped the beneficiary households in providing them a significants share of total employment. In the absence of NREGA, the employment opportunities for beneficiary households could have been less by almost 25 per cent than the employment opportunities of the non-beneficiary households. Even within the wage working rural households, relatively poorer seem to have been benefited through NREGA in the initial years of its implementation.

The beneficiary households are more equally dependent on wage employment in the farm as well as non-farm sector, the non-beneficiary households are deriving almost 58 per cent of their income from wage employment in the non-farm sector. The beneficiary households which derive a significant proportion of their income from employment in NREGA activities have not been as successful in obtaining employment in the non-farm sector,

which may be an important reason for them to opt for employment activities in NREGA to supplement their meager incomes. The values of coefficient of variation (CV) for different components of the household income reveal very high income variability across these households. There was comparatively more variability in wage income from non-agricultural employment for the beneficiary households as compared to the non-beneficiary households. Even the income from NREGA activities shows very high variability with CV of 81.43 per cent. As wages for NREGA activities are fixed, high variability of income from NREGA reflects large-scale variation in the number of employment days generated for different beneficiary households.

The pattern of consumption amongst the beneficiary and non-beneficiary households is discussed in this section. Average consumption of rice and wheat was 0.67 kg per capita per month (pcpm) and 8.35 kg for the beneficiary households and 0.59 kg and 8.97 kg for non-beneficiary households, respectively (Table 10). Total cereal consumption was estimated to be 9.45 kg and 10.07 kg pcpm for the beneficiary and non-beneficiary households. The beneficiary households were consuming comparatively less cereals per capita as compared to the non-beneficiary households, which may be due to their comparatively lower incomes. There were no major differences in the consumption of pulses, sugar and edible oils across the beneficiary and non-beneficiary households. The overall variability in wheat consumption is comparatively less, but that of rice, pulses, sugar, vegetables, edible oils and spices is medium and that of fruits, milk and milk products is high. Lesser variability does not reflect a better consumption level but points towards the household efforts to stick to the some minimum consumption levels of these items and hence there are lesser variations in their consumption.

TABLE 10—PATTERN OF FOOD CONSUMPTION AMONGST RURAL HOUSEHOLDS

(Kg/capita/month)

Item	Type of household			NSS	NSS	NSS
	Beneficiary	Non-beneficiary	Overall	1993-94	1999-2000	2004-05
Rice	0.67	0.59	0.64	0.73	0.70	0.755
	(55.89)	(39.56)	(51.68)			
Wheat	8.35	8.97	8.56	9.58	9.66	8.971
	(35.43)	(38.32)	(36.92)			
Other cereals	0.43	0.51	0.46	0.18	0.22	0.192
	(63.18)	(38.64)	(55.12)			
Total cereals	9.45	10.07	9.66	10.79	10.58	9.918
	(32.30)	(35.18)	(33.75)			
Total pulses	0.63	0.67	0.64	0.89	0.90	0.838
	(39.08)	(51.41)	(44.25)			
Sugar	2.04	2.09	2.06	1.68	1.77	1.875
	(45.53)	(71. 72)	(56.41)			
Edible oils	0.38	0.42	0.39	0.49	0.56	0.656
	(50.03)	(45.02)	(48.51)			
Milk & milk products	4.18	4.66	4.34	14.33	11.67	—
	(74.01)	(87.86)	(80.21)			
Spices	56.89	42.35	52.04	—	—	—
	(63.23)	(80.65)	(68.96)			
Poultry-meat	—	—	—	—	—	—
Fruits	0.23	0.28	0.25	—	—	—
	(113.10)	(98.94)	(108.14)			
Vegetables	2.84	3.07	2.92	—	—	—
	(52.31)	(43.19)	(49.30)			

NOTE: Edible oil and liquid milk is in litres and spices are in grams. Figures in parentheses are the coefficient of variation.

The non-beneficiary households were spending about eight per cent more on food items as compared to the beneficiary households. On the other hand, the expenditure on non-food items differed by about 24 per cent with the beneficiary households spending Rs 246.53 pcpm and non-beneficiary households spending Rs 306.49 pcpm. An average non-beneficiary household was spending about 14 per cent higher per capita per month on food and non-food items together. The variability in food expenditure was slightly higher amongst the beneficiary households as compared to the non-beneficiary households. In a similar manner, the variability in expenditure on non-food items was higher for the beneficiary households at about 147 per cent as compared to 119 per cent for the non-beneficiary households. As food is the first priority for the poor, the expenditure on non-food items occurs largely when the food requirements are taken care of. It may be the reason for the larger variations in non-food expenditure for the beneficiary households.

Variability in the household income from different sources reflects on higher inequalities in income and productive asset distribution across these households. Considering the different sources of income, income from dairying and non-farm self-employment showed the highest variability across the households, these activities require some sort of asset base to be carried out; the access to which varies across the households reflecting in the high variability of income from these sources. Income from regular salaried jobs was the next most variable source with comparatively lesser contribution to the net income of households; these households are poor and endowed with lower education levels as is clear from the high variability of salaried income among the households. Non-agricultural wage income varied much across the beneficiary households than the non-beneficiary households, though agricultural wage income did not show much variability.

The results of the logistic regression reveal that family size, asset value, household income other than NREGA and stage of implementation of NREGA in the district, were significant determinants of household level participation in NREGA (Table 11). A large sized household was more likely to participate in the NREGA activities. Higher asset value of the household and more income from other sources were found to be the deterrents for NREGA participation. It is obvious that relatively richer households did not prefer minimum wage employment. In those areas, where NREGA was implemented in the first two phases, the likelihood of NREGA participation was more, which may be due to better work planning, availability of more employment opportunities and better implementation of NREGA programme. As most of the households belonged to either SC or OBC category, the caste dummies did not emerge as significant determinants of household participation in NREGA.

TABLE 11— DETERMINANTS OF HONSEHOLD PARTICIPATION IN NREGA ACTIVITIES

Determinants	Household Participation	Member Participation
1. Constant	1. 77 ^{NS} (1.02)	-2.63* (0.37)
2. Family size	0.27* (0.13)	—
3. Asset value	1.83E-5* (4.59E-6)	—
4. Other income	-2.56E-5* (6.79E-6)	—
5. Stage of NREGA implementation	0.58* (0.29)	—
6. SC Dummy	-0.49 ^{NS} (0.83)	—
7. OBC Dummy	-0.39 ^{NS} (0.94)	—
8. AA Y Dummy	0.10 ^{NS} (0.31)	—
9. Worker's age	—	1.87E-3 ^{NS} (6.84E-3)

TABLE 11— DETERMINANTS OF HONSEHOLD PARTICIPATION IN NREGA ACTIVITIES—*Contd.*

Determinants	Household Participation	Member Participation
10. Worker's education	—	0.09 NS (0.13)
11. Gender	—	0.90* (0.19)
12. Marital status	—	1.37* (0.28)
Log likelihood function	-170.21	-418.50
Restricted log likelihood	-188.74	-454.67
Chi-square	37.07*	72.34*
Pseudo-: R^2	0.10	0.08

NOTE: Figures in parentheses represent the standard errors. * means significant at 5% level. NS means non-significant. Very small values of the coefficients have been presented in the exponential form.

At the worker level, though gender and marital status were found significant determinants of participation in NREGA, age and education of the workers were not found significant. Provision of NREGA employment at minimum wages and widespread unemployment in the rural areas seem to be two most important reasons for the non-significance of age and education. A male was more likely to get employed in the NREGA activities. Married workers were also more likely to get employed in NREGA as unmarried young workers preferred working at higher wages outside the NREGA ambit.

4. Work Profile, Wage Structure and Migration Issues of NREGA

The average number of days of employment generated under NREGA for the beneficiary households was estimated to be 54.15 work days per annum per household (paph). The average number of days of employment generation under NREGA was the highest for the scheduled caste households, followed by the backward caste households and general caste households. The extent of employment of women workers under NREGA can be judged from the fact that, overall, women workers were getting 13.87 work days of employment paph. It comes out clearly that NREGA is providing comparatively higher wage earning employment opportunities for the scheduled caste workers, which is a good sign. The poorest of the poor (largely scheduled castes) are perhaps trying to make more out of the guaranteed wage employment 10 reduce the severity of unemployment. The NREGA also seems to promote labour force participation of the women by providing them wage employment at comparatively higher wages than usually prevail for most of the rural employment activities for females. In the absence of NREGA works, these women would not have participated in the labor force due to lack of sufficient employment opportunities. The average number of employment days reveals that the efforts under NREGA need to be at least doubled to achieve the overall objective of providing employment of 100 days to every household as the current number of employment days are at 54.15 days per capita per household. The wage rate for both male and female workers across different castes and across all the districts was obviously the same at Rs 123 per day as fixed by the Govt. of India in consideration of the prevailing minimum wage in the state.

Though, the average wage rate for agricultural activities was slightly lower at Rs 141.3 per day, the wages were not found to differ significantly across wage activities across farm and non-farm activities (Table 12). The wages for migrant workers were also equal to the local workers. Variability in all the kinds of wages as indicated by their CV was estimated to be very low ranging between 3-5 per cent, which shows that wages were not varying significantly across the workers. The NREGA wages were Rs 123 per day and there was no variability across different workers.

TABLE 12—WAGE DIFFERENTIALS AMONG DIFFERENT ACTIVITIES

Occupation		Beneficiaries		Non beneficiaries		Aggregate	
		Average wage rate	CV	Average wage rate	CV	Average wage rate	CV
Agricultural	Male	140.5	2.78	142.8	3.89	141.3	3.12

TABLE 12—WAGE DIFFERENTIALS AMONG DIFFERENT ACTIVITIES—*Contd.*

Occupation		Beneficiaries		Non beneficiaries		Aggregate	
		Average wage rate	CV	Average wage rate	CV	Average wage rate	CV
Agricultural casual labour (Rs)	Male	140.5	2.78	142.8	3.89	141.3	3.12
	Female	55.6	17.86	58.7	15.68		
Non-agricultural casual labour (Rs)	Male	148.6	4.75	149.3	3.72	148.8	4.33
	Female	42.3	25.65	63.5	29.35		
Wage Rate of migrant workers (Rs)	Male	148.6	4.75	149.3	3.72	148.8	4.33
	Female	NA	NA	NA	NA	NA	NA
Wage rate under NREGA (Rs)	Male	123	—	—	—	123	—
	Female	123	—	—	—	123	—
Any other work (Rs)	Male	—	—	—	—	—	—
	Female	—	—	—	—	.—	—

NOTE: NA means not available.

Another important fact is that there is no gender differential in the wages for NREGA activities as minimum wage specified for NREGA works is same for male as well as female workers. This is a good and huge step towards bringing equality in wages and eliminating gender differentials in remuneration. The gender differentials still exist to a considerable extent in agricultural and non-agricultural activities, with higher differences and variability existing in the non-agricultural sector. These wage differentials are believed to come down with a simultaneous decline in variability of these wages with time. It may be due to squeeze in the labor supply for the agricultural and non-agricultural sector due to the generation of employment opportunities under NREGA. Further increase in employment opportunities under NREGA, especially for female workers will increase the female wages, thereby reducing the gender differentials and variability.

The results of this study do not confirm any major impact on migration of rural workers in rural areas of Punjab. Only 4.5 per cent of the households reported any migration from the village due to lack of employment opportunities and there was no incidence reported for anyone to come back. While 33 per cent of those migrated during the recent year, 67 per cent of the migration occurred during the previous years. It was informally observed that many rural workers were commuting to the nearby towns and cities in search of work but were not permanently migrated. It may be due to better road network in the state, making it easy and cheap to commute to these places rather than migrating there permanently. Comparatively very high cost of living in the urban areas was also a big hindrance for such migration. The workers were commuting in the lean periods to find employment in cities, mainly in the construction activities. The rural households do not believe that there will be any reverse migration in the short-run due to employment effect of NREGA.

5. Functioning of NREGA: Some Qualitative Issues

Analysis of the qualitative aspects of NREGA reveals that value of the total assets owned by non-beneficiary households was 1.89 times the value of assetsowned by the beneficiary households. The entire borrowing of the wage worker households was sourced from the non-institutional sources at very high rate of interest and the amount borrowed by the beneficiary households was 1.6 times that of the non-beneficiary households. There were a few irregularities in the issuance of job cards such as some job cards lying with the village heads, non-issuance of receipt of the work application, etc., which need to be addressed properly. There were some minor issues related to NREGA wages and their appropriateness but most of them appeared to be related to lack of awareness and not due to poor implementation. There is need for a significant improvement in the worksite facilities such as childcare facilities on the worksite, provision of shade and first-aid facilities, which will not only improve the work conditions under NREGA but will also, increase the work force participation, especially among the females. Just 4.5 per cent of the respondents reported some incidence of migration after the implementation of NREGA and there is no such evidence on what was the rate of such migration before that programme to make some meaningful conclusion about the impact of NREGA.

While the level of awareness about implementation of NREGA, right to apply for work, work application procedure and level of minimum wages was relatively high, there was quite less awareness on wage calculation method, provision of worksite facilities and right to unemployment allowance. There is a need to enhance efforts to further increase awareness on all the aspects of NREGA amongst the rural population and especially on provision of worksite facilities, right to unemployment allowance and wage

calculation procedure. Enhanced awareness will increase the employment opportunities for the wage workers, increase demand for such labour and will ultimately lead to the empowerment of the rural poor. As has already been mentioned earlier, NREGA is expected to enhance food security of the people. While 69 per cent of the households had two full meals per day throughout the year, 17 per cent and 14 per cent of the rural households could not get sufficient food for one month and two months of the reference year, respectively. All the households, which were not able to get sufficient food during the year, borrowed money from some non-institutional source to cope up with such situation. This situation is expected to improve with time with the increased coverage and enhanced employment opportunities generated by the NREGA programme in the long-run. Due to rising food prices in the recent periods and decline in employment opportunities, the wage earning households were struggling to sustain their consumption levels. These households were struggling to sustain their consumption levels. The general suggestions to improve the rural livelihoods were the enhancement of employment opportunities under NREGA and extending it to even beyond 100 days.

6. Impact on Village Economy

Though all the villages under study were not having all the important infrastructural facilities, these were lying in the nearby villages and were within an approachable distance. In these villages, the proportion of households dependent on cultivation and agricultural labour declined over time, while the proportion of households dependent on wage labour in the construction sector, manufacturing, trade, business and other services increased during 2001 to 2009. There was an increase in the wages for male and female workers and also for most of the agricultural operations resulting into the cost of agricultural production over time. There is a general perception that labor shortages occurring due to the implementation of NREGA caused an increase in agricultural wages and rise in the cost of cultivation by 10-20 per cent. NREGA was not believed to have a significant impact on migration of the workers to nearby towns/cities and vice-versa. Even daily and periodic commuting to the urban places did not seem to have been impacted much. It will perhaps take longer time before any significant impact is visible. The wages of the casual labor have increased owing to an overall decline in the supply of labor to the agriculture sector. These changes seem to have been the result of significant decline in the in-flow of migrant labor to Punjab from other states (Bihar and Uttar Pradesh) and shortage in the supply of local agricultural labor as well.

7. Policy Implications

Keeping in mind the present number of job seekers and their future growth, the employment opportunities under NREGA has to be increased by almost 11 times in Punjab. While the work on major activities such as rural connectivity and traditional water bodies has to be intensified, numerous other activities in the rural areas have to be identified which can increase the demand for wage labour. However, regional requirements have to be kept in mind while selecting the activities for employment generation under NREGA. The problem of spillovers has to be taken care of. The current list of indicators of social auditing needs to be expanded to ensure better evaluation of the qualitative aspects of aspects of NREGA. Increased employment generation under the programme will also bring significant enhancement in household incomes and consumption and will reduce the income and consumption variability as well as inequality. Increased participation of females in rural labour force will also boost the household incomes, bring down gender wage differentials and will improve consumption and food security of the households. Hence, special provisions should be made to further increase the share of females in total employment.

D. Commodity Reviews

(i) Foodgrains

The rainfall from south-west monsoon (June-September), for the country as a whole, for the period 1st June to 30th September, 2012 was 92 per cent of its Long Period Average (LPA). It was 101 per cent of the Long Period Average for the country as a whole in 2011 and 102 per cent of the LPA in 2010.

THE PRODUCTION ESTIMATES OF PRINCIPAL CROPS DURING 2011-12

Crop	Production (in Million tonnes)			
	Normal	2011-12	2010-11	2009-10
Rice	94.02	105.31	95.98	89.09
Wheat	77.04	94.88	86.87	80:80
Coarse Cereals	36.47	42.04 .	43.68	33.55
Pulses	14.31	17.09	18.24	14.66
Nine Oilseeds	26.92	29.80	32.48	24.88
Sugarcane	312.44	361.04	342.38	292.30
Cotton *	22.66	35.20	33.00	24.02
Jute**	10.27	10.74	10.01	11.23

*Million bales of 170 Kgs each.
** Million bales of 180 Kgs each.

Rice

The production of rice during 2011-12 estimated at 105.31 million tonnes, is higher by 9.33 million tonnes than last year. The production estimates for kharif and rabi seasons are 92.75 and 12.56 million tonnes respectively.

Wheat

The wheat production during 2011-12 estimated at 94.88 million tonnes, is 8.01 million tonnes more than last year's production.

Coarse Cereals

The production of coarse cereals during 2011-12 estimated at 42.04 million tonnes, is 1.66 is less than the previous year's production. The production for kharif season is estimated at 32.46 million tonnes and for rabi season it is estimated at 9.58 million tonnes.

Pulses

The total pulses production during 2011-12 estimated at 17.09 million tonnes, is 1.15 million tonnes less than last year. The production of gram and tur is estimated at 7.70 and 2.65 million tonnes respectively.

Oilseeds

The production of nine oilseeds during 2011-12 estimated at 29.80 million tonnes is 2.68 million tonnes less than last year. The production of groundnut, soyabean, sunflower, rapeseed and mustard is estimated at 6.96, 12.21, 0.51 and 6.60 million tonnes respectively.

Sugarcane

The sugarcane production is estimated at 361.04 million tonnes, as compared to 342.38 million tonnes last year, i.e. 18.66 million tonnes more than last year.

Cotton

The cotton production is estimated at 35.20 million bales of 170 Kgs. each, as against 33.00 million bales last year, an increase of 2.20 million bales.

Jute

Jute production is estimated at 10.74 million bales of 180 kg each against 10.01 million bales last year showing increase of 0.73 million bales.

1. Wholesale Price Indices

A statement giving all India monthly index number of wholesale prices of foodgrains (Base 2004-2005=100) is given at Annexure-I. On a point to point basis the Wholesale Price Index (WPI) of foodgrains, cereals, rice and pulses showed a rising trend but wheat showed a falling trend in 2011-12 as compared to the previous year.

The annual fluctuations are as under:—

Crop/Commodity	Annual Variation (%) 2011-12(April-March)
1. Foodgrains	(+) 3.61
2. Cereals	(+) 3.83
3. Rice	(+) 3.05
4. Wheat	(-) 1.81
5. Pulses	(+) 2.49

2. Minimum Support Prices (MSPs)

The Government's price policy for agricultural commodities seeks to. ensure remunerative prices to the growers for their produce with a view to encourage higher investment and production, and to safeguard the interest of consumers by making available supplies at reasonable prices. The price policy also seeks to evolve a balanced and integrated price structure in the perspective of the overall needs of the economy. Towards this end, the Government announces each season Minimum Support Prices (MSPs) for major agricultural commodities and organizes purchase operations through public and cooperative agencies.

The Government decides on the support price for various agricultural commodities taking into account the recommendations of the Commission for Agricultural Costs and Prices (CACP), the views of State Governments and Central Ministries as well as such other relevant factors which, are considered important for fixation of support prices.

The Government has fixed the Minimum Support Price (MSPs) -of **kharif crops of 2012-13 season.** The MSPs of paddy (Common)has been fixed at RS.1250 per quintal and that of Paddy (GradeA) at Rs. 1280 per quintal. The MSP of Arhar (Tur) has been fixed at Rs. 3200 per quintal while that of Moong fixed at Rs. 3500 per quintal. ln addition, similar to last year, an additional incentive has not been declared till the time. The MSP of Groundnut-inshell has been fixed at Rs. 3700 per quintal raising it by Rs. 1000 per quintal.

The MSPs of **Rabi Crops of 2012 - 2013 season** to be marketed in 2013 -2014 have been raised over their previous years MSPs. The MSP of Wheat has been raised to Rs. 1350 per quintal and of Barley to Rs. 980 per quintal. MSP of Gram has been raised by Rs. 200 per quintal and of Masur by Rs. 100 per quintal and fixed at Rs. 3000 per quintal and 2900 per quintal respectively. MSP of Rapeseed / Mustard has been raised to Rs. 3000 per quintal from Rs. 2500 per quintal. Recent trends in the MSPs of different crops may be seen from the statement given at **Annexure -II.**

3. Procurement

One of the main ingredients of Government's Food Management Policy is procurement of foodgrains, of which, rice and wheat form the bulk of grains procured. These are procured not only with a view to meet the requirements of PDS but also for building up stocks for imparting stability of supplies and prices. While Food Corporation of India is the designated central nodal agency for undertaking price support operations of paddy/rice, wheat and coarse grains, NAFFED undertakes price support operations of pulses and oilseeds.

During 1st October, 2011 to 30th September, 2012, 35031 thousand tonnes of rice was procured as against 34198 thousand tonnes procured during the corresponding period of the previous season. The total procurement of rice during 2010-11 season stood at 34198 thousand tonnes as against 32034 thousand tonnes procured during 2009-10 season.

The procurement of wheat during 2012-13 marketing season till 2nd August, 2012 stood at 28335 thousand tonnes as against 22514 thousand tonnes during 2010-11. During 2009-10, procurement of Wheat stood at 25382 thousand tonnes.

Similarly, the procurement of coarse cereals during 2010-11 season up to 30th September 2011 is about. 128 thousand tonnes. Where as the procurement of coarse cereals during 2009-10 season was 407 thousand tonnes.

Details regarding state-wise procurement of rice (including paddy converted in rice) during the 2011-12 and wheat during the 2012-13 marketing season etc. are given in the statement at **Annexure-III and IV** respectively.

Central Issue Prices

Wheat and rice are issued from the central pool to the State Governments at uniform Central Issue Prices (CIP) for distribution under the TPDS (Targetted Public Distribution System). The CIPs of rice and wheat were not revised during the year under review and stand as under.

CENTRAL ISSUE PRICE OF FOODGRAINS :

(Rupees per Quintal)

Rice

		APL	BPL	AA Y (*)
Period	Common*	Grade "A"	Common/Grade "A"	
12-7-2001 to 31-3-2002	795	830	565	300

CENTRAL ISSUE PRICE OF FOODGRAINS :—*Contd.*

Rice

(Rupees per Quintal)

Period	APL		BPL	AA Y (*)
	Common*	Grade "A"	Common/Grade "A"	
1-4-2002 to 30-6-2002	695	730	565	300
1-7-2002 to till date	795	830	565	300

* Applicable only to J&K, Himachal Pradesh, N. E. States, Sikkim & Uttaranchal

Wheat

	APL	BPL	AAY(*)
12-7-2001 to 31-3-2002	610	415	200
1-4-2002 to 30-6-2002	510	415	200
1-7-2002 to till date	610	415	200

Coarsegrains

	APL	BPL	AAY(*)
with effect from 16-11-2005	70% of Economic cost	50% of Economic cost	Rs. 2.00 Per kg
KMS2008-2009	Rs. 4.50 per kg	Rs. 3.00 per kg	Rs. 1.50 per kg
KMS2009-2010	Rs. 4.50 per kg	Rs. 3.00 per kg	Rs. 1.50 per kg
KMS2010-2011	Rs. 4.50 per kg	Rs. 3.00 per kg	Rs. 1.50 per kg

- Applicable only to J & K, H.P.N.E states,Sikkim and Jharkhand .
- APL—Above Poverty Line
- BPL —Below Poverty Line

(*) with effect from December, 2000

4. Imports and Exports of Agricultural commodities

The following statement shows the imports and exports of foodgrains during the Year 2010-11 (Apr. - March) and 2011-12(Apr. - March)

Quantity & Value of Exports and Imports (2010-11 and 2011-12)

Exports

Quantity in '000 tonnes
Value:Rs. In crores

Commodity	April, 2010- March, 2011		April, 2011- March, 2012(P)	
	Quantity	Value	Quantity	Value
Pulses	208.02	865.74	174.20	1065.84
Rice Basmati	2370.68	11354.76	3211.80	15450.45
Rice (other than Basmati)	100.68	231.29	4099.00	8668.19
Wheat	0.40	0.70	741.19	1023.80
Other Cereals	3220.07	3648.49	4072.37	5479.21
Total Exports		**1142921.92**		**1459280.51**

Imports

Commodity	April, 2010- March, 2011		April, 2011- March, 2012 (P)	
	Quantity	Value	Quantity	Value
Pulses	2698.66	7149.62	3307.87	8767.42
Wheat	185.28	255.85	0.02	0.08
Rice	0.22	1.12	1.08	5.73
Other Cereals	30.68	59.53	15.36	30.04
Total Imports		**1683466.96**		**2345972.70**

P-Provisional

Source: DGCI & S, Ministry of Commerce, Kolkata.

5. Buffer Stocks

The stocks of foodgrains held by the government agencies as on 29th February 2012 stood at 545.26 lakh tonnes as against 460.12 lakh tonnes during the corresponding period of last year. A total minimum stock of 319.00 lakh tonnes is required to be maintained as on 1st July, under the buffer stocking policy.

MONTHLY AVERAGE OF WHOLESALE PRICE INDEX

(Base 2004-05 =100)

Commodity	Weight	Year	Apr	May	June	July	Aug.	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
Food-Grains	4.08982	2005-06	100.6	100.9	103.0	105.4	106.0	106.5	107.7	108.5	109.4	112.6	113.4	113.1	107.3
		2006-07	112.9	114.9	116.6	116.6	117.8	122.2	126.2	128.8	129.4	128.8	128.8	125.9	122.4
		2007-08	127.3	126.8	126.5	128.7	129.7	129.7	132.8	133.0	132.2	132.7	134.1	137.0	130.9
		2008-09	139.5	139.0	139.5	141.3	143.2	143.2	147.3	148.3	148.4	149.8	152.0	152.1	145.3
		2009-10	154.7	156.1	157.1	158.9	161.1	164.1	166.9	173.6	177.3	179.0	175.3	172.2	166.4
		2010-11	171.8	172.2	173.4	174.2	174.4	174.0	173.4	174.4	175.2	176.4	178.2	175.6	174.4
		2011-12	175.5	176.7	177.0	178.6	180.2	180.8	182.9	182.4	182.1	183.3	183.5	185.6	180.7
		2012-13	187.5	190.4											
Cereals	3.37323	2005-06	101.0	101.2	103.0	104.7	105.1	105.4	106.5	106.3	106.7	110.3	111.3	110.4	106.0
		2006-07	109.1	110.8	111.9	111.8	112.9	115.9	117.8	121.1	122.2	122.9	123.0	121.5	116.7
		2007-08	122.8	122.8	122.8	124.6	125.8	126.1	129.9	130.4	129.9	131.7	132.9	134.6	127.9
		2008-09	137.9	137.9	137.9	139.0	139.8	140.0	144.5	145.6	145.9	147.8	150.1	150.7	143.1
		2009-10	152.9	154.1	154.8	154.5	155.5	158.7	161.2	166.4	169.9	170.5	169.2	166.5	161.2
		2010-11	165.2	165.0	166.3	167.4	168.7	169.3	169.0	171.7	172.6	173.5	175.0	172.3	169.7
		2011-12	172.5	174.5	174.7	176.1	177.4	176.3	176.3	175.4	175.6	177.4	178.2	180.3	176.2
		2012-13	182.5	184.5											
Rice	1.79348	2005-06	102.5	102.5	104.3	105.7	106.7	107.0	107.6	106.6	105.0	104.9	105.0	105.0	105.2
		2006-07	105.6	106.4	107.0	107.3	107.8	108.9	111.7	112.0	111.9	113.3	113.9	114.5	110.0
		2007-08	115.7	116.2	116.6	117.8	119.3	120.6	126.1	125.4	124.8	127.3	128.8	130.9	122.5
		2008-09	132.6	132.7	132.6	133.9	134.9	135.7	145.0	146.3	146.3	147.0	149.3	151.1	140.6
		2009-10	150.9	151.0	151.8	151.4	153.1	157.6	160.2	162.6	164.5	164.7	164.1	163.3	157.9
		2010-11	163.5	163.5	164.3	165.9	164,4	166.6	168.7	170.3	171.1	170.6	170,4	167.0	167.2
		2011-12	167.3	169.7	169.0	169.9	172.9	173.3	176.3	175.4	173.1	172.2	173.0	175.4	172.3
		2012-13	176.8	178.3											

MONTHLY AVERAGE OF WHOLESALE PRICE INDEX—*Contd.*

(Base 2004-05 =100)

Commo-dity	Weight	Year	Apr	May	June	July	Aug.	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Aver-age
Wheat	1.11595	2005-06	95.8	96.1	98.1	100.3	100.6	101.3	103.5	104.7	107.0	116.7	119.4	116.7	105.0
		2006-07	111.6	114.4	116.3	115.9	119.1	125.6	127.4	134.9	137.1	135.8	134.8	128.6	125.1
		2007-08	130.1	128.8	127.9	131.6	133.1	133.1	135.5	137.7	137.1	137.6	139.0	139.9	134.3
		2008-09	146.7	146.4	145.6	147.1	147.0	146.6	144.8	145.9	. 147.0	150.7	152.3	150.7	147.6
		2009-10	155.7	158.0	158.4	157.5	156.5	159.1	163.3	174.0	180.8	182.1	179.4	172.8	166.5
		2010-11	168.9	168.1	168.8	167.8	172.5	171.6	168.2	172.7	!73.3	175.2	177.1	173.1	171.4
		2011-12	169.2	167.4	168.7	170.8	168.9	166.9	165.3	164.3	166.6	169.2	170.1	172.1	168.3
		2012-13	174.7	178.8											
Pulses	0.71662	2005-06	98.9	100.0	103.1	108.3	110.1	111.7	113.4	119.0	122.5	123.7	123.4	126.0	113.3
		2006-07	131.0	134.2	139.0	139.1	141.1	151.6	166.1	165.2	163.5	156.6	156.3	146.5	149.2
		2007-08	148.3	145.7	144.0	147.6	147.9	146.4	146.7	145.2	142.7	137.3	139.6	147.8	144.9
		2008-09	147.3	144.5	147.3	152.3	159.4	158.3	160.7	161.1	160.6	158.7	160.8	159.1	155.8
		2009-10	163.2	165.6	168.1	179.9	187.2	189.2	193.7	208.0	212.1	219.1	204.1	198.9	190.8
		2010-11	202.5	206.2	206.8	205.8	201.7	196.5	194.1	187.2	187.2	189.9	193,4	191.0	196.9
		2011-12	189.6	187.2	187.5	190.4	193.1	202.2	214.0	215.2	212.9	210.8	208.6	210.3	201.8
		2012-13	211.0	218.3											

MINIMUM SUPPORT PRICES

(According to Crop Year)

(As on 26-12-2012)

(Rs. per Quintal)

Sl. No	Commodity	Variety	2008-09	2009-10	2010-11	2011-12	(#) increase in MSP 2011-12 over 2010-11	2012-13	(#) increase in MSP 2012-13 over 2011-12
	Kharif Crops								
1.	Paddy	Common	850$	950$	1000	1080	80(8.0)	1250	170(15.7)
		Grade 'A'	880$	980$	1030	1110	80(7.8)	1280	170(15.3)
2.	Jowar	Hybrid	840	840	880	980	100(11.4)	1500	520(53.1)
		Maldandi	860	860	900	1000	100(11.1)	1520	520(52.0)
3.	Bajra		840	840	880	980	100(11.4)	1175	195(19.9)
4.	Maize		840	840	880	980	100(11 .4)	1175	195(19.9)
5.	Ragi		915	915	965	1050	85(8.8)	1500	450(42.8)
6.	Arhar(tur)		2000	2300	3000¶	3200¶	200(6.7)	3850	650(20.3)
7.	Moong		2520	2760	3170¶	3500¶	330(10.4)	4400	900(25.7)
8.	Urad		2520	2520	2900¶	3300¶	400(13.8)	4300	1000(30.3)
9.	Cotton	Medium Staple	2500[a]	2500[a]	2500[a]	2800[a]	300(12.0)	3600	800(28.6)
		Lonq Staple	3000[aa]	3000[aa]	3000[aa]	3300[aa]	300(10.0)	3900	600(18.2)
10.	Groundnut In Shell		2100	2100	2300	2700	400(17.4)	3700	1000(37.0)
11.	Sunflower Seed		2215	2215	2350	2800	4507(19.1)	3700	900(32.1)
12.	Soyabeen	Black	1350	1350	1400	1650	250(17.8)	2200	550(33.3)
		Yellow	1390	1390	1440	1690	250(17.4)	2240	550(32.5)

MINIMUM SUPPORT PRICES—*Contd.*

(According to Crop Year)

(As on 26-12-2012)

(Rs. per Quintal)

Sl. No	Commodity	Variety	2008-09	2009-10	2010-11	2011-12	(#) increase in MSP 2011-12 over 2010-11	2012-13	(#) increase in MSP 2012-13 over 2011-12
13.	Sesamum		2750	2850	2900	3400	500(17.2)	4200	800(23.5)
14.	Nigerseed		2405	2405	2450	2900	450(18.4)	3500	600(20.7)
	Rabi Crops								
15.	Wheat		1080	1100	1120$	1285	165(14.7)	1350	65(5.05)
16.	Barley		680	750	780	980	200(25.6)	980	0(0.00)
17.	Gram		1730	1760	2100	2800	700(33.3)	3000	200(7.14)
18.	Masur (Lentil)		1870	1870	2250	2800	550(24.4)	2900	100(3.57)
19.	Rapeseed/Mustard		1830	1830	1850	2500	650(35.1)	3000	500(20.00)
20.	Safflower		1650	1680	1800	2500	700(38.9)	2800	300(12.00)
21.	Toria		1735	1735	1780	2425	645(36.2)	2970	545(22.47)
	Other Crops								
22.	Copra	Milling	3660	4450	4450	4525	75(1.7)	5100	575(12.7)
	(Calender Year)	Ball	3910	4700	4700	4775	7571.6)	5350	575(12.0)
	De-husked Coconut		988				0(0.0)		200(16.7)
23.	Calender Year)			1200	1200	1200		'1400	
24.	Jute		1250	1375	1575	1675	100(6.3)	2200	525(31.3)
25.	Sugarcane		81.18	129.84a	139.12a	145.00a	5.88(4.2)	170.00a	25(17.2)

Figures In Brackets Indicate Percentage Increase.

$ An additional incentive bonus of Rs. 50 per quintal was payable over the Minimum Support Price(MSP). .

[a] Staple length (mm) of 24.5-25.5 and Micronaire value of 4.3-5.1

[aa] Staple length (mm) of 29.5-30.5 and Micronaire value of 3.5-4.3

¶ Additional incentive at the rate of Rs. 500 per quintal of tur, urad and moong sold to procurement agencies is payable during the harvest/arrival period of two months.

Fair and remunerative price.

PROCUREMENT OF RICE

(000 Tonnes)

State	2008-09	2009-10	2010-11	2011-12
Andhra Pradesh	9061	7555	9609	7540
Assam	3	8	16	23
Bihar	1083	890	883	1534
Chandigarh	10	14	10	13
Chhatisgarh	2848	3357	3746	4115
Haryana	1425	1819	1687	2007
Jharkhand	135	23	0	275

PROCUREMENT OF RICE—*Contd.*

(000) Tonnes)

State	2008-09	2009-10	2010-11	2011-12
Karnataka	107	86	180	.356
Kerala	237	261	263	372
Madhya Pradesh	245	255	516	635
Maharashtra	261	229	308	178
Orissa	2790	2496	2465	2864
Punjab	8553	9275	8635	7731
Rajasthan	11	0	0	0
Tamil Nadu	1199	1241	1543	1596
Uttarakhand	349	375	422	378
Uttar Pradesh	3687	2901	2554	3355
West Bengal	1667	1240	1310	2041
Others	14	9	51	18
Total:	33685	32034	34198	35031

* - As on 20-02-2013

Source: Department of Food and Public Distribution.

PROCUREMENT OF WHEAT

State/Year	2009-10	2010-11	2011-12
Bihar	497	183	556
Chandigarh	12	9	7
Gujarat	75	1	105
Haryana	6924	6347	6928
Madhya Pradesh	1968	3538	4965
Punjab	10725	10209	10958
Rajasthan	1152	476	1303
Uttar Pradesh	3882	1645	3461
Uttarakhand	145	86	42
Others	2	20	10
TOTAL	25382	22514	28335

* - As on 2-08-2012

Source: Department of Food and Public Distribution.

(ii) Commercial Crops

Oil Seeds and Edible Oils : The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 203.1 in November, 2012 showing an increase of 3.3 per cent and 31.4 per cent over the previous month and over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed an increased trend. The WPI of Groundnut seed (6.3 per cent), Soyabean (6.0 per cent), Copra (2.4 per cent), Rape and Mustard (1.2 per cent), Sunflower (1.2 per cent) and increased over the previous month. However, the WPI of Niger Seed (7.0 per cent), Gingelly seed (1.5 per cent) and Cottonseed (0.2 per cent) decreased over the previous month. The WPI of Safflower seed remained unchanged over the previous month. The Wholesale Price Index (WPI) of Edible Oils as a group stood 148.7 in November, 2012 showing an increase of 0.4 per cent and 9.9 per cent over the previous month and over the previous year. The WPI of Groundnut Oil (2.6 per cent), Mustard Oil (0.6 per cent), Sunflower Oil (1.1 per cent), Gingelly Oil (1.4 per cent), Cottonseed Oil (0.1 per cent) and Copra oil (1.0 per cent) increased over the previous month. However, the WPI of Soyabean Oil (1.0 per cent) decreased over the previous month.

Fruits and Vegetable : The Wholesale Price Index (WPI) of Fruits and Vegetable as a group stood at 195.7 in November, 2012 showing an increase of 1.5 per cent and 3.1 per cent over the previous month and over the previous year.

Potato : The Wholesale Price Index (WPI) of Potato stood at 241.6 in November, 2012 showing an increase of 4.6 per cent and 72.2 per cent over the previous month and over the previous year.

Onion : The Wholesale Price Index (WPI) of Onion stood 260.8 in November, 2012 showing an increase of 24.1 per cent and 17.0 per cent over the previous month and over the previous year.

Condiments and Spices : The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 208.1 in November, 2012 showing a fall of 0.3 per cent and 17.5 per cent over the previous month and over the previous year.

The WPI of Black Pepper remained unchanged over the previous month. However, the WPI of Chillies (Dry) increased by 1.5 per cent over the previous month. The Wholesale Price Index of Turmeric decreased by 1.1 per cent, over the previous month.

Raw Cotton : The Wholesale Price Index (WPI) of Raw Cotton stood at 202.7 in November, 2012 showing an increase of 0.9 per cent over the previous month. However, it decreased by 6.2 per cent over the previous year.

Raw Jute : The Wholesale Price Index (WPI) of Raw Jute stood at 234.8 in November, 2012 showing a fall of 2.9 per cent over the previous month. However, it increased by 17.6 per cent over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year. 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over the	
	Nov., 2012	October, 2012	Nov.., 2011	Month	Year
Oil Seeds	203.1	196.6	154.6	3.3	31.4
Groundnut Seed	256.5	241.3	191.3	6.3	34.1
Rape & Mustard Seed	227.1	224.4	149.8	1.2	51.6
Cotton Seed	174.3	174.6	148.7	–0.2	17.2
Copra (Coconut)	90.5	88.4	110.9	2.4	–18.4
Gingelly Seed (Sesamum)	295.9	300.4	212.2	–1.5	39.4
Niger Seed	178.4	191.8	169.0	–7.0	5.6
Safflower (Kardi Seed)	150.4	150.4	126.6	0.0	18.8
Sunflower	186.6	184.3	156.4	1.2	19.3
Soyabean	200.5	189.1	129.5	6.0	54.8
Edible Oils	148.7	148.1	135.3	0.4	9.9
Groundnut Oil	187.9	183.2	159.3	2.6	18.0
Cotton Seed Oil	186.9	186.7	149.8	0.1	24.8
Mustard & Rapeseed Oil	155.7	154.8	138.3	0.6	12.6
Soyabean Oil	161.7	163.4	145.9	–1.0	10.8
Copra Oil	112.7	111.6	122.5	1.0	–8.0
Sunflower Oil	138.6	137.1	134.5	1.1	3.0
Gingelly Oil	166.2	163.9	146.6	1.4	13.4
Fruits and Vegetables	195.7	192.9	189.8	1.5	3.1
Potato	241.6	231.0	140.3	4.6	72.2
Onion	260.8	210.2	222.9	24.1	17.0
Condiments and Spices	208.1	208.8	252.2	–0.3	–17.5
Black Pepper	530.4	530.3	434.6	0.0	22.0
Chillies (Dry)	229.7	226.4	294.9	1.5	–22.1
Turmeric	167.3	169.1	178.6	–1.1	–6.3
Raw Cotton	202.7	200.9	216.2	0.9	–6.2
Raw Jute	234.8	241.9	199.7	–2.9	17.6

PART II—Statistical Tables

A. Wages

1. Daily Agricultural Wages in Some States (Category-wise)

(in Rupees)

State/Distt.	Village	Month and Year	Normal Daily Working Hours	Field Labour			Other Agri. Labour			Herdsman			Skilled Labour		
				Man	Woman	Non Adult	Man	Woman	Non Adult	Man	Woman	Non Adult	Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Andhra Pradesh															
Krishna	Ghantasala	Dec., 2011	8	250.00	100.00	NA	250.00	130.00	NA	NA	NA	NA	NA	NA	NA
Guntur	Tadikonda	Dec., 2011	8	200.00	175.00	110.00	200.00	160.00	110.00	160.00	NA	NA	NA	NA	NA
Rangareddy	Arutla	Dec., 2011	8	200.00	120.00	NA	150.00	120.00	NA	150.00	120.00	NA	220.00	200.00	NA
Karnataka															
Bangalore	Harisandra	May to June, 2012	8	200.00	150.00	NA	200.00	150.00	NA	250.00	180.00	NA	300.00	300.00	NA
Tumkur	Gedlahali	May to June, 2012	8	160.00	160.00	NA	180.00	160.00	NA	180.00	160.00	NA	180.00	180.00	NA
Maharashtra															
Nagpur	Mauda	Dec., 2009	8	100.00	80.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ahmednagar	Akole	June, 2009	8	80.00	70.00	NA	NA	NA	NA	NA	NA	NA	83.5	85.00	85.00
Jharkhand															
Ranchi	Gaintalsood	April, 2012	8	100.00	100.00	NA	90.00	90.00	NA	58.00	58.00	NA	170.00	150.00	NA

1.1 Daily Agricultural Wages in Some States (Operation-wise)

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Assam													
Barpeta	Loharapara	March, 12	M	8	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
			W	8	NA	NA	160.00	160.00	160.00	NA	NA	NA	NA
Bihar													
Muzaffarpur	Bhalui Rasul	Feb. and,	M	8	104.00	104.00	104.00	104.00	104.00	NA	150.00	150.00	150.00
		March, 2010	W	8	NA	104.00	104.00	104.00	104.00	NA	NA	NA	NA
Shekhpura	Kutaut	May and	M	8	150.00	NA	NA	NA	150.00	NA	220.00	NA	NA
		June, 2010	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh													
Dhamtari	Sihaba	Oct., 2012	M	8				80.00	80.00	100.00	200.00	100.00	100.00
			W	8				80.00	80.00	80.00	200.00	100.00	NA
Gujarat													
Rajkot	Rajkot	March, 2012	M	8	247.00	270.00	164.00	197.00	168.00	140.00	408.00	358.00	240.00
			W	8	NA	182.00	142.00	167.00	167.00	100.00	NA	NA	NA
Dahod	Dahod	March, 2012	M	8	71.00	71.00	71.00	71.00	71.00	NA	143.00	150.00	150.00
			W	8	NA	71.00	71.00	71.00	71.00	NA	NA	NA	NA
Haryana													
Panipat	Ugarakheri	May and	M	8	180.00	180.00	180.00	200.00	180.00	NA	NA	NA	NA
		June, 2012	W	8	NA	150.00	150.00	180.00	150.00	NA	NA	NA	NA

1.1 Daily Agricultural Wages in Some States (Operation-wise)—*Contd.*

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Himachal Pradesh													
Mandi	Mandi	Nov., to Dec. 2010	M	8	300.00	110.00	110.00	110.00	110.00	110.00	200.00	200.00	NA
			W	8	NA	110.00	110.00	110.00	110.00	110.00	NA	NA	NA
Kerala													
Kozhikode	Koduvally	Feb., and March, 2012	M	4 to 8	720.00	450.00	NA	450.00	572.05	NA	500.00	NA	NA
			W	4 to 8	NA	NA	350.00	350.00	350.00	NA	NA	NA	NA
Palakkad	Elappally	Feb., and March, 2012	M	4 to 8	400.00	300.00	NA	275.00	368.75	NA	400.00	NA	NA
			W	4 to 8	NA	NA	150.00	200.00	160.00	NA	NA	NA	NA
Madhya Pradesh													
Hoshangabad	Sangarkhera	Aug., 2012	M	8	150.00	130.00	150.00	150.00	125.00	100.00	350.00	350.00	NA
			W	8	NA	130.00	150.00	150.00	125.00	100.00	NA	NA	NA
Satna	Kotar	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shyopur Kala	Vijaypur	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Orissa													
Bhadrak	Chandbali	May, 2012	M	8	220.00	150.00	NA	NA	166.66	150.00	250.00	140.00	140.00
			W	8	NA	NA	NA	NA	106.66	100.00	NA	NA	NA
Ganjam	Aska	May, 2012	M	8	250.00	150.00	150.00	150.00	168.33	150.00	300.00	150.00	150.00
			W	8	NA	100.00	100.00	100.00	100.00	100.00	NA	NA	NA
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	NA	NA	90.00	95.00	NA	99.44	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan													
Barmer	Vishala	July, 2012	M	8					—NA—				
			W	8					—NA—				
Jalore	Panwa	July, 2012	M	8	NA	NA	NA	NA	NA	50.00	100.00	50.00	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu													
Thanjavur	Pulvarnatham	Sep., 2012	M	6					—NA—				
			W	5									
Tirunelveli	Malayakulam (Kurvikulam)	Sep., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	100.00	NA	NA	NA	NA	NA	NA
Tripura													
Agartala	Govt. Agri. Farm		M						—NA—				
			W										
*Uttar Pradesh**													
Meerut	Ganeshpur	July, 2012	M	8	208.00	205.00	205.00	207.00	204.00	NA	306.00	NA	NA
			W	8	NA	175.00	175.00	177.00	176.00	NA	NA	NA	NA
Aurraiya#	Aurraiya	July, 2012	M	8	120.00	120.00	120.00	132.9	120.00	NA	257.1	NA	NA
			W	8	NA	NA	120.00	132.9	120.00	NA	NA	NA	NA
Chandauli	Chandauli	July, 2012	M	8	NA	NA	NA	125.00	125.00	NA	236.00	NA	NA
			W	8	NA	NA	NA	125.00	125.00	NA	NA	NA	NA

M-Man, W-Woman,

N. A. —Not Available N. R. —Not Reported

*- Uttar Pradesh reports its district-wise average rural wage data rather than from selected centre/village.

New district is opted to replace Chandbali.

B. PRICES

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA DURING 2010-11 AND 2011-12

(in Rupees)

Commodity	Variety	Unit	State	Centre	2010-11	2011-12	Crop year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1180	1185	May-April
Wheat	Dara	Quintal	Uttar Pradesh	Hapur	1215	1126	May-April
Wheat	—	Quintal	Madhya Pradesh	Sagar	1450	1475	May-April
Jowar	—	Quintal	Maharashtra	Mumbai	1806	2474	May-April
Gram	—	Quintal	Madhya Pradesh	Sehore	2143	3100	May-April
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	939	1098	May-April
Gram Split	—	Quintal	Bihar	Patna	3194	4278	May-April
Gram Split	—	Quintal	Maharashtra	Mumbai	3202	4107	May-April
Arhar Split	—	Quintal	Bihar	Patna	6105	5948	May-April
Arhar Split	—	Quintal	Maharashtra	Mumbai	6291	5608	May-April
Arhar Split	—	Quintal	NCT of Delhi	Delhi	5763	5695	May-April
Arhar Split	Sort 11	Quintal	Tamil Nadu	Chennai	5342	5333	May-April
Gur	—	Quintal	Maharashtra	Mumbai	2971	3162	Nov.-Oct.
Gur	Sort 11	Quintal	Tamil Nadu	Chennai	2825	2992	Nov.-Oct.
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2217	2655	Nov.-Oct.
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	2316	2740	April-March
Mustard Seed	Red	Quintal	West Bengal	Purulia	3133	2967	April-March
Mustard Seed	Yellow	Quintal	West Bengal	Purulia	3467	3467	April-March
Linseed	—	Quintal	Uttar Pradesh	Kanpur	2717	3103	April-March
Linseed	Bada Dana	Quintal	Uttar Pradesh	Varansi	2776	3051	April-March
Cotton Seed	Superior	Quintal	Uttar Pradesh	Hapur	1933	2143	April-March
Cotton Seed	—	Quintal	Maharashtra	Mumbai	—	—	Nov.-Oct.
Castor Seed	—	Quintal	Andhra Pradesh	Hyderabad	4307	3448	Nov.-Oct.
Sesamum Seed	Black	Quintal	Tamil Nadu	Chennai	4568	4500	Nov.-Oct.
Copra	FAQ	Quintal	Kerala	Alleppey	6090	4329	Jan.-Dec.
Groundnut	—	Quintal	Maharashtra	Mumbai	5830	6413	Nov.-Oct.
Groundnut	TMV7	Quintal	Tamil Nadu	Chennai	4142	4280	Nov.-Oct.
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	839	1034	April-March
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	986	1213	April-March
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1270	1675	Nov.-Oct.
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1287	1667	Nov.-Oct.
Linseed Oil	Bada Dana	15 Kg.	Uttar Pradesh	Kanpur	2717	3103	April-March
Linseed Oil	—	16 Kg.	Uttar Pradesh	Varansi	2776	3051	April-March
Castor Oil	—	15 Kg.	Andhra Pradesh	Hyderabad	1512	1183	Nov.-Oct.
Sesamum Oil	—	15 Kg.	Maharashtra	Mumbai	1163	-	Nov.-Oct.
Sesamum Oil	Agmark	15 Kg.	Tamil Nadu	Chennai	1844	2110	Nov.-Oct.
Coconut Oil	—	15 Kg.	Kerala	Cochin	1370	946	Jan.-Dec.
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1128	1110	April-March
Groundnut Cake	—	Quintal	Uttar Pradesh	Kanpur	—	—	Nov.-Oct.
Cotton/Kapas	F414	Quintal	Punjab	Abohar	—	—	Sep.-Aug.
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virdhunagar	4620	3465	Sep.-Aug.
Jute Raw	ID5	Quintal	West Bengal	Kolkata	2994	2328	July-June

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA DURING 2010-11 AND 2011-12 —*Contd.*

(in Rupees)

Commodity	Variety	Unit	State	Centre	2010-11	2011-12	Crop year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jute Raw	W5	Quintal	West Bengal	Kolkata	3073	2316	July-June
Oranges	—	100 No.	Maharashtra	Mumbai	-	-	Jan.-Dec.
Oranges	Big	100 No.	Tamil Nadu	Chennai	573	544	Jan.-Dec.
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	360	430	Jan.-Dec.
Banana	Basarai	100 No.	NCT of Delhi	Delhi	166	189	Jan.-Dec.,
Banana	Singapore	100 No.	Tamil Nadu	Kodaikkanai	292	319	Jan.-Dec.
Cashewnuts	—	Quintal	Maharashtra	Mumbai	52799	46773	Jan.-Dec.
Almonds	—	Quintal	Maharashtra	Mumbai	38260	43092	Jan.-Dec.
Walnuts	—	Quintal	Maharashtra	Mumbai	64042	53288	Jan.-Dec.
Kishmish	—	Quintal	Maharashtra	Mumbai	14375	11803	Jan.-Dec.
Peas Green	—	Quintal	Maharashtra	Mumbai	2857	3011	Jan.-Dec.
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	985	1151	Jan.-Dec.
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	1840	2508	Jan.-Dec.
Cauliflower	—	100 No.	Tamil Nadu	Chennai	992	1267	Jan.-Dec.
Potatoes	Red	Quintal	Bihar	Patna	740,	928	Jan.-Dec.
Potatoes	Desi	Quintal	West Bengal	Kolkata	542	1005	Jan.-Dec.
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	1407	2097	Jan.-Dec.
Onions	Pole	Quintal	Maharashtra	Nasik	751	490	Jan.-Dec.
Turmeric	Erode	Quintal	Tamil Nadu	Chennai	11142	5960	Jan.-Dec.
Turmeric	Nadan	Quintal	Kerala	Cochin	11808	7496	Jan.-Dec.
Chillies	—	Quintal	Bihar	Patna	8367	7752	Jan.-Dec.
Black Pepper	Palai	Quintal	Kerala	Alleppey	26800	-	Jan.-Dec.
Ginger	Dry	Quintal	Kerala	Cochin	13467	10163	Jan.-Dec.
Cardamom	Major	Quintal	NCT of Delhi	Delhi	94318	73208	Jan.-Dec.
Cardamom	Big	Quintal	West Bengal	Kalimpong	69250	54438	Jan.-Dec.
Milk	Cow	100	NCT of Delhi	Delhi	3380	3491	Jan.-Dec.
Milk	Buffalo	100	West Bengal	Kolkata	2920	3217	Jan.-Dec.
Ghee Deshi	Desi No 1	Quintal	NCT of Delhi	Delhi	26474	27506	Jan.-Dec.
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	24667	25967	Jan.-Dec.
Ghee Deshi	—	Quintal	Uttar Pradesh	Kanpur	—	—	Jan.-Dec.
Fish	Rohu	Quintal	NCT of Delhi	Delhi	6233	7625	Jan.-Dec.
Fish	Sea Prawns	Quintal	Tamil Nadu	Chennai	20122	17900	Jan.-Dec.
Eggs	Madras	1000 No.	West Bengal	Kolkata	2775	3483	Jan.-Dec.
Tea	Medium	Quintal	Bihar	Patna	19175	19652	Jan.-Dec.
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	13500	11857	Jan.-Dec.
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26333	27333	Jan.-Dec.
Coffee	Rubusta	Qumtal	Taniil Nadu	Coimbatore	11933	13467	Jan.-Dec.
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2365	2397	Jan.-Dec.
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2278	2290	Jan.-Dec.
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3210	3950	Jan.-Dec.
Rubber	—	Quintal	Kerala	Kottayam	20595	17479	Jan.-Dec.
Arecanut	Rashi	Quintal	Tamil Nadu	Chennai	26083	30000	Jan.-Dec.

3. Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2012

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.
Barley		Canada	Winni-peg	Can Dollar/M.T..	213.00 1072.88	214.00 1048.81	216.00 1100.30	220.00 1175.68	220.00 1183.38	220.00 1203.40	220.00 1211.54	— —	— —	— —	— —
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T. Rs./Qtl.	15000.00 77295.00	11000.00 53889.00	12500.00 63600.00	12500.00 65562.50	12500.00 69212.50	12500.00 69550.00	12500.00 69062.50	12500.00 69400.00	12500.00 66075.00	12500 67212.50	16500.00 89545.50
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/1bs Rs./Qtl.	4.12 46791. 71	4.03 43513.51	4.00 44855.81	4.06 46933.52	4.03 49180.30	3.80 46599.61	3.65 44446.42	3.55 43439.96	3.53 41125.71	3.44 40767.12	3.54 42342.32
Castor Oil	Any Origin ex tank Rotterdam	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1880.00 9687.64	1875.00 9185.63	1700.00 8649.60	1600.00 8392.00	1500.00 8305.50	1500.00 8346.00	1680.00 9282.00	1760.00 9771.52	1680.00 8880.48	1650.00 8872.05	1540.00 8357.58
Celery Seed	ASTA cif	India	—	Dollar/M.T. Rs./Qtl.	1500.00 7729.50	1500.00 7348.50	1500.00 7632.00	1500.00 7867.50	1500.00 8305.50	1500.00 8346.00	1500.00 8287.50	1500.00 8328.00	1500.00 7929.00	1500.00 8065.50	1500.00 8140.50
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T. Rs./Qtl.	5500.00 28341.50	6500.00 31843.50	5900.00 30019.20	5900.00 30945.50	5650.00 31284.05	5650.00 31436.60	5650.00 31216.25	5650.00 31368.80	5650.00 29865.90	5650.00 30380.05	5000.00 27135.00
Cinnamon Bark		Mada-gascar	—	Dollar/M.T. Rs./Qtl.	1100.00 5668.30	1100.00 5388.90	1100.00 5596.80	1100.00 5769.50	1100.00 6090.70	1100.00 6120.40	1100.00 6077.50	1100.00 6107.20	1100.00 5814.60	1100.00 5914.70	1100.00 5969.70
Cloves	Singapore	Mada-gascar	—	Dollar/M.T. Rs./Qtl.	10875.00 56038.88	12000.00 58788.00	12000.00 61056.00	12000.00 62940.00	12000.00 66444.00	10300.00 57309.20	10500.00 58012.50	9500.00 52744.00	9500.00 50217.00	9500.00 51081.50	9500.00 51556.50
Coconut Oil	Crude Phillipine/ Indonesia	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1430.00 7368.79	1430.00 7005.57	1315.00 6690.72	1325.00 6949.63	1030.00 5703.11	1095.00 6092.58	1000.00 5525.00	995.00 5524.24	920.00 4863.12	900.00 4839.30	830.00 4504.41
Copra	Phillipines cif Rotterdam	Philli pine	—	Dollar/M.T. Rs./Qtl.	901.50 4645.43	905.00 4433.60	835.00 4248.48	825.50 4329.75	648.00 3587.98	692.00 3850.29	616.00 3403.40	648.00 3597.70	600.00 3171.60	552.50 2970.79	501.50 2721.64
Corriander		India	—	Dollar/M.T. Rs./Qtl.	1150.00 5925.95	1150.00 5633.85	1150.00 5851.20	1150.00 6031.75	1150.00 6367.55	1150.00 6398.60	1150.00 6353.75	1150.00 6384.80	1150.00 6078.90	1150.00 6183.55	1150.00 6241.05
Cummin Seed		India	—	Dollar.M.T. Rs./Qtl.	3800.00 19581.40	3800.00 18616.20	3800.00 19334.40	3800.00 19931.00	3800.00 21040.60	2800.00 15579.20	2800.00 15470.00	2800.00 15545.60	2800.00 14800.80	2800.00 15055.60	2889.00 15678.60
Fennel seed		India	—	Dollar/M.T. Rs./Qtl.	2600.00 13397.80	2600.00 12737.40	2600.00 13228.80	2600.00 13637.00	2600.00 14396.20	2600.00 14466.40	2600.00 14365.00	2600.00 14435.20	2600.00 13743.60	2600.00 13980.20	2600.00 14110.20

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2012—*Contd.*

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.
Ginger	Split	Nigeria	—	Dollar/M.T.	3800.00	3400.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
				Rs./Qtl.	19581.40	16656.60	12974.40	13374.75	14119.35	14188.20	14088.75	14157.60	13479.30	13711.35	13838.85
Groundnut	US 2005, 40/50	European		—	Dollar/M.T	—	—	—	2400.00	1725.00	1650.00	1595.00	1155.00	1400.00	1400.00
1350.00															
kernels	cif Rotterdam	Ports		Rs./Qtl.	—	—	—	12588.00	9551.33	9180.60	8812.38	6412.56	7400.40	7527.80	7326.45
Groundnut	Crude Any Ori	U.K.	—	Dollar/M.T	—	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	—	2200.00	2200.00	2200.00
Oil	gin cif Rotterdam			Rs./Qtl.	—	10777.80	11193.60	11539.00	12181.40	12240.80	12155.00	—	11629.20	11829.40	11939.40
Lentils	Turkish Red Split	U.K.	—	Pound/M.T	587.57	567.02	562.08	553.32	574.59	572.94	571.55	519.93	510.50	—	—
	Crop 1+1 water			Rs./Qtl.	4637.69	4409.15	4578.70	4720.93	4983.42	5007.50	4971.91	4580.58	4360.69	—	—
Maize		U.S.A	Chic-	C/56 lbs.	658.00	630.00	630.50	607.00	601.25	645.50	790.00	789.75	724.75	754.50	760.25
			ago	Rs./Qtl	1332.53	1212.94	1260.74	1251.20	1308.34	1411.48	1715.35	1723.18	1505.59	1594.38	1621.47
Oats		Canada	Winni-	Dollar/M.T.	209.31	211.40	211.23	207.59	217.72	215.14	212.19	370.30	371.28	—	—
			peg	Rs./Qtl.	1054.29	1036.07	1076.01	1109.36	1171.12	1176.82	1168.53	2084.79	1995.63	—	—
Palm Kernal	Crude	Nether-	—	Dollar/M.T.	1355.00	1410.00	1370.00	1375.00	1180.00	1070.00	1000.00	1040.00	925.00	870.00	780.00
Oil	Malaysia/	lands	—	Rs./Qtl.	6982.32	6907.59	6970.56	7211.88	6533.66	5953.48	5525.00	5774.08	4889.55	4677.99	4233.06
	Indonesia														
Palm Oil	Crude	Nether-	—	Dollar/M.T.	1063.00	1125.00	1163.00	1178.00	1015.00	1013.00	990.00	998.00	885.00	860.00	790.00
	Malaysian/	lands	—	Rs./Qtl.	5477.64	5511.38	5917.34	6178.61	5620.06	5636.33	5469.75	5540.90	4678.11	4624.22	4287.33
	Sumatra														
Rapeseed	Canola	Canada	Winni-	Can	524.80	559.50	606.90	620.50	610.80	632.10	605.00	621.40	595.10	622.60	592.90
			peg	Dollar/M.T.	2643.42	2742.11	3091.55	3315.95	3285.49	3457.59	3331.74	3498.48	3198.66	3351.46	3239.01
	U.K. Rapeseed	U.K.	—	Pound/M.T.	365.00	372.00	394.00	397.00	364.00	378.00	390.00	393.00	380.00	382.00	368.00
	Buyer Price			Rs./Qtl.	2880.95	2892.67	3209.52	3387.20	3156.97	3303.72	3392.61	3462.33	3245.96	3305.83	3200.13
	DAP Erith														
Rapeseed	UK produced HP	U.K.	—	Pound/M.T.	171.00	176.00	166.00	178.00	197.00	199.00	221.00	—	—	—	—
Meal	37% DO, Resell			Rs/Qtl.	1349.70	1368.58	1352.24	1518.70	1708.58	1739.26	1922.48	—	—	—	—
	Erith														
Rapeseed	Refined bleached	U.K.	—	Pound/M.T.	911.00	914.00	909.00	913.00	851.00	870.00	870.00	873.00	864.00	857.00	840.00
Oil	and deodorised			Rs/Qtl.	7190.52	7107.26	7404.71	7789.72	7380.72	7603.80	7568.13	7691.13	7380.29	7416.48	7304.64
Soyabean	U.K. produced	U.K.	—	Pound/M.T.	264.00	269.00	302.00	292.00	354.00	365.00	459.00	498.00	477.00	484.00	480.00
Meal	49% oil & protein			Rs./Qtl.	2083.75	2091.74	2460.09	2491.34	3070.24	3190.10	3992.84	4387.38	4074.53	4186.54	4174.08
Soyabean		U.S.A.	—	C/lbs Rs./Qtl.	52.15	54.00	55.02	55.72	50.40	50.87	51.73	55.77	51.65	51.84	50.11
Oil					5922.79	5830.59	6169.92	6441.22	6150.59	6238.22	6299.21	6824.36	6017.40	6143.51	5993.71

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2012—*Contd.*

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.
	Refined bleached and deodorised	U.K.	—	Pound/M.T.	843.00	874.00	875.00	871.00	823.00	834.00	864.00	865.00	844.00	818.00	797.00
				Rs/Qtl.	6653.80	6796.22	7127.75	7431.37	7137.88	72.89.16	7515.94	7620.65	7209.45	7078.97	6930.71
Soyabeans		U.S.A.	—	C/60 lbs	1208.50	1267.75	1370.75	1465.00	1382.50	1471.50	1645.50	1736.00	1573.00	1570.50	1446.25
				Rs./Qtl	2285.46	2279.33	2559.60	2820.00	2809.35	3004.79	3336.54	3537.25	3051.56	3099.16	2880.51
	US No. 2 yellow	Nether-lands	Chi-cago	Dollar/M.T.	503.90	527.50	558.20	591.70	556.40	606.30	676.10	707.50	641.60	636.60	583.50
				Rs./Qtl	2596.60	2584.22	2840.12	3103.47	3080.79	3373.45	3735.45	3928.04	3391.50	3423.00	3166.65
Sunflower Seed	US hulled ex-store	U.K.	—	Pound/M.T.	979.28	945.03	936.80	922.20	957.64	—	—	—	—	—	—
				Rs./Qtl	7729.46	7348.55	7631.17	7868.21	8305.61	—	—	—	—	—	—
Sunflower Seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	964.00	985.00	981.00	1004.00	1038.00	1026.00	981.00	988.00	976.00	958.00	959.00
				Rs./Qtl	7608.85	7659.36	7991.23	8566.13	9002.57	8967.24	8533.72	8704.28	8336.99	8290.53	8339.46
Tallow	High grade delivered	U.K.	Lon-don	Pound/M.T.	550.00	550.00	550.00	550.00	570.00	570.00	570.00	570.00	600.00	570.00	550.00
				Rs./Qtl	4341.15	4276.80	4480.30	4692.60	4943.61	4981.80	4958.43	5021.70	5125.20	4932.78	4782.80
Turmeric	Madras finger spot/cif	India	—	Dollar/M.T.	4100.00	4100.00	4100.00	4100.00	4100.00	850.00	850.00	850.00	850.00	850.00	850.00
				Rs./Qtl	21127.30	20085.90	20860.80	21504.50	22701.70	4729.40	4696.25	4719.20	4493.10	4570.45	4612.95
Walnuts	Indian light halves	U.K.	—	Pound/M.T.	6750.00	6300.00	6350.00	6350.00	6350.00	6775.00	5900.00	5900.00	5900.00	6400.00	7250.00
				Rs./Qtl	53277.75	48988.80	51727.10	54178.20	55073.55	59213.50	51324.10	51979.00	50397.80	55385.60	63046.00
Wheat		U.S.A.	Chic-ago	C/60 lbs	646.50	633.00	639.50	624.50	683.00	727.50	880.25	854.75	869.25	884.00	876.00
				Rs../Qtl	1222.63	1138.09	1194.14	1202.11	1387.91	1485.55	1784.86	1741.62	1686.31	1744.45	1744.74

Source : Public Ledger.

Exchange Rate

	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug.	Sep.	Oct.	Nov.
US Dollar	51.53	48.99	50.88	52.45	55.37	55.64	55.25	55.52	52.86	53.77	54.27
CAN Dollar	50.37	49.01	50.94	53.44	53.79	54.70	55.07	56.30	53.75	53.83	54.63
UK Pound	78.93	77.76	81.46	85.32	86.73	87.40	86.99	84.10	85.42	86.54	86.96

4. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING JANUARY, 2012

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Summer Rice, Ragi (R), Small Millets (R), Other Rabi Pulses, Sugarcane, Onion.	Winter Rice, Jowar (K), Maize (R), Ragi (K), Tur (K), Urad (K), Mung (K), Winter Potato (Plains), Sugarcane, Groundnut, Castorseed, Cotton, Mesta, Sweet Potato, Garlic.
Assam Bihar	—	Winter Rice, Winter Potato, Sugarcane, Sesamum, Cotton.
Bihar	Summer Rice, Winter Potato (Plains), Sugarcane.	Winter Potato (Plains), Sugarcane, Groundnut, Rapeseed & Mustard, Linseed.
Gujarat	Sugarcane.	Small Millets (R), Tur (K), Sugarcane, Ginger, Chillies, Tobacco, Castorseed, Cotton, Turmeric.
Himachal Pradesh	Winter Potato (Hills), Onion.	—
Jammu & Kashmir	Onion.	Winter Potato, Chillies (Dry).
Karnataka	Summer Rice, Ragi (R), Urad, Mung (R), Potato (Plains). Sugarcane.	Winter Rice, Jowar (R), Bajra (K), Ragi(K), Wheat, Barley, Small Millets (K), Gram, Tur (K), Mung (K), Other Kharif Pulses, Potato (Plains), Sugurcane, Black Pepper, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Mesta, Sweet Potato, Turmeric, Kardiseed, Tapioca.
Kerala	Summer Rice, Sugarcane, Sesamum (3rd Crop).	Winter Rice, Ragi, Tur (K), Other Kharif Pulses, (Kulthi), Urad (R), Other Rabi Pulses, Sugarcane, Ginger, Black Pepper, Sesamum (2nd Crops), Sweet Potato, Turmeric, Tapioca.
Madhya Pradesh	Sugarcane, Onion.	Jowar (K), Small Millets (R), Tur (K), Urad (R), Mung (R), Other Rabi, Pulses, Sugarcane, Ginger, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp.
Maharashtra	Sugarcane.	Winter Rice, Jowar, Gram, Urad (R), Mung (R), Sugarcane, Chillies (Dry), Tobacco, Cotton, Turmeric, Sannhemp.
Orissa	Summer Rice, Chillies (Dry).	Winter Rice, Winter Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Nigerseed.
Punjab and Haryana	Potato, Tabacco, Onion.	Potato, Sugarcane, Sweet Potato.
Rajasthan	Sugarcane, Tobacco.	Tur (K), Winter Potato (Plains), Sugarcane, Chillies (Dry).
Tamil Nadu	Winter Rice, Jowar(R), Sugarcane, Tur(R), Tobacco, Groundnut, Sesamum, Onion, Bajra (R).	Rice, Jowar (K), Bajra (K), Ragi, Small Millets (K), Gram, Tur (K), Urad (K), Mung (K), Other Kharif Pulses Winter Potato (Hills), Sugarcane, Black Pepper, Groundnut, Castorseed, Sesamum, Cotton, Turmeric, Onion.
Tripura	Summer Rice.	Winter Rice, Gram, Winter Potato (Plains), Sugarcane, Rapeseed & Mustard, Sweet Pototo.
Uttar Pradesh	Summer Rice, Sugarcane, Jute, Onion, Tobacco (Late).	Tur (K), Winter Potato (Plains), Sugarcane, Tobacco (Early), Castorseed, Rapeseed & Mustard, Cotton, Sweet, Potato, Turmeric, Tapioca.
West Bengal	Summer Rice, Sugarcane.	Tur (K), Urad (R), Mung (R), Other Rabi Pulses, Winter Potato (Plains), Sugarcane, Ginger, Chillies (Dry), Sesamum, Rapeseed & Mustard.
Delhi	Winter Potato (Plains). Onion	Summer Potato (Plains), Sugarcane, Chillies (Dry), Onion.
Andaman & Nicobar Islands	—	Winter Rice.

(K)—Kharif (R)—Rabi

METRIC WEIGHTS AND MEASURES

SIMPLE CONVERSION TABLES

I. WEIGHTS

Tons to metric Tonnes

Tons	1	2	3	4	5	6	7	8	9	10
Metric tonnes	1.02	2.03	3.05	4.07	5.08	6.10	7.11	8.13	9.14	10.16

Pounds (av.) to Kilograms

Pounds	1	2	3	4	5	6	7	8	9	10
Kilograms	0.45	0.91	1.36	1.81	2.27	2.72	3.18	3.63	4.08	4.54

Tolas to grams

Tolas	1	2	3	4	5	6	7	8	9	10
Grams	11.66	23.33	34.99	46.66	58.32	69.98	81.65	93.31	104.97	116.64

Seers to Kilograms

Seers	1	2	3	4	5	6	7	8	9	10
Kilograms	0.93	1.87	2.80	3.73	4.67	5.60	6.53	7.46	8.40	9.33

Maunds to Quintals

Maunds	1	2	3	4	5	6	7	8	9	10
Quintals	0.37	0.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73

II. LENGTHS

Miles to Kilometres

Miles	1	2	3	4	5	6	7	8	9	10
Kilometres	1.61	3.22	4.83	6.44	8.05	9.66	11.27	12.87	14.47	16.09

Yards to Metres

Yards	1	2	3	4	5	6	7	8	9	10
Metres	0.91	1.83	2.74	3.66	4.57	5.49	6.40	7.32	8.23	9.14

Inches to Millimetres

Inches	1	2	3	4	5	6	7	8	9	10	11	12
Millimetres	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40	304.80

III. AREA

Acres to Hectares

Acres	1	2	3	4	5	6	7	8	9	10
Hectares	0.40	0.81	1.21	1.61	2.02	2.43	2.83	3.24	3.64	4.04

Square Yards to Square Metres

Square Yards	1	2	3	4	5	6	7	8	9	10
Square Metres	0.84	1.67	2.51	3.34	4.18	5.02	5.85	6.69	7.53	8.36

IV. CAPACITY

Gallons (Imperial) to Litres

Gallons	1	2	3	4	5	6	7	8	9	10
Litres	4.55	9.09	13.64	15.14	22.73	27.28	31.82	36.37	40.91	45.44

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