AGRICULTURAL SITUATION IN INDIA

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Agricultural Situation in India

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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 & Cooperation'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-110001, 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.

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LIST OF PUBLICATIONS

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District-wise Area and Production of Principal Crops in India

Year Book of Agro-Economic Research Studies

Land Use Statistics at a Glance

Farm Harvest Prices in Principal Crops in India

Agricultural Statistics at a Glance

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A. General Survey

Important Policy Decision taken during the month :

The Government of India has fixed the Minimum Support Prices for the Kharif Crops 2012-13 season of Fair Average Quality as under :

(Rs. Per quintal)

Commodity	Variety	MSP for 2012-13 Season
Paddy	Common	1250
	Grade A	1280
Jowar	Hybrid	1500
	Maldandi	1520
Bajra	—	1175
Maize	—	1175
Ragi	—	1500
Tur (Arhar)	—	3200*
Moong	—	3500*
Urad	—	4300
Groundnut-in-shell	—	3700
Soyabean	Black	2200
	Yellow	2240
Sunflower Seed	—	3700
Sesamum	—	4200
Nigerseed	—	3500
Cotton	Staple length(mm) of 24.5- 25.5 and micronaire value of 4.3- 5.1.	3600
	Staple length(mm) of 29.5- 30.5 and micronaire value of 3 .5-4.3.	3900

*Till a final decision on revision ofMSP for 2012-13 is taken by the Govt.

Trends in Foodgrain Prices :

During the month of May, 2012 the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains increased by 10.03 per cent from 187.5 in April, 2012 to 206.3 in May, 2012.

Similarly, the Wholesale Price Index Number of Cereals showed an increase of 1.10 per cent from 182.5 to 184.5 and Pulses showed an increase of 3.46 per cent from 211.0 to 218.3.

The Wholesale Price Index Number of Wheat and Rice increased by 2.35 per cent and 0.85 per cent respectively during the same period.

Weather, Rainfall and Reservoir situation during June, 2012

- Cumulative Monsoon Rainfall for the country as a whole during the period 1st June to 27th June, 2012 is 23 per cent less than LPA.Rainfall in the four broad geographical divisions of the country during the above period was (-) 63 per cent in North West India, (-) 34 per cent in Central India, (-) 28 per cent in South Peninsula and (+) 4 per cent in East & North East India.
- Out of a total of 36 meteorological subdivisions, 12 subdivisions constituting 26 per cent of the total area of the country received excess/normal rainfall and the remaining 24 subdivisions constituting 74 per cent 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 28th June, 2012 was 25.36 BCM as against

41.01 BCM on 28.06.2011(1ast year) and 24.59 BCM of normal storage (average storage of the last 10 years). Current year's storage is 62 per cent of the last year's and 103 per cent of the normal storage. Major States reporting lower than normal storage are Himachal Pradesh, Jharkhand, West Bengal, Karnataka, Kerala, Maharashtra, Odisha, Tripura and Punjab.

- As per the preliminary reports, sowing of Kharif crops such as Rice, Coarse Cereals, Oilseeds and Cotton has commenced. Reported area Coverage under these crops is less than last year's as well as normal area coverage till this week. As compared to last year's position as on date, area coverage is lagging behind by 10.8 lakh hectares under Rice, 11.6 lakh hectares under Coarse Cereals, 2.1 lakh hectares under Pulses and 2.2 lakh hectares under Oilseeds. Area coverage under Sugarcane and Cotton are higher by 2.3 lakh hectares and 2.1 lakh hectares respectively.
- Inputs such as seeds, fertilizers etc. are available in adequate quantity. Contingency plans for sowing of alternate crops in rainfall deficit areas have been prepared and shared with the States.

All India production of foodgrains : As per the 4th advance estimates released by Ministry of Agriculture on 17-7-2012, production of foodgrains during 2011-12 is estimated at 257.44 million tonnes compared to 244.78 million tonnes in 2010-11.

Procurement : Procurement of rice as on 1st May, 2012 (Kharif Marketing Season 2011-12) at 30.98 million tonnes represents an increase of 15.86 per cent compared to the corresponding date last year. Wheat procurement during Rabi Marketing Season 2012-13 is 20.7 million tonnes as compared to 18.23 million tonnes during the corresponding period last year.

TABLE 1— PROCUREMENT IN MILLION TONNES

	2009-10	2010-11	2011-12	2012-13
Rice (Oct.-Sept.)	32.03	34.20	33.46*	0
Wheat (Apr.-Mar.)	25.38	22.51	28.34	36.34*
Total	**57.41**	**56.71**	**61.80**	**36.34**

* Position as on 13-6-2012.

Off-take: Off-take of rice during the month of April, 2012 was 22.73 lakh tonnes. This comprises 20.80 lakh tonnes under TPDS and 1.93 lakh tonnes under other schemes. In respect of wheat, the total off take was 16.67 lakh tonnes comprising of 16 lakh tonnes under TPDS and 0.67 lakh tonnes under other schemes.

Stocks : Stocks of food-grains (rice and wheat) held by FCI as on May 1, 2012 were 71.11 million tonnes, which is higher by 20.2 per cent over the level of 59.14 million tonnes as on May 1, 2011.

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

	Off-take			Stocks	
	2010-11	2011-12	2012-13 provisional	1-may, 2011	1-May.-12
Rice	29.93	32.13	2.27	27.76	32.92
Wheat	23..07	24.26	1.67	31.38	38.19
Total	**53.00**	**56.39**	**3.94**	**59.14**	**71.11**

Growth of Economy

As per the latest Revised Estimates (RE) of Central Statistics Office (CSO), the growth in real Gross Domestic Product (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.The growth in GDP is placed at 5.3 per cent in the fourth quarter of 2011-12; agriculture grew by 1.7 per cent; industry by 1.9 per cent and services by 7.9 per cent.

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)

Items	2010-11				2011-12			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Agriculture, forestry & fishing	**3.1**	**4.9**	**11.0**	**7.5**	**3.7**	**3.1**	**2.8**	**1.7**
Industry	8.3	5.7	7.6	7.0	5.6	3.7	2.5	1.9
2. Mining and quarrying	6.9	7.3	6.1	0.6	-0.2	-5.4	-2.8	4.3
3. Manufacturing	9.1	6.1	7.8	7.3	7.3	2.9	0.6	-0.3
4. Electricity, gas & water supply	2.9	0.3	3.8	5.1	8.0	9.8	9.0	4.9
5. Construction	8.4	6.0	8.7	8.9	3.5	6.3	6.6	4.8
Services	**10.0**	**9.1**	**7.7**	**10.6**	**10.2**	**8.8**	**8.9**	**7.9**
6. Trade, hotels, transport and communication	12.6	10.6	9.7	11.6	13.8	9.5	10.0	7.0
7. Financing, insurance, real estate and bus.	10.0	10.4	11.2	10.0	9.4	9.9	9.1	10.0
8. Community, social and personal services	4.4	4.5	-0.8	9.5	3.2	6.1	6.4	7.1
9. GDP at factor cost (total I to 8)	**8.5**	**7.6**	**8.2**	**9.2**	**8.0**	**6.7**	**6.1**	**5.3**

B. Articles

A Comparative Analysis of India's Paddy Productivity

DR. M. SYED MEERA LEBBAI*

Introduction

For the last serveral millennia, India has been known as the "Land of Agriculture". Agriculture forms the backbone of the Indian economy. Despite the concerted industrialization in the last five decades, agriculture occupies a place of pride. It is the duty of Government to make adequate foodgrains available to all the people. So, right from the beginning the Government realized the need to attain self-sufficiency in foodgrains as one of the goals of planning.

With the introduction of economic planning in 1950-51 and with the emphasis on agricultural development, there has been a steady increase in the area under cultivation and productivity per hectare. This enabled India to stock more than 60 million tonnes of foodgrains at the end of 2002, which was one fifth of the world's food stocks. Statistics have shown that a 3 per cent growth in agriculture will lead to 2.6 percent growth in manufacturing, which will lead to 8 per cent growth in Gross Domestic Products. In India, wheat and rice are the staple foods of the people and like wheat, rice is being widely cultivated.

Paddy Production in India

Among the rice producing countries in the world, India occupies an important place in terms of total area under cultivation and total production but, as far as productivity and growth rate are observed it is not in the place of pride. Anindya Bhukta said that during the decade 1991-2001 the growth rate of food-grain was only 1.66 percent per annum, whereas, the population growth rate was 1.9 per cent over the same period.

The fast increasing population builds up the need for tapping the opportunities to increase the food production, particularly paddy. Vyas in analyzing India's agricultural performance in the last 25 years concluded that the rate of growth in agricultural sector was sluggish as compared to the needs. He opined that the rate of growth should be 3.9 per cent per annum. If the rate of growth is lower than this the problems of food security will aggravate.

With 4,41,00,000 hectares of land under paddy cultivation and 13,12,74,000 metric tonnes of production in the year 2009, India ranks first In total cultivated area and second in the total production and the respective percentages being 27.32 and 19.34 of the world total. The following table shows India's share in the world total paddy cultivated area and production.

TABLE 1—SHARE OF INDIA IN THE WORLD TOTAL PADDY CULTIVATED AREA AND PRODUCTION

Year	Area (in '000 Hectares)			Production (in '000 Tonnes)		
	All Countries	India	Share of India (in %)	All Countries	India	Share of India (in %)
1995	149594.37	42800.00	28.61	547429.60	115440.00	21.09
1996	150293.11	43400.00	28.88	568905.94	122500.00	21.53
1997	151114.22	43469.80	28.77	576985.86	123700.00	21.44
1998	151695.55	44802.30	29.53	579186.67	129055.00	22.28
1999	156803.45	45260.00	28.86	610937.91	134495.90	22.01
2000	154055.86	44712.00	29.02	599354.77	127464.90	21.27
2001	152043.15	44900.00	29.53	598315.64	139900.00	23.38
2002	147953.22	41176.10	27.83	569451.35	107730.30	18.92

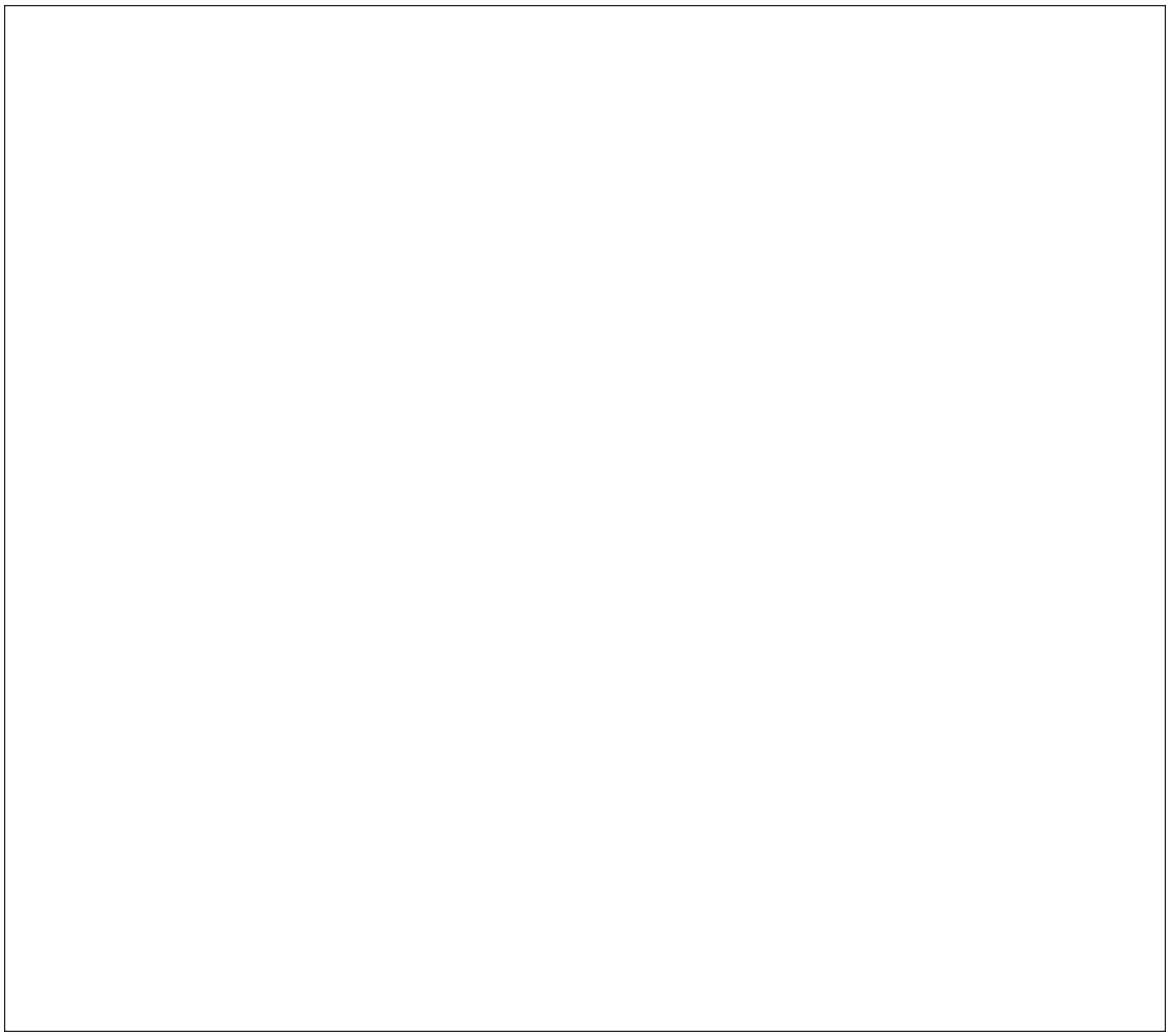
*Associate Professor, P.G. & Research Department of Commerce, Hajee Karutha Rowther Howdia College, Uthampalayam-625533, Theni District (T. N.)

TABLE 1—SHARE OF INDIA IN THE WORLD TOTAL PADDY CULTIVATED AREA AND PRODUCTION—*Contd.*

Year	Area (in '000 Hectares)			Production (in '000 Tonnes)		
	All Countries	India	Share of India (in %)	All Countries	India	Share of India (in %)
2003	148531.70	42592.50	28.68	584630.11	132789.00	22.71
2004	150548.67	41906.70	27.84	607794.74	124697.10	20.52
2005	155026.24	43659.80	28.16	634389.86	137690.10	21.70
2006	155744.20	43810.00	28.13	641094.64	139137.00	21.70
2007	155952.52	43770.00	28.07	656807.35	144570.00	22.01
2008	159250.95	44000.00	27.63	685874.70	148260.00	21.62
2009	161420.74	44100.00	27.32	678688.289	131274.00	19.34

Source : FAO statistics

Figure-1



Source : Computed from Table-1

From Table 1 and Figure-1 it can be understood that India's share in world's total paddy cultivated area ranges from 27.32 to 29.53 percentages, whereas its share in paddy production ranges between 18.92 and 23.38 percentages. In each year, the percentage of India's share in production is lower than its proportionate share in the total cultivated area. This lower percentage may be due to low productivity (Yield). This being the situation, an analysis of India's paddy productivity may help to know the Sub-continent's position and suggesting measures to increase the production and productivity of paddy.

Objectives

The following objectives have been framed to carry out the present study :

(i) To focus on India's paddy productivity for a period of 15 years.

(ii) To estimate the growth rates in area, production and productivity and their trend values.

(iii) To compare and analyse paddy productivity in India with that of some select major paddy producing countries

(iv) To compare of the Productivity Gaps (Yield Variations) between the select countries and India.

Sources of Data

The period taken for the present study is 15 years commencing from 1995. The variables area, production and productivities in China, Vietnam, Indonesia, Japan, Philippines and Egypt and also those of all paddy producing countries combined are compared with India's productivity. These countries were selected because, in these countries, rice paddy cultivation is the main agricultural activity and rice is the staple food of the majority of people. The data on production and productivity have been taken from Food and Agriculture Organisation's (FAO) statistics available in the website "www.fao.org (faostat-agriculture).Besides articles published in various journals and periodicals were also discussed.

Review of Literature

Parthasarathy and Prasad studied the difference in the rate of growth of rice yield in India (1977) and stated that the difference in yield was due to the difference in factors like infrastructural development, environment and the level of input use.

According to Ganesh Kumar (1999) the yield disparities for rice are low and remained unchanged over time and the superior cereal rice had experienced growth in all the regions of Andhra Pradesh.

Roy B.C. and Datta.K.K.,(2000) identified ten production constraints causing production losses in rice-wheat system in the Trans-Gangetic plains of Haryana. According to the study irregular power supply, non-availability of labour during peak periods and high cost of plant protection chemicals were the top three foremost problems.

Renuka Pillai(2001) mentioned that productivity of inputs had played an important role in the growth performance of paddy in West Bengal and Orissa, and that one-third of the output growth in Indian rice was contributed by Total Factor Productivity (TFP).TFP growth measures the increase in output that is not accounted for by the increase in basic factor inputs such as land, labour, and capital.

Total Factor Productivity (TFP) in agricultural was calculated by Kecuk Suhariyanto and Colin Thirtle (2001) for eighteen Asian countries covering a 30 year period from 1965. According to the calculation, the TPF for India diminished from the 0.72 level in 1965 to -0.50 in 1996. The efficiency differences were not great before the Green Revolution, with a spread of only 28 per cent between the most efficient and the least efficient countries. But, the gap in agricultural productivity differences between the countries was widening rather than narrowing and productivity differences would not vanish in the long run.

Barah B. C., and Shusil Pandey (2005) observed that the reason for variations in yield was due to the absence of uniform or balanced cultivation of modem varieties and because of this, the farmers had to grow the same variety In all the seasons under different ecosystems.

Singh R. S., et al.,(2005) revealed that over the years gross cropped area, cropping intensity, net irrigated area and gross irrigated area have increased, whereas the net sown area has decreased.

According to Nivedita Deka and B.C. Bhowmick (2005) factors like age, education, number of farm workers and irrigated area of paddy influenced the technical efficiency positively, while upland and lowland areas had influenced the technical efficiency negatively. They were of the opinion that to increase the yield of rice, cultivation of this cereal in the medium land with proper irrigation should be undertaken. These conclusions were arrived at in a study on the technical efficiency in rice production in selected areas of Assam state.

In assessing the economic viability of small and marginal farmers of Northern Karnataka L.K.Wader and A.K. Koulagi (2006) explained that small and marginal farmers exclusively dependent on rainfed farming have failed to achieve economic viability. They proposed the promotion of agro-based subsidies and the development of non agro-based subsidies so as to enable them to achieve economic viability.

Gyan Prakash, Ramkumar Jha and R.C. Sharma(2006) estimated the growth rates of foodgrains production in India and observed that the Compound Growth Rate of Areas, Production and Yield of rice were respectively 1.4, 2.7 and 1.4 during the Pre-Green Revolution period (1955-

56 to 1965-66), and the growth rates have changed to 0.8, 2.5, and 1.7 in the Green Revolution period (1966-67 to 1976-77) , to 0.3, 2.0 and 2.8 in Post-Green Revolution/Pre-economic Reform period (1977-78 to 1991-92), and to 0.7, 2.0, and 1.0 in Post- economic Reform period (1992-93 to 1998-99). The overall growth rates for the whole period (1955-56 to 1998-99) were 0.7, 2.7 and 2.0. Their study further showed that future growth in foodgrains production would be extremely demanding and therefore more emphasis should be laid on technology-based growth in agriculture, and the adoption of growth promoting inputs like High Yielding Varieties (HYV), chemical fertilisers and irrigation. These inputs should be arranged and made available in time and in adequate quantities.

Methodology

The data have been analyzed with the help of statistical tools percentage analysis, trend values by the method of least squares, Compound Growth Rate, Arithmetic Mean, Range, Standard Deviations and coefficient of variations.

1. The trend values for Area, Production, Productivity and Productivity-Gaps were computed by Ordinary Least Squares (OLS) method by applying the following formula

$Y_c = a + bx$

Where,

Y_c = Trend Values

a = constant

b = intercept (growth rates)

x = Time (years)

2. The Percentage of Compound Growth Rates of Area, Production and Productivity were computed by applying the formula

Compound Growth Rate (CGR) = (Antilog. b-l) x 100

3. The productivity (Yield) is calculated by the following method.

$$\text{Productivity (Yield)} = \frac{\text{Total Production}}{\text{Total Cultivated Area}}$$

4. The Mean (Average) Values are calculated by dividing the sum of Area/Production/Productivity (Yield) by the number of years (15) taken for study.

5. Coefficient of Variation (in %) is calculated by the formula

$$\frac{\text{Standard Deviation}}{\text{Mean (Average)}} \times 100$$

In the rice production, India and China together account for half of the world's rice cultivation area and output. The total area under paddy cultivation, production and the shares of select paddy growing countries and the productivity (Yield) are given in the following tables

TABLE 2—AREA UNDER CULTIVATION AND PRODUCTION OF PADDY IN SELECT COUNTRIES

(Area in '000 hectares and Production in '000 tonnes)

Year	China		Vietnam		Indonesia		Japan		Philippines		Egypt	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1995	31107.48	187297.97	6765.60	24963.70	11438.76	49744.10	2118.00	13435.00	3758.70	10540.64	588.54	4788.10
1996	31753.89	197032.90	7003.80	26396.70	11569.73	51101.50	1977.00	12930.00	3951.10	11283.57	590.45	4895.39
1997	32129.20	202771.84	7099.70	27523.90	11140.59	49377.06	1953.00	12531.00	3842.27	11268.00	651.21	5480.01
1998	31571.50	200571.56	7362.70	29145.50	11730.20	49236.70	1801.00	12200.00	3170.04	8554.00	517.83	4474.11
1999	31637.10	200403 .31	7653.60	31393.80	11963.20	50866.39	1788.00	11468.80	3999.84	11786.60	655.21	5816.96
2000	30301.49	189814.06	7666.30	32529.50	11793.00	51898.00	1770.00	11863.00	4038.08	12389.40	659.22	6000.49
2001	29144.02	179304.89	7492.70	32108.40	11500.00	50460.80	1706.00	11320.00	4065.44	12954.90	563.02	5226.70
2002	28508.80	176342.20	7504.30	34447.20	11521.17	51489.70	1688.00	11111.00	4046.32	13270.65	650.29	6105.46
2003	26780.12	162304.28	7452.20	34568.80	11477.36	52137.60	1665.00	9740.00	4006.40	13499.90	633.57	6176.27
2004	28615.72	180522.60	7445.30	36148.90	11922.97	54088.47	1701.00	10912.00	4126.65	14496.78	645.67	6352.37
2005	29116.40	182055.14	7329.20	35832.90	11839.06	54151.10	1706.00	11342.00	4070.42	14603.01	613.30	6125.30
2006	29201.20	183276.05	7324.80	35849.50	11786.43	54454.94	1688.00	10695.00	4159.93	15326.71	670.47	6755.00
2007	29179.12	187397.46	7207.40	35942.70	12147.64	57157.44	1673.00	10893.00	4272.89	16240.19	704.05	6876.83
2008	29493.29	193354.18	7414.30	38725.10	12309.16	60251.07	1627.00	11028.75	4459.98	16815.55	745.39	7253.37
2009	29932.29	197257.18	7440.10	38895.50	12883.58	64398.89	1624.00	10592.50	4532.30	16266.42	750.00	7500.00

Source : FAO statistcs

TABLE 3—DISTRIBUTION OF WORLD TOTAL CULTIVATED AREA AND PRODUCTION OF PADDY (IN %)

Year	China		Vietnam		Indonesia		Japan		Philippines		Egypt	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1995	20.79	34.21	4.52	4.56	7.65	9.09	1.42	2.45	2.51	1.93	0.39	0.87
1996	21.13	34.63	4.66	4.64	7.70	8.98	1.32	2.27	2.63	1.98	0.39	0.86
1997	21.26	35.14	4.70	4.77	7.37	8.56	1.29	2.17	2.54	1.95	0.43	0.95
1998	20.81	34.63	4.85	5.03	7.73	8.50	1.19	2.11	2.09	1.48	0.34	0.77
1999	20.18	32.80	4.88	5.14	7.63	8.33	1.14	1.88	2.55	1.93	0.42	0.95
2000	19.67	31.67	4.98	5.43	7.66	8.66	1.15	1.98	2.62	2.07	0.43	1.00
2001	19.17	29.97	4.93	5.37	7.56	8.43	1.12	1.89	2.67	2.17	0.37	0.87
2002	19.27	30.97	5.07	6.05	7.79	9.04	1.14	1.95	2.73	2.33	0.44	1.07
2003	18.03	27.76	5.02	5.91	7.73	8.92	1.12	1.67	2.70	2.31	0.43	1.06
2004	19.01	29.70	4.95	5.95	7.92	8.90	1.13	1.80	2.74	2.39	0.43	1.05
2005	18.78	28.70	4.73	5.65	7.64	8.54	1.10	1.79	2.63	2.30	0.40	0.97
2006	18.75	28.49	4.70	5. 59	7.57	8.49	1.08	1.67	2.67	2.39	0.43	1.05
2007	18.71	28.53	4.62	5.47	7.79	8.70	1.07	1.66	2.74	2.47	0.45	1.05
2008	18.52	28.19	4.66	5.65	7.73	8.78	1.02	1.61	2.80	2.45	0.47	1.06
2009	18.54	29.06	4.61	5.73	7.98	9.49	1.01	1.56	2.81	2.40	0.46	1.11

Source : Computed from F.A.O. Statistics.

TABLE 4—TREND VALUES FOR AREA UNDER CULTIVATION OF PADDY IN SELECT COUNTRIES

(in '000 Hectares)

Year	All Countries	India	China	Vietnam	Indonesia	Japan	Philippines	Egypt
1995	149308.69	43686.12	31381.08	7191.24	11309.64	1961.54	3660.58	571.24
1996	149883.91	43677.24	31169.23	7213.08	11379.91	1933.56	3713.84	581.43
1997	150459.12	43668.36	30957.38	7234.92	11450.18	1905.58	3767.09	591.61
1998	151034.34	43659.47	30745.52	7256.77	11520.45	1877.60	3820.34	601.80
1999	151609.55	43650.59	30533.67	7278.61	11590.72	1849.61	3873.60	611.99
2000	152184.77	43641.71	30321.82	7300.45	11660.98	1821.63	3926.85	622.17
2001	152759.98	43632.83	30109.96	7322.29	11731.25	1793.65	3980.10	632.36
2002	153335.20	43623.95	29898.11	7344.13	11801.52	1765.67	4033.36	642.55
2003	153910.41	43615.06	29686.25	7365.98	11871.79	1737.68	4086.61	652.73
2004	154485.63	43606.18	29474.40	7387.82	11942.06	1709.70	4139.86	662.92
2005	155060.84	43597.30	29262.55	7409.66	12012.33	1681.72	4193.12	673.11
2006	155636.06	43588.42	29050.69	7431.50	12082.60	1653.74	4246.37	683.30
2007	156211.27	43579.54	28838.84	7453.34	12152.87	1625.76	4299.62	693.48
2008	156786.49	43570.66	28626.99	7475.18	12223.14	1597.77	4352.88	703.67
2009	157361.70	43561.77	28415.13	7497.03	12293.41	1569.79	4406.13	713.86
Trend Coefficients								
'a' Constant	148733.475	43659.001	31592.939	7169.399	11239.370	1989.524	3607.329	561.053
'b' Intercept	575.215	–8.882	–211.854	21.842	70.269	–27.982	53.254	10.187
R^2	0.420	0.001	0.399	0.164	0.555	0.764	0.575	0.522
CGR(%)	0.4	– 0.0082	–0.7	0.3	0.6	–1.5	1.3	1.6

Source: Computed from F.A.O. Statistics.

TABLE 5—TREND VALUES FOR PRODUCTION OF PADDY IN SELECT COUNTRIES

(in '000 tonnes)

Year	World Average	India	China	Vietnam	Indonesia	Japan	Philippines	Egypt
1995	550800.34	120404.92	192706.37	26379.32	47558.39	12705.24	9825.59	4692.99
1996	559160.74	121858.53	192031.23	27320.10	48391.13	12528.89	10320.00	4878.06
1997	567521.14	123312.15	191356.09	28260.89	49223.88	12352.54	10814.40	5063.12
1998	575881.55	124765.76	190680.94	29201.67	50056.62	12176.19	11308.81	5248.18
1999	584241.95	126219.38	190005.80	30142.45	50889.36	11999.85	11803.21	5433.24
2000	592602.35	127672.99	189330.66	31083.24	51722.10	11823.50	12297.61	5618.30
2001	600962.76	129126.61	188655.52	32024.02	52554.84	11647.15	12792.02	5803.36
2002	609323.16	130580.22	187980.37	32964.81	53387.58	11470.80	13286.42	5988.42
2003	617683.56	132033.83	187305.23	33905.59	54220.33	11294.46	13780.83	6173.49
2004	626043.97	133487.45	186630.09	34846.37	55053.07	11118.11	14275.23	6358.55
2005	634404.37	134941.06	185954.95	35787.16	55885.81	10941.76	14769.63	6543.61
2006	642764.77	136394.68	185279.81	36727.94	56718.55	10765.41	15264.04	6728.67
2007	651125.18	137848.29	184604.66	37668.73	57551.29	10589.06	15758.44	6913.73

TABLE 5—TREND VALUES FOR PRODUCTION OF PADDY IN SELECT COUNTRIES—*Contd.*

(in '000 tonnes)

Year	World Average	India	China	Vietnam	Indonesia	Japan	Philippines	Egypt
2008	659485.58	139301.91	183929.52	38609.51	58384.03	10412.72	16252.85	7098.79
2009	667845.98	140755.52	183254.38	39550.29	59216.78	10236.37	16747.25	7283.85
Trend Coefficients								
'a' Constant	542439.935	118951.306	193381.513	25438.535	46725.650	12881.586	9331.189	4507.933
'b' Intercept	8360.403	1453.614	–675.142	940.784	832.742	–176.348	494.404	185.061
R^2	0.802	0.359	0.074	0.941	0.750	0.661	0.870	0.852
CGR (%)	1.4	1.1	-0.4	2.9	1.5	–1.5	3.8	3.1

Source: Computed from F.A.O. Statistics.

TABLE 6—RESULTS OF STATISTICAL ANALYSIS FOR AREA, PRODUCTION AND AVERAGE YIELD OF PADDY

India						
	Calculated Values					
Variables	Mean	Minimum	Maximum	Range	Standard Deviation	Coefficient of Variation (%)
Area	43623.95	41176.10	45260.00	4083.90	1135.79	2.60
Production	130580.22	107730.30	148260.00	40529.70	10856.94	10.08
Yield	2991.51	2616.33	3369.55	753.21	214.10	7.16
China						
Area	29898.11	26780.12	32129.20	5349.08	1500.36	5.02
Production	187980.37	162304.28	202771.84	40467.56	11069.71	5.89
Yield	6286.20	6020.99	6590.11	569.12	157.90	2.51
Vietnam						
Area	7344.13	6765.60	7666.30	900.70	241.02	3.28
Production	32964.81	24963.70	38895.50	13931.80	4337.69	13.16
Yield	4481.98	3689.80	5227.82	1538.02	527.00	11.76
Indonesia						
Area	11801.52	11140.59	12883.58	1742.99	421.97	3.58
Production	53387.58	49236.70	64398.89	15162.19	4300.35	8.05
Yield	4518.44	4197.43	4998.53	801.10	219.63	4.86
Japan						
Area	1765.67	1624.00	2118.00	494.00	143.19	8.11
Production	11470.80	9740.00	13435.00	3695.00	970.13	8.46
Yield	6497.95	5849.85	6778.58	928.73	229.70	3.53
Philippines						
Area	4033.36	3170.04	4532.30	1362.26	314.13	7.79
Production	13286.42	8554.00	16815.55	8261.55	2370.22	17.84
Yield	3272.46	2698.39	3800.75	1102.37	373.83	11.42

TABLE 6—RESULTS OF STATISTICAL ANALYSIS FOR AREA, PRODUCTION AND AVERAGE YIELD OF PADDY—*Contd.*

India						
	Calculated Values					
Variables	Mean	Minimum	Maximum	Range	Standard Deviation	Coefficient of Variation (%)
			Egypt			
Area	642.55	517.83	750.00	232.17	63.08	9.82
Production	5988.42	4474.11	7500.00	3025.89	896.78	14.98
Yield	9285.47	8135.58	10075.02	1939.44	669.38	7.21
			All Countries			
Area	153335.20	147953.22	161420.74	13467.52	3971.11	2.59
Production	609323.16	547429.60	685874.70	138445.10	41753.90	6.85
Yield	3970.43	3659.43	4306.88	647.45	183.84	4.63

Productivity of Paddy

India leads all other countries in the production of certain agricultural products and enjoys monopoly in the production of some selected items like spices. Though India competes favourably with other countries of the world in agricultural production its position is not satisfactory in so far as the yield of crops per unit of cultivated land is concerned. Paddy crop is no exclusion to this general feature. The paddy productivity, its trend values and the Compound Growth Rate (CGR) in India and the select countries are presented in the following tables.

TABLE 7—PRODUCTIVITY (YIELD) OF PADDY IN SELECT COUNTRIES

(Kgs./Hectare)

Year	World Average	India	China	Vietnam	Indonesia	Japan	Philippines	Egypt
1995	3659.43	2697.20	6021.00	3689.80	4348.73	6343.25	2804.33	8135.58
1996	3785.31	2822.58	6205.00	3768.91	4416.83	6540.21	2855.81	8290.96
1997	3818.21	2845.65	6311.14	3876.77	4432.17	6416.28	2932.64	8415.16
1998	3818.09	2880.54	6352.93	3958.53	4197.43	6774.01	2698.39	8640.08
1999	3896.20	2971.63	6334.44	4101.83	4251.90	6414.32	2946.77	8878.01
2000	3890.50	2850.80	6264.18	4243.18	4400.75	6702.26	3068.14	9102.45
2001	3935.17	3115.81	6152.37	4285.29	4387.90	6635.40	3186.59	9283.32
2002	3848.86	2616.33	6185.54	4590.33	4469.14	6582.35	3279.69	9388.88
2003	3936.06	3117.66	6060.63	4638.74	4542.65	5849.85	3369.58	9748.36
2004	4037.20	2975.59	6308.51	4855.26	4536.49	6415.05	3512.97	9838.42
2005	4092.15	3153.70	6252.67	4889.06	4573.94	6648.30	3587.59	9987.45
2006	4116.33	3175.92	6276.32	4894.26	4620.14	6335.90	3684.37	10075.02
2007	4211.59	3302.95	6422.32	4986.92	4705.23	6511.06	3800.75	9767.48
2008	4306.88	3369.55	6555.87	5223.03	4894.82	6778.58	3770.32	9730.98
2009	4204.47	2976.74	6590.11	5227.82	4998.53	6522.48	3589.00	10000.00

Source: computed from F.A.O. Statistics

To comprehend tendency of productivity, the trend values for productivity are computed by the method of least squares and presented in Table 8.

TABLE 8—TREND VALUES FOR YIELD (PRODUCTIVITY) OF PADDY IN SELECT COUNTRIES

(Kgs/Hectare)

Year	World Average	India	China	Vietnam	Indonesia	Japan	Philippines	Egypt
1995	3695.76	2753.90	6133.95	3663.89	4221.82	6479.25	2715.98	8299.03
1996	3735.00	2787.85	6155.70	3780.76	4264.19	6481.92	2795.48	8439.95
1997	3774.24	2821.79	6177.45	3897.63	4306.57	6484.59	2874.97	8580.87
1998	3813.48	2855.73	6199.20	4014.50	4348.94	6487.26	2954.47	8721.79
1999	3852.72	2889.68	6220.95	4131.37	4391.32	6489.94	3033.97	8862.72
2000	3891.95	2923.62	6242.70	4248.24	4433.69	6492.61	3113.47	9003.64
2001	3931.19	2957.57	6264.45	4365.11	4476.07	6495.28	3192.97	9144.56
2002	3970.43	2991.51	6286.20	4481.98	4518.44	6497.95	3272.46	9285.48
2003	4009.67	3025.45	6307.95	4598.85	4560.82	6500.63	3351.96	9426.40
2004	4048.91	3059.40	6329.70	4715.72	4603.19	6503.30	3431.46	9567.32
2005	4088.14	3093.34	6351.45	4832.59	4645.57	6505.97	3510.96	9708.24
2006	4127.38	3127.29	6373.20	4949.47	4687.94	6508.64	3590.45	9849.16
2007	4166.62	3161.23	6394.95	5066.34	4730.32	6511.32	3669.95	9990.08
2008	4205.86	3195.17	6416.70	5183.21	4772.69	6513.99	3749.45	10131.00
2009	4245.10	3229.12	6438.45	5300.08	4815.07	6516.66	3828.95	10271.92
Trend Coefficients								
'a' Constant	3656.524	2719.962	6112.199	3547.017	4179.444	6476.576	2636.481	8158.112
'b' Intercept	39.238	33.944	21.750	116.871	42.375	2.672	79.498	140.920
R^2	0.911	0.503	0.379	0.984	0.744	0.003	0.904	0.886
CGR (%)	1.0	1.1	0.3	2.6	0.9	0.004	2.4	1.5

Source: Computed from Table-7.

TABLE 9—RESULTS OF STATISTICAL ANALYSIS FOR PADDY PRODUCTIVITY

Country	Calculated Values					
	Mean	Minimum	Maximum	Range	Standard Deviation	Coefficient of Variation (%)
World Average (All countries)	3970.43	3659.43	4306.88	647.45	183.84	4.63
India	2991.51	2616.33	3369.55	753.21	214.10	7.16
China	6286.20	6020.99	6590.11	569.12	157.90	2.51
Vietnam	4481.98	3689.80	5227.82	1538.02	527.00	11.76
Indonesia	4518.44	4197.43	4998.53	801.10	219.63	4.86
Japan	6497.95	5849.85	6778.58	928.73	229.70	3.53
Philippines	3272.46	2698.39	3800.75	1102.37	373.83	11.42
Egypt	9285.47	8135.58	10075.02	1939.44	669.38	7.21

The Table 9 sketches the Productivity Gap (Yield Variations) between major paddy growers, herein accounted for, and India. The Productivity Gap is the difference in productivity between one producer and another in a specified period for the uniform size of cultivated land (Productivity in the compared country -Productivity in India).

TABLE 10—PADDY PRODUCTIVITY GAP—MAJOR RICE GROWERS VS INDIA

(In Kgs. / Hectare)

Year	World Average Vs India	China Vs India	Vietnam Vs India	Indonesia Vs India	Japan Vs India	Philippines Vs India	Egypt Vs India
1995	962.23	3323.80	992.60	1651.54	3646.05	107.14	5438.38
1996	962.73	3382.42	946.33	1594.25	3717.63	33.22	5468.38
1997	972.56	3465.49	1031.12	1586.52	3570.63	86.99	5569.50
1998	937.54	3472.39	1077.99	1316.89	3893.47	-182.16	5759.54
1999	924.57	3362.81	1130.21	1280.28	3442.69	-24.86	5906.38
2000	1039.71	3413.38	1392.38	1549.95	3851.46	217.34	6251.65
2001	819.36	3036.56	1169.48	1272.08	3519.59	70.78	6167.51
2002	1232.53	3569.21	1974.00	1852.81	3966.02	663.36	6772.55
2003	818.40	2942.96	1521.08	1424.99	2732.19	251.92	6630.69
2004	1061.61	3332.92	1879.68	1560.90	3439.46	537.38	6862.83
2005	938.44	3098.96	1735.36	1420.23	3494.60	433.89	6833.74
2006	940.41	3100.40	1718.34	1444.22	3159.98	508.45	6899.10
2007	908.64	3119.37	1683.97	1402.28	3208.11	497.81	6464.53
2008	937.34	3186.33	1853.48	1525.27	3409.04	400.77	.6361.43
2009	1227.73	3613.38	2251.09	2021.79	3545.74	612.26	7023.27

Source: Computed from Table-7.

To estimate whether the gap in paddy productivity between the select countries and India is widening or narrowing, the trend values for Productivity Gaps are calculated and shown in Table 11. The increasing trend indicates the 'widening-gap', whereas, decreasing trend does show the 'narrowing gaps'.

TABLE 11—TREND VALUES FOR PADDY PRODUCTIVITY (YIELD) GAP—MAJOR RICE GROWERS VS INDIA

(In Kgs. /Hectare)

Year	World Average Vs India	China Vs India	Vietnam Vs India	Indonesia Vs India	Japan Vs India	Philippines Vs India	Egypt Vs India
1995	941.86	3380.04	909.98	1467.92	3725.34	–37.93	5545.13
1996	947.15	3367.85	992.91	1476.35	3694.07	7.63	5652.10
1997	952.45	3355.66	1075.84	1484.78	3662.80	53.18	5759.08
1998	957.74	3343.47	1158.77	1493.21	3631.53	98.74	5866.06
1999	963.04	3331.27	1241.69	1501.64	3600.26	144.29	5973.03
2000	968.33	3319.08	1324.62	1510.07	3568.99	189.84	6080.01
2001	973.63	3306.89	1407.55	1518.50	3537.72	235.40	6186.99
2002	978.92	3294.69	1490.47	1526.93	3506.44	280.95	6293.97

TABLE 11—TREND VALUES FOR PADDY PRODUCTIVITY (YIELD) GAP—MAJOR RICE GROWERS VS INDIA—*Contd.*

(In Kgs./Hectare)

Year	World Average Vs India	China Vs India	Vietnam Vs India	Indonesia Vs India	Japan Vs India	Philippines Vs India	Egypt Vs India
2003	984.21	3282.50	1573.40	1535.36	3475.17	326.51	6400.94
2004	989.51	3270.31	1656.33	1543.80	3443.90	372.06	6507.92
2005	994.80	3258.11	1739.26	1552.23	3412.63	417.61	6614.90
2006	1000.10	3245.92	1822.18	1560.66	3381.36	463.17	6721.87
2007	1005.39	3233.73	1905.11	1569.09	3350.09	508.72	6828.85
2008	1010.69	3221.53	1988.04	1577.52	3318.82	554.28	6935.83
2009	1015.98	3209.34	2070.96	1585.95	3287.55	599.83	7042.80
			Trend Coefficients				
'a' Constant	936.563	3392.238	827.056	1459.486	3756.614	-83.480	5438.150
'b' Intercept	5.295	-12.193	82.927	8.431	-31.271	45.554	106.977
R^2	0.039	0.072	0.798	0.034	0.199	0.615	0.748
CGR(%)	0.5	- 0.4 -	5.8	0.5	– 0.9	33.60	1.7

Source: Computed from Table-10.

The trend values for Productivity Gaps are increasing during the period of study with exception that between China and India, and between Japan and India.

TABLE 12—RESULTS OF STATISTICAL ANALYSIS FOR PRODUCTIVITY (YIELD) GAPS

Select Countries Vs India	Calculated Values						
	Mean	Minimum	Maximum	Range	CGR	Standard Deviation	Coefficient of Variation (%)
World Average Vs India	978.92	818.40	1232.53	414.13	0.5	120.42	12.30
China Vs India	3294.69	2942.96	3613.38	670.42	–0.4	202.71	6.15
Vietnam Vs India	1490.47	946.33	2251.09	1304.76	5.8	415.20	27.86
Indonesia Vs India	1526.93	1272.08	2021.79	749.71	0.5	205.36	13.45
Japan Vs India	3506.44	2732.19	3966.02	1233.83	–0.9	313.58	8.94
Philippines Vs India	280.95	–182.16	663.36	845.52	33.60	259.74	92.45
Egypt Vs India	6293.97	5438.38	7023.27	1584.89	1.7	552.99	8.79

Computed form Table-9

TABLE 13—RANKS OF SELECT COUNTRIES IN AVERAGE AREA, PRODUCTION, YIELD AND PRODUCTIVITY GAPS

Area

	Mean	Minimum	Maximum	Range	CGR	Standard Deviation	Coefficient of Variation (%)
Rank 1	India	India	India	China	Egypt	China	Egypt
Rank 2	China	China	China	India	Philippines	India	Japan
Rank 3	Indonesia	Indonesia	Indonesia	Indonesia	Indonesia	Indonesia	Philippines
Rank 4	Vietnam	Vietnam	Vietnam	Philippines	Vietnam	Philippines	China
Rank 5	Philippines	Philippines	Philippines	Vietnam	India	Vietnam	Indonesia
Rank 6	Japan	Japan	Japan	Japan	China	Japan	Vietnam
Rank 7	Egypt	Egypt	Egypt	Egypt	Japan	Egypt	India

Production

	Mean	Minimum	Maximum	Range	CGR	Standard Deviation	Coefficient of Variation (%)
Rank 1	China	China	China	India	Philippines	China	Philippines
Rank 2	India	India	India	China	Egypt	India	Egypt
Rank 3	Indonesia	Indonesia	Indonesia	Indonesia	Vietnam	Vietnam	Vietnam
Rank 4	Vietnam	Vietnam	Vietnam	Vietnam	Indonesia	Indonesia	India
Rank 5	Philippines	Philippines	Philippines	Philippines	India	Philippines	Japan
Rank 6	Japan	Japan	Japan	Japan	China	Egypt	Indonesia
Rank 7	Egypt	Egypt	Egypt	Egypt	Japan	Japan	China

Yield

	Mean	Minimum	Maximum	Range	CGR	Standard Deviation	Coefficient of Variation (%)
Rank 1	Egypt	Egypt	Egypt	Egypt	Vietnam	Egypt	Vietnam
Rank 2	Japan	China	Japan	Vietnam	Philippines	Vietnam	Philippines
Rank 3	China	Japan	China	Philippines	Egypt	Philippines	Egypt
Rank 4	Indonesia	Indonesia	Vietnam	Japan	India	Japan	India
Rank 5	Vietnam	Vietnam	Indonesia	Indonesia	Indonesia	Indonesia	Indonesia
Rank 6	Philippines	Philippines	India	India	China	India	Japan
Rank 7	India	India	Philippines	China	Japan	China	China

TABLE 13—RANKS OF SELECT COUNTRIES IN AVERAGE AREA, PRODUCTION, YIELD AND PRODUCTIVITY GAPS—*Contd.*

	Productivity Gap (Compared Country Vs India)						
	Mean	Minimum	Maximum	Range	CGR	Standard Deviation	Coefficient of Variation (%)
Rank 1	Egypt	Egypt	Egypt	Egypt	Philippines	Egypt	Philippines
Rank 2	Japan	Japan	Japan	Vietnam	Vietnam	Vietnam	Vietnam
Rank 3	China	China	China	Japan	Egypt	Japan	Indonesia
Rank 4	Indonesia	Indonesia	Vietnam	Philippines	Indonesia	Philippines	Japan
Rank 5	Vietnam	Vietnam	Indonesia	Indonesia	China	Indonesia	Egypt
Rank 6	Philippines	Philippines	Philippines	China	Japan	China	China

Prepared from Tables 6, 9 and 12

Results and Discussion

Table 2 points out that over the 15 year period, the area under cultivation and production of rice in the select paddy producing countries are fluctuating. The trend values (Table 4 and Table 5) for these variables record that the total cultivated area is decreasing in India, China and Japan. However, production of this cereal in all major paddy producing countries including India has been increasing barring China and Japan. Even so, the productivity in China and Japan has been higher than India's productivity during period of study.

In the years 1998 and 2001 India held the largest share (29.53%) of the total cultivated area. This percentage is the highest in the study period. But the largest proportion (35.14%) in the total production was associated with China in 1997. The contribution to the world total production by every nation except India and Philippines has been higher than its proportionate share in the total cultivated area (Table -3).

The Compound Growth Rate (CGR) of area under cultivation in India was -0.0082 per cent. All other countries excluding China and Japan have positive CGR with Egypt occupying the uppermost rung in the productivity ladder with1.6 per cent and the world average in the period of study was 0.4 per cent. The CGR for production of India was 1.1 per cent, but the world average production has been put at 1.4 per cent. The highest CGR of 3.8 per cent for production was connected to Philippines followed by Egypt, Vietnam, Indonesia and India with 3.1, 2.9,1.5 and 1.1 percentages respectively. However, China and Japan have shown negative CGR with -0.4 and -1.5 percentages respectively. The CGR for India's total cultivated area is also negative (-0.0082), but the CGR of production was positive with 1.1 per cent. The higher percentage of CGR for production may be due to higher productivity.

The highest average area under cultivation was held by India with 43623.95 thousand hectares followed by China with 29898.11 thousand hectares. India's Minimum and Maximum cultivated areas were 41176.10 (2003) and 45260.00 (2000) thousand hectares. These values were the highest of the compared countries' respective values.

In the production of paddy, India's average production in the 15 year period was 130580.22 thousand tonnes, and the lowest and largest production were 107730.30 (2003) and 148260.00 (2009) thousand tonnes respectively. However, China surpassed India in the average, minimum and maximum production with the corresponding values of 187980.37,162304.28(2003) and 202771.84(1997) thousand tonnes.

As far as the productivity (Yield) is considered, India's fifteen year average productivity of 2991.51 (Kgs./ Hectare) was the lowest of all values. The lowest and highest productivities were 2616.33 (2002) and 3369.55 (2008). The Coefficient of Variations in Area, Production and Average Yield of India were 2.60, 10.08 and 7.16 percentages respectively, but these values for World Average (all countries combined) were 2.59, 6.85 and 4.63 percentages. It can be noticed that highest variation in India's value was recorded in the production (10.08 %) followed by Yield (7.16%) and Area under cultivation (2.60%). The paddy Productivity in Egypt had been the highest across all the years of study.

All the countries have increased the paddy productivity as the trend values (Table-8) are on the raise. If CGR is considered as an indication of growth in productivity, the first place goes to Vietnam with 2.6 per cent. Following Vietnam, the countries Philippines (2.4), Egypt (1.5), India (1.1), Indonesia (0.9), China (0.3) and Japan (0.004) have come to occupy the next places in the stated order. The co-efficient of variation in productivity was the highest for Vietnam with 11.76 per cent, closely

followed by Philippines (11.42), Egypt (7.21) and India (7.16). The magnitude of range (difference between maximum and minimum values) for India's productivity was the second lowest (753.21), next only to China (569.12 Kgs.).

Barring 1998 and 1999, the paddy productivity in India has been lower that of other countries. During the two years the Productivity of India has been slightly higher than that of Philippines. Further, with the exclusion of China and Japan, the Productivity Gap between the select countries and India is widening as the trend values for Productivity Gaps have shown an upward movement over the period. The widest Productivity Gap between Egypt and India with 7023.27 Kgs. was noticed in 2009, the narrowest being -182.16 Kgs. between Philippines and India, recorded in 1998.

The countries selected for this study have not held equal area under cultivation. Accordingly, the cultivated areas in each country vary, so do their production (Table -13). India, even though has held largest area under cultivation and ranked 1, is not in the first position in production. But China ranked second in area holds the first place in production. The ranks of all other countries are the same in area and production. The CGR of India's area and production are ranked fifth, but their corresponding ranks in Co-efficient of Variations are seven and four.

In the average per hectare productivity (yield) and the minimum productivity (in the 15 year period) India is in the last place, but its CGR and Coefficient of Variations in productivity are recorded as the fourth highest. The co-efficient of variations in Productivity Gap was highest (92.45 per cent) between Philippines and India and the lowest (6.15) between China and India. The Average, the Maximum and the Minimum Productivity Gaps were the highest between Egypt and India and the lowest between Philippines and India. The CGR and Co-efficient of Variations in Productivity Gaps were the highest between Philippines and India.

Conclusion

Even though India has shown an increase in productivity in the fifteen year period, the rate of growth in productivity is not significant as compared with other countries. There are many reasons for such low performance. Some of the reasons behind this slow growth rate being the fall in public investment in agriculture, disparities in productivity across the different paddy-growing regions within the nation, conversion of agricultural lands to other purposes, liberalization of agricultural trade, falling prices of the agricultural products in the world market, withdrawal of input subsidies and disproportionate use of fertilizers. The other reason for declining yield rate is the slower growth of area under High Yielding Varieties seeds, which appear to have stagnated in the last few years. According to a report the annual average farm growth rate has declined from 4.9 per cent in Eighth Plan to 1.3 per cent in the Tenth Plan. The average size operational holding declined from 2.28 hectares in 1970-71 to 1.41 hectares in 1995-96. In other words, 78.7 per cent land holding is of the size of less than two hectares. The reduction in land holding size is one of the major causes for worry.

Some other the reasons for slower productivity growth are the changes in climatic conditions, frequent monsoon failures, crop failure due to damages caused by pest and diseases, ineffective transfer of technology from Research Stations/Institutions to the farms cultivators, bringing out marginal and sub-marginal lands under cultivation due to increasing population may be the reasons for low productivity. Since the availability of lands is not infinite, the increase in productivity is the 'mantra' of the present state. Cultivating High Yielding Varieties with assured irrigation may be the solution to raise paddy yield. The extension of cultivable lands can be accomplished only by investing more in irrigation- oriented activities. Increasing the productivity and area under paddy cultivation can be achieved by policy implications of Government. Because any increase in productivity will increase the farm incomes of paddy cultivators, most of whom are mean land -holders, and also the nation's food-grain production and thus lead the nation to economic prosperity.

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A Study on Estimating the Fair Value of Future Income from Fruits Harvested from Standing Fruit Trees as Affecting the Income Security of Farmers

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Introduction

The estimation of the net present value of future income from fruits for a standing fruit tree is a matter of interest when compensation is due as the tree is acquired, irrevocably damaged or insured.

The extant methods for such estimation adopted by the Departments of Horticulture of the Governments of Punjab, Himachal Pradesh, Uttar Pradesh and Haryana are available and are being adopted for official purposes. There are unexplained inconsistencies in these methods. These inconsistencies in methodologies appear to be very wide, leading to huge differences in valuations across neighbouring states. These differences may partly be explained by possible variations in assumptions regarding costs and prices accross the states. Yet much of the variation can be traced to methodological differences. This calls for an examination of the subject which is attempted in this paper.

The issue of valuation of standing trees gains added significance on account of the increasing acquisition of agricultural land by State Governments for the purposes of infrastructure development such as roads, industries, urban expansion etc. Such acquisitions affect the distribution of income and wealth between agriculturists and non-agriculturists. There are questions of equity and many other social issues which lead to social turmoil as has been witnessed in recent times. It is pertinent that the evaluation of fruit income from standing trees and the compensation paid to agriculturists should be aligned with its fair value, more so when discounting rates ranging from 10% to 75% are being used on account of one time payment on the assessed value. Such a wide variation in discounting rates across different states highlights the presence of arbitrariness in the payment of compensation to the farmer.

In the present study, an attempt has been made to examine the valuation systems adopted by official agencies in the states of Punjab, Himachal Pradesh, Uttar Pradesh and Haryana. An analysis has been made which brings out the differences in methodologies and. a reasonable approach to the matter of determination of the fair value of fruits harvested from standing fruit trees has been suggested.

Methodology

The methodology followed in the present study involves the examination of basic principles and methods used by the states of Punjab, Himachal Pradesh, Uttar Pradesh and Haryana for the evaluation of income from fruits harvested from standing trees of Indian jujube (budded— *Zyzyphus mauritiana),* guava (layered—*Psidium guajava),* mango (grafted—*Mangifera indica)* and lemon (air layered—*Citrus limon).*

This comparative study is based on the standard principles and theory used for the evaluation of net present value in commerce and economics. The study focuses on class I fruit trees which are defined as trees having good commercial varieties from orchards having good management practices conducive to satisfactory yields in fruit production. For the purpose of discount factor, bank rates of interest on fixed deposits have been used. These have been obtained from the Central Bank of India, Central Office, Mumbai (2011). The data on inflation are based on the index numbers of wholesale prices and are taken from the Office of the Economic Advisor to Government of India (2011).

Results and Analysis

Punjab: In the case of Punjab, the formula adopted for evaluation of the income from fruits harvested from standing trees was developed in 1954 and later revised in 1966, 1985 and 2004. The present methodology is reflected in Table 1 given below.

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TABLE 1—STATEMENT FOR THE EVALUATION OF FRUIT TREES

Sl. No.	Kind of fruit	Pre-bearing stage		Bearing stage			
1	2	Non-recurring expenditure (Rs) 3	Recurring expenditure (Rs) 4	Mortality (%) 5	Age at which the tree comes in to bearing (years) 6	Average bearing life (years) 7	Yearly income from a class I tree (Rs) 8
3	Indian jujube	45	45	30	4th	50	300
8	Guava	45	45	10	4th	20	400
15	Mango	45	45	10	5th	75	300
26	Lemon	45	45	10	4th	30	300

Source—Director of Horticulture. 2004. Punjab

The basic value of a tree is taken as the value of the tree at the end of pre-bearing stage. It is obtained with the help of the following formula.

$$\text{Basic Value} = \text{Non-recurring expenditure} + [\text{Recurring expenditure per annum} \times \text{number of years of the pre-bearing stage}] \times \frac{100 + \text{mortality rate}}{100}$$

Thus, the basic value represents the total expenditure made by the farmer on planting and rearing a fruit tree.

In the bearing stage, the yearly income has been stated in column 8 of Table 1.

It is further stated that for class two, three and four orchards in descending order of quality, the yearly income stated in column 8 would be reduced to the extent of 75%, 50% and 25% respectively. But there is neither any formula nor any exact calculation which can indicate the precise methodology which has been used for arriving at this procedure.

In this method, there is an adjustment in income for the remaining life of the tree as given in Table 2 below.

TABLE 2—MULTIPLYING FACTOR FOR INCOME ACCORDING TO THE YEARS OF REMAINING LIFE OF THE TREES

Remaining life of the trees (years)	Multiplying factor
1-10	2/3
11-20	½
21-30	1/3
Over 30	¼

Source - Director of Horticulture 2004 Punjab.

Thus, this formula which has been used for arriving at the compensation value can be stated as follows: Compensation value = Basic value

+ (number of remaining bearing years x multiplying factor)

+ fuel or timber value

It appears that there is an area of opacity in this method due to the absence of any stated logic. It is not possible to determine whether the value of the tree arrived at, is aligned to the fair value of fruits from the tree. Even Table 2 which provides for discounting of the value of compensation is without any transparent analytical base. However, this method rightly takes into account the fuel or timber value of the standing tree.

Himachal Pradesh: In the case of Himachal Pradesh, the method adopted for evaluation of a fruit tree in the pre-bearing stage, is contained in Table 3 given below.

TABLE 3—BASIC VALUE OF FRUIT TREES

Sl. No. 1	Name of fruit 2	Non-recurring expenditure (Rs) 3	Recurring expenditure per anum (Rs) 4	Length of pre-bearing period (Years) 5	Basic value of a tree (Rs) 6
5	Indian jujube	30.50	60.51	4	273
11	Guava	38.50	69.74	4	317
20	Mango	45.00	112.86	6	578
16	Lemon	38.50	65.80	4	302

Source—Department of Horticulture. 2001. Himachal Pradesh.

It may be noted that the evaluation formula adopted by Department of Horticulture, Himachal Pradesh does not take into account the incidence of mortality and differs from the methodology of Department of Horticulture, Punjab in this respect.

This formula may be stated as follows :

$$\text{Value of a tree during pre-bearing stage or basic value} = \text{Value of Non-recurring expenditure} + \left\{ \text{Age of tree} \times \text{Average annual expenditure during pre-bearing period} \right\}$$

For the post -bearing stage, the methodology. adopted by Department of Horticulture, Himachal Pradesh is given in Table 4.

TABLE 4—AVERAGE ANNUAL COST OF MAINTENANCE AND AVERAGE ANNUAL INCOME

Sl. No. 1	Name of fruit 2	Average annual cost of maintenance/ cultivation per tree (Rs.) 3	Average annual production per tree (Kg) 4	Farm gate price (Rs. per Kg) 5	Average annual income per tree (Rs.) 6
5	Indian jujube	102	69	5	345
11	Guava	168	49	6	260
20	Mango	250	50	8	412
16	Lemon	152	31	6	186

Source-Department of Horticulture. 2001. Himachal Pradesh.

For the post-bearing period, the evaluation criteria adopted is as follows:

$$\text{Net present value (NPV) of likely earning for remaining bearing life} = \text{Remaining number of years in bearing life} \times \left\{ \textit{Average annual income} - \textit{Average annual expenditure} \right\} \times \textit{Average discount factor}$$

In this case, an average discount factor of 10% per annum has been used to get the discounted value of the future stream of income from the fruits during the remaining years of bearing— life of a tree. The 10% discount rate has been justified on the ground that it is close to the bank rate of interest on fixed deposits.

Further, the final value of a fruit—bearing tree is determined by applying the following formula:

Value of final compensation for a fruit bearing tree = Basic value + NPV of likely earning for remaining bearing life of a tree

Uttar Pradesh: In the case of Uttar Pradesh, the methodology for evaluation of fruit trees is as per Table 5 given below :

TABLE 5—STATEMENT FOR EVALUATION OF STANDING FRUIT TREES

Sl. No. 1	Name of fruit 2	Non-recurring expenditure. (Rs) 3	Recurring expenditure per annum (Rs) 4	Age at which the tree comes into bearing (years) 5	Average bearing life (years) 6	Yearly income from a class I tree (Rs) 7
18	Indian jujube	45	25	5th	45	400
2	Guava	55	25	4th	30	500
5	Mango	50	53	5th	50	800
24	Lemon	45	25	5th	20	150

Source - Director of Horticulture. 2007.Uttar Pradesh.

In this case, the NPV is obtained by discounting to an extent of three fourths of the sum of the future stream of income from a fruit tree.

The formula adopted is as follows:

NPV = Basic value + (Remaining years × Annual Income × ¼) + Fuel or timber value.

Haryana: In the case of Haryana, the methodology adopted by Department of Horticulture is as per Table 6 given below:

TABLE 6—STATEMENT FOR EVALUATION OF STANDING FRUIT TREES

Sl. No. 1	Name of fruit 2	Non-recurring expenditure (Rs) 3	Recurring expenditure per anum (Rs) 4	Age at which the tree comes into bearing (years) 5	Average bearing life (years) 6	Yearly income from a class I tree (Rs) 7
26	Indian jujube	50	260	5th	45	1000
16	Guava	50	260	4th	30	1200
5	Mango	50	260	5th	50	2000
22	Lemon	50	260	4tn	20	800

Source-Director of Horticulture. 2001.Haryana.

For a pre-bearing tree, the basic value of the tree is obtained by applying the following formula:

Basic value = Non- recurring expenditure + (Age of the tree at pre-bearing stage × Recurring expenditure per year)

For a bearing tree, the NPV is determined as follows:

NPV = Basic value of the tree

+ (Number of remaining bearing years × Income per year × 1/4) + fuel or timber value

Comparison

The methodologies adopted by the Departments of Horticulture of the four states of Punjab, Himachal Pradesh, Uttar Pradesh and Haryana are based on two stages in the life cycle of a fruit tree.

(1) The pre-bearing stage

(2) The bearing stage.

In the pre—bearing stage, there is a commonality of approach to the extent that the value of the tree at this stage is taken as "basic value". It is obtained as a sum of the non- recurring expenditure in planting the sapling and the recurring expenditure per annum multiplied by the years of non-bearing age. In the case of Punjab, there is a reduction to the extent of the survival rate attributed to mortality of saplings after plantation. This mortality is taken at 30% for Indian jujube and 10% for the other three fruit tree saplings. This would lead to a hike in the basic value of the surviving plants. There seems to a valid ground for such a provision. There are wide differences in the numbers relating to non - recurring and recurring expenditure for the non-bearing stage of the fruit trees. These differences may not be attributed to differences in cost across the states since there is a mobility of labour and resources across the neighbouring states leading to near equalization of costs and prices. There is a strong case for further investigation into this "aspect of the matter so that a statement can be made about the true picture regarding these costs. With "regard to the evaluation of fruit trees in the bearing stage, the following issues would emerge.

1. The methodologies adopted by the Departments of Horticulture mention yearly income for different fruit trees using figures which differ widely across the states (Table 7). This is unusual since these are neighboring states and the market mechanism would result in wiping out wide differences in prices of fruits across the states. In the three states of Punjab, Uttar Pradesh and Haryana, there is no mention of the procedure by which annual income from a tree has been arrived at.

TABLE 7—COMPARISON BETWEEN ESTIMATES OF ANNUAL INCOME FROM FRUITS HARVESTED FROM STANDING FRUIT TREES AND THE COMPENSATION PAID ACROSS STATES

	Uttar Pradesh 2007		Himachal Pradesh 2001		Punjab 2004		Haryana 2001	
	Annual income per tree (Rs)	Compensation paid after discounting	Annual income per tree (Rs)	Compensation paid after discounting (Rs)	Annual income per tree (Rs)	Compensation paid after discounting (Rs)	Annual income per tree (Rs)	Compensation paid after discounting (Rs)
1. Indian jujube	400	100.00	345	Discounted value using a discount rate of 10%	300	Compensation depends on remaining bearing life	1000	250
2. Guava	500	125.00	260		400		1200	300
3. Mango	800	200.00	412		300		2000	500
4. Lemon	150	37.50	186		300		800	200

Source: Tables 1, 4, 5 and 6

2. Wide inter -state differences in estimates of annual income per tree are evident from Table 7. Considering the four states of Uttar Pradesh, Himachal Pradesh, Punjab and Haryana, in that order, the figures for Indian jujube are Rs. 400, Rs. 345, Rs. 300 and Rs. 1000 respectively. For guava, the figures are Rs. 500, Rs. 260, Rs. 400 and Rs. 1200 respectively. For mango, the figures are Rs. 800, Rs. 412, Rs. 300 and Rs. 2000 respectively. For lemon, the figures are Rs. 150, Rs. 186, Rs. 300 and Rs. 800 respectively. These wide differences in adjoining states with high mobility in the transportation of these products are unexplained. The estimates of income from standing fruit trees are therefore open to question. This criticism is further compounded by the fact that income per tree is taken as a constant over long periods of time with no provision for

escalation on account of increases in the market prices of fruits.

3. In the case of all the four states, the future stream of income from fruits of a fruit tree has been discounted to obtain the NPV. In the case of Uttar Pradesh and Haryana, the method adopted for discounting is to take one fourth of the aggregate income as its discounted value. The rationale of the methods adopted for discounting is unexplained. The implication of this method for valuation of compensation for guava- trees for Uttar Pradesh is shown in column 4 of Table 8. The NPV at a discount rate of 8.75 % per annum is given in column 5. The extent of valuation (±) is given in column 7.

TABLE 8—IMPLICATION OF THE COMPENSATION FORMULA FOR GUAVA TREES WITH 30 YEARS OF REMAINING BEARING LIFE FOR UTTAR PRADESH

Trees with remaining fruit bearing years	Yearly income from Class I tree (Rs.) Yearly	Cumulative Total	Compensation (1/4th of yearly income) Cumulative Total (Rs)	Compound Interest earned rate of 8.75% per annum (Rs)	Amount after years at compound interest rate of 8.75% per annum	Extent of Under-valuation or Over-valuation against cumulative Total (Rs) (3 ± 6)
1	2	3	4	5	6	7
1.	500	500	125.00	10.94	135.94	–364.06
2.	500	1000	250.00	45.66	295.66	–704.34
3.	500	1500	375.00	107.3	482.3	–1017.7
4.	500	2000	500.00	199.34	699.34	–1300.66
5.	500	2500	625.00	325.66	950.66	–1549.34
6.	500	3000	750.00	490.61	1240.61	– 1759.39
7.	500	3500	875.00	699.03	1574.03	–1925.97
8.	500	4000	1,000.00	956.29	1956.29	–2043.71
9.	500	4500	1,125.00	1268.4	2393.4	–2106.6
10.	500	5000	1,250.00	1642.03	2892.03	–2107.97
11.	500	5500	1,375.00	2084.59	3459.59	–2040.41
12.	500	6000	1,500.00	2604.33	4104.33	–1895.67
13.	500	6500	1,625.00	3210.42	4835.42	–1664.58
14.	500	7000	1,750.00	3913.02	5663.02	–1336.98
15.	500	7500	1,875.00	4723.42	6598.42	–901.58
16.	500	8000	2,000.00	5654.17	7654.17	–345.83
17.	500	8500	2,125.00	6719.16	8844.16	+344.16
18.	500	9000	2,250.00	7933.79	10183.79	+1183.79
19.	500	9500	2,375.00	9315.14	11690.14	+2190.14

TABLE 8—IMPLICATION OF THE COMPENSATION FORMULA FOR GUAVA TREES WITH 30 YEARS OF REMAINING BEARING LIFE FOR UTTAR PRADESH—*Contd.*

Trees with remaining fruit bearing years	Yearly income from Class I tree (Rs.) Yearly	Cumulative Total	Compensation (1/4th of yearly income) Cumulative Total (Rs)	Compound Interest earned rate of 8.75% per annum (Rs)	Amount after years at compound interest rate of 8.75% per annum	Extent of Under-valuation or Over-valuation against cumulative Total (Rs) (3 ± 6)
1	2	3	4	5	6	7
20.	500	10000	2,500.00	10882.13	13382.13	+3382.13
21.	500	10500	2,625.00	12655.72	15280.72	+4780.72
22.	500	11000	2,750.00	14659.11	17409.11	+6409.11
23.	500	11500	2,875.00	16917.97	19792.97	+8292.97
24.	500	12000	3,000.00	19460.72	22460.72	+10460.72
25.	500	12500	3,125.00	22318.78	25443.78	+12943.78
26.	500	13000	3,250.00	25526.92	28776.92	+15776.92
27.	500	13500	3,375.00	29123.55	32498.55	+18998.55
28.	500	14000	3,500.00	33151.14	36651.14	+22651.14
29.	500	14500	3,625.00	37656.62	41281.62	+26781.62
30.	500	15000	3750.00	4269.82	46441.82	+31441.82

It can be shown that the situation is similar for the other fruit trees in Uttar Pradesh and for the four types of fruit trees in the case of Haryana where the same method of discounting is being applied by the Department of Horticulture.

In the case of Punjab, the figures are given in Table 9.

TABLE 9—IMPLICATION OF THE COMPENSATION FORMULA FOR GUAVA TREES WITH 30 YEARS OF REMAINING BEARING LIFE FOR PUNJAB

Trees with remaining fruit bearing years	Yearly income from Class I tree (Rs.) Yearly	Cumulative Total	Compensation (as per multiplying factor) of yearly income) Cumulative Total (Rs)	Compound Interest @ rate of 8.75% per annum earned (Rs)	Amount after year Col. 1 at compound inerest @ rate of 8.75% per annum	Extent of Under-valuation or Overvaluation against Cumulative Total (Col. 3) (Rs) (3 ± 6)
1	2	3	4	5	6	7
1.	400	400	266.67	23.33	290	–110
2.	400	800	533.33	97.42	630.75	–169.25
3.	400	1200	800.00	228.91	1028.91	–171.09

TABLE 9—IMPLICATION OF THE COMPENSATION FORMULA FOR GUAVA TREES WITH 30 YEARS OF REMAINING BEARING LIFE FOR PUNJAB—*Contd.*

Trees with remaining fruit bearing years	Yearly income from Class I tree (Rs.) Yearly	Cumulative Total	Compensation (as per multiplying factor) of yearly income) Cumulative Total (Rs)	Compound Interest @ rate of 8.75% per annum earned (Rs)	Amount after year Col. 1 at compound inerest @ rate of 8.75% per annum	Extent of Under-valuation or Overvaluation against Cumulative Total (Col. 3) (Rs) (3 ± 6)
1	2	3	4	5	6	7
4.	400	1600	1,066.67	424.99	1490.99	–109.01
5.	400	2000	1,333.33	694.74	2028.07	+28.07
6.	400	2400	1,600.00	1046.64	2646.64	+246.64
7.	400'	2800	1.866.67	1491.27	3357.94	+557.94
8.	400	3200	2,133.33	2040.09	4173.42	+973.42
9.	400	3600	2,400.00	2705.93	5105.93	+1505.93
10.	400	4000	2,666.67	3503	6169.67	+2169.67
11.	400	4400	2,200.00	3335.34	5535.34	+1135.34
12.	400	4800	2,400.00	4166.93	6566.93	+1766.93
13.	400	5200	2,600.00	5136.67	7736.67	+2536.67
14.	400	5600	2,800.00	6260.83	9060.83	+3460.83
15.	400	6000	3,000.00	7557.48	10557.48	+4557.48
16.	400	6400	3,200.00	9046.68	12246.68	+5846.68
17.	400	6800	3,400.00	10750.65	14150.65	+7350.65
18.	400	7200	3,600.00	12694.06	16294.06	+9094.06
19.	400	7600	3,800.00	14904.22	18704.22	+11104.22
20.	400	8000	4,000.00	17411.41	21411.41	+13411.41
21.	400	8400	2,800.00	13499.44	16299.44	+7899.44
22.	400	8800	2,933.33	15636.36	18569.69	+9769.69
23.	400	9200	3,066.67	18045.85	21112.52	+11912.52
24.	400	9600	3,200.00	20758.1	23958.1	+14358.1
25.	400	10000	3,333.33	23806.68	27140.01	+17140.01
26.	400	10400	3466.67	27228.74	30695.41	+20295.41
27.	400	10800	3,600.00	31065.12	34665.12	+23865.12
28.	400	11200	3,733.33	35361.18	39094.51	+27894.51
29.	400	11600	3,866.67	40167.09	44033.76	+32433.76
30.	400	12000	4000.00	45537.94	49537.94	+37537.94

The discounting method used by Department of Horticulture, Himachal Pradesh for arriving at the NPV of the future stream of income can be stated as follows.

$$NPV = R_0 + \frac{R_1}{1+i} + \frac{R_2}{(1+i)^2} + .. + \frac{R_n}{(1+i)^n}$$

where R_0 the return in period 0

R_1 is the return in period 1

R_n is the return in period n

and$_i$ is the rate of discount.

A rate of discount of 10% has been used. This choice is clearly without any justification. Bank interest rates on fixed deposits experience wide fluctuations over time and are lower on many occasions. This high rate of discount would lead to undervaluation of the discounted value of compensation per tree.

4. In the methods used by all the four states, the market value of produce has been kept constant over the remaining bearing life of the trees. There is a strong case for escalating the market prices of fruits to keep them aligned with price index numbers in order to arrive at a fair value of the fruits from standing trees over time. This is an important shortcoming in the prevalent methodologies.

Thus, on the one hand, the constancy of prices of fruits over time tends to result in an underestimate of the future income from the produce of standing fruit trees and on the other hand, the arbitrary choice of high discount rates also leads to an underestimation of net present value of the future produce from a fruit tree. In principle, for a fair valuation of future harvest from a fruit tree, the prices of fruits must be linked with the price index. However, the changes in price index are not constant and the choice of the rate of escalation in the prices of fruits over a very long period of time to cover the remaining bearing life of a tree itself raises some thorny problems. The rate of inflation itself fluctuates widely over time. (Table 10). There can be no justifiable reason to assume that next few decades will witness a given rate of inflation that will be sustained.

TABLE 10—WHOLESALE PRICE INDEX AND INFLATION (2004-05 = 100)

(year on year %)

	2006-07	2007- 08	2008-09	2009-10	2010-11	Feb-11	Mar-11	Apr-l1
WPI	111.4	116.6	126.0	130.8	143.3	148.1	148.6	150.6
Inflation (%)	6.6	4.7	8.1	3.8	9.5	9.6	9.1	8.7

Source: Office of the Economic Advisor. 2011.

On the other side, the bank rates of interest have been fluctuating widely i.e from 5% to 8.6% during 2003—2010 (Table 11). The choice of rate of interest and, rate of discount intrinsically involves an element of arbitrariness.

TABLE 11—INTEREST RATES ON FIXED DEPOSITS AT CENTRAL BANK OF INDIA

Serial No.	Applicable w.e.f.	Interest Rates for a Fixed Deposit Five Years and Above (%)
1.	1 September 2003	5.00
2.	12 November 2004	5.50
3.	1 August 2005	6.25
4.	1 April 2006	6.75
5.	22 January 2007	8.00
6.	11 August 2008	8.75
7.	9 January 2009	8.75
8.	6 March 2010	7.25

Source: Central Bank of India (2011)

One solution of the problem may lie in eliminating both factors i.e. the linkage with an escalating price index and the discounting of the future stream of income since these two factors have opposite effects and in certain situations their effects may be equalizing when the bank rates of interest on fixed deposits and the changes in the wholesale price index may not differ widely in magnitude. The determination of the fair value of fruits may be closer to the true value under such a dispensation. The case for this type of approach is strengthened in view of wide and unpredictable fluctuations in bank deposit rates and in the wholesale price index. This implies that the farmer may be paid compensation equal to the aggregate value of the future stream of income from the produce at current market prices without any discounting on the one hand and without any provision for increase in the market price of fruit in future, on the other hand.

Conclusions

The determination of the fair value of fruits from a standing fruit tree assumes importance when orchards are acquired by governments or private parties for various purposes affecting the income security of farmers.

The methodologies adopted by the Departments of Horticulture in the four states of Uttar Pradesh, Himachal Pradesh, Punjab and Haryana have been analysed with a view to obtaining a fair value of the harvested fruits from standing fruit trees. It is noted that there are wide differences in the estimates and methodologies that have been used regarding 'costs and annual incomes from fruits harvested from trees. Further, the income from fruits from standing trees has been kept constant with no provision of escalation due to rise in market prices of fruits.

The aggregate income over the remaining bearing life of a tree is also discounted to obtain the net present value in a questionable way resulting in underestimation of annual income from fruits which are harvested from standing trees.

It is noted that there are conceptual problems in arriving at the rate of future inflation with regard to fruit prices. Similarly, there are difficulties in selecting the rate of discount for determining net present value in view of wide fluctuations in bank interest rates over time.

It is concluded that a possible solution to the problem may be to ignore both factors (discounting and inflation) and to consider the aggregate value of the future stream of income from the produce at current market prices over the remaining bearing life of a fruit tree as a fair value.

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Challenges and Opportunities for Sustainable Viability of Marginal and Small Farmers in India

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The article examined the challenges and opportunities for sustainable viability of marginal and small farmers in India. It is suggested that for ensuring sustainable viability of marginal and small farmers, the creation of job opportunities in rural areas along with suitable policy support for development of livestock sector and other allied activities especially dairy, goat and sheep farming would be panacea for resource-poor farming community in the future.

Introduction

The Indian agriculture characterized by millions of marginal and small farmers, who are facing difficulties to operate the high risk of farming. The risk are related to weather uncertainties, uneven access to technologies and natural resources, unreliable input supplies, stressed infrastructure in power and irrigation and uncertain marketing arrangements which responsible for less bargaining power in input and output marketing of Indian farmers in present economic scenario. The increase in population, subdivision and fragmentation of land holdings due to breakdown of joint family system encouraging conversion of semi-medium and medium group of farmers into group of small and marginal farmers, which resulting un-economic land holdings. In future Indian agriculture will be dominated by marginal and small holdings, on which application of new agricultural technologies would become more difficult (Rao, 1989). However, opportunities are also widely open to marginal and small farmers in terms of increasing scope of human labour intensive enterprises such as fruits and vegetables, dairy, fishery, goat and sheep rearing etc. due to increasing consumption resulting demand of these high value commodities (HVCs) in recent years. Within the agricultural sector, high-value segment is expected to contribute more to the wellbeing of the smallholders, as its require more labour and generate higher returns than cereals (Joshi *et al*., 2006). Crop diversification possibly will be an important mechanism for employment generation, income growth, poverty alleviation, food and nutritional security, risk aversion and sustainability of the system from judicious use of scarce natural resources (Kar, *et. al*, 2003). The other important opportunities open in favours of marginal and small farmers due to implementation of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) during Eleventh Five Year Plan (2007-08 to 2011-12) through employment generation, land reclamation and water management especially for marginal and small farmers, restoration of old water bodies, rural roads and other agricultural infrastructure development.

The important agricultural development scheme such as strengthening of agriculture extension system through Agriculture Technology Management Agency (ATMA), Rashtriya Krishi Vikas Yojana (RKVY), National Food Security Mission (NFSM), National Horticulture Mission (NHM), National Rainfed Area Authority and Small Farmers' Agribusiness Consortium (SFAC) are also overcoming the challenges facing by marginal and small farmers.

The several study conducted on issue related to viability of marginal and small farmers at micro-level. Pasha, 1991 examined the role of animal husbandry and common property resources for sustainability and viability of small and marginal farmers in drought-prone region and found that ruminant livestock and common property resources played important role for viability and sustainability of marginal and small farmers. Chandra, 2001 reported that small farms are not viable unless they are supported with some supplementary income. Sidhu, 2002 concluded that the falling groundwater table is effectively excluding marginal and small farmers from utilizing this common natural resource, leading to tension and social strife in the state of Punjab. Singh *et al*., 2009 examined the contribution of various factors in viability of marginal and small farmers in state of Punjab and suggested that creation of off-farm employment opportunities, public investments to remove regional productivity gap, assuring remunerative prices of output and up-scaling of input supply to promote dairy and other allied activities should be made helpful viable to marginal and small farmers. Singh, 2000 suggested that corporatization and diversification of agriculture, introduction of new generation co-operatives, contract farming should be strengthen the viability of marginal and small farmers.

Keeping in view the majority of marginal and small farmers and their resource-poor condition, this study

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attempts to identify the challenges and opportunities determine the viability of marginal and small farmers in present economic scenario. The specific objectives are (i) to study the changes in pattern of number and share of area under operational holdings in various size groups of farmers; (ii) the status of farmers' land resources in major states; (iii) distribution of farms land into various activities and source of income by size group of farmers; (iv) changes in employment opportunities in rural India; (v) changes in agricultural wage rates after implementation of MGNREGS in major states; and (vi) policy suggestion to strengthen the viability of marginal and small farmers.

Data Source and Methodology

The study based on secondary data collected from various publications such as Agricultural Census in India, Directorate of Economics and Statistics, Ministry of Agriculture, Ministry of Rural Development, National Sample Survey office of Ministry of Statistics and Programme Implementation, Planning Commission, Ministry of Labour and Employment, Government of India and International Food Policy Research Institute, Washington and other published sources. The simple tabular analysis was used in this study.

Results and Discussion

Changes in pattern of number and share of area under operational holdings in various size groups of farms

The compound annual growth rate (CAGR) in number and area under operational holdings by various size groups for the period of 1970-71 to 2005-06 is presented in Table1. It shows that the total numbers of operational holdings in the country has increased from 120 million in 2000-01 to 129 million in 2005-06 and increase of around 8 per cent during five years. The total operated area has decreased from 159.44 million hectare (m ha) in 2000-01 to 158.32 m ha in 2005-06 showing a decline of about one per cent in corresponding period. The highest CAGR in number under size group of holdings was recorded in marginal (2.4 per cent) followed by small farmers (1.8 per cent). However, maximum negative CAGR was observed in large (-2.5 per cent), followed by medium (-0.7) farmers during 1970-71 to 2005-06. The same pattern observed in CAGR in area under various size groups.

TABLE 1—NUMBER OF OPERATIONAL HOLDINGS AND OPERATED AREA BY SIZE CLASS, 1970-71 TO 2005-06

Size groups	Number of holdings ('000)								
	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	CAGR
Marginal (< 1.0 ha)	36200	44523	50122	56147	63389	71179	75408	83694	2.4
Small (1.0-2.0 ha)	13432	14728	16072	17922	20092	21643	22695	23930	1.8
Semi-medium (2.0-4.0 ha)	10681	11666	12455	13252	13923	14261	14021	14127	0.8
Medium (4.0-10.0 ha)	7932	8212	8068	7916	7580	7092	6577	6375	–0.7
Large (> 10.0 ha)	2766	2440	2166	1918	1654	1404	1230	1096	–2.5
All sizes	71011	81569	88883	97155	106638	115579	119931	129222	1.7
	Operated area ('000 ha)								
Marginal (<1.0 ha)	14599	17509	19735	22042	24894	28121	29814	32026	2.4
Small (1.0-2.0 ha)	19282	20905	23169	25708	28827	30722	32139	33101	1.7
Semi-medium (2.0-4.0 ha)	29999	32428	34645	36666	38375	38953	38193	37898	0.7
Medium (4.0-10.0 ha)	48234	49628	48543	47144	44752	41398	38217	36583	–0.9
Large (> 10.0 ha)	50064	42873	37705	33002	28659	24161	21072	18715	–2.6
All sizes	162178	163343	163797	164562	165507	163355	159435	158323	-0.1

Source: Agriculture Census (various issue), Ministry of Agriculture, Government of India.

Table 2 shows the percentage share of number and area under various size groups of operational holdings during 1970-71 to 2005-06. The small and marginal holdings constituted 84 per cent in 2005-06 against 82 per cent in 2000-01 with the operated area of 41 per cent in 2005-06 against 39 per cent in 2000-01. The large holdings were one per cent of total number of holdings in 2005-06 with a share of 12 per cent in operated area in 2005-06. The share in number and area operated by marginal farmers were continuously increasing while medium and large farmers

were decreasing. It implies that the 65 per cent of marginal farmers occupied only 20 per cent of land area while one per cent of large farmers occupied 12 per cent of land area in 2005-06.

TABLE 2—SHARE OF NUMBER OF OPERATIONAL HOLDINGS AND OPERATED AREA BY SIZE CLASS, 1970-71 TO 2005-06

Size groups	Share in number of holdings (%)							
	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Marginal	51	55	56	58	59	62	63	65
Small	19	18	18	18	19	19	19	19
Semi-medium	15	14	14	14	13	12	12	11
Medium	11	10	9	8	7	6	5	5
Large	4	3	2	2	2	1	1	1
	Share in operated area (%)							
Marginal	9	11	12	13	15	17	19	20
Small	12	13	14	16	17	19	20	21
Semi-medium	18	20	21	22	23	24	24	24
Medium	30	30	30	29	27	25	24	23
Large	31	26	23	20	17	15	13	12

Source: Agriculture Census (various issue), Ministry of Agriculture, Government of lndia.

Status of Farmers' Land Resources for Agricultural Development

The scenario of farmers land resources and their economic status by states is presented in Table 3. It shows that 65 per cent of farmers are marginal and their land holdings below one hectare of land. The highest share of marginal farmers was recorded in the state of Kerala, followed by Bihar and West Bengal. The small and marginal farmers contribute over 80 per cent share of total farmers and they cannot sustain livelihood only on their own farms. These two groups of farmers supply their surplus labour to large farmers and secondary and tertiary sector. It is observed that states with higher share of marginal and small farmers and higher share of rainfed area are positively correlated with share of rural population below poverty line and higher score of State Hunger Index. For example the state of Punjab with lowest share of marginal and small farmers, higher average size of holdings, lowest rainfed area showed lower share of rural population below poverty line and lower score of hunger index (lower value indicates less severity of hunger). However, the state of Kerala is exception and shows peculiar feature, because maximum area are under plantation crops and lion share of agricultural labourers have been migrated to abroad and they contributed through remittances in big way in the state, the share of agriculture and allied sector in Net State Domestic Product (NSDP) is only 13 per cent. The state of Madhya Pradesh also showed peculiar result might be due to regular occurrence of severe drought, higher share of degraded land and lower level of adoption of new agricultural technology in the State.

TABLE 3—STATUS OF FARMERS' AND LAND RESOURCES FOR AGRICULTURAL DEVELOPMENT BY STATES IN INDIA 2005

State	[1]% share of marginal farmers (below 1.00 ha)	[1]% share of small farmers (1.00-2.00 ha)	[1]Total Number of farmers ('000)	[1]Average size of holding, 2005 (ha)	[2]% Rain-fed area, 2008-09	[3]% degraded land of total geographical area	[4]% of rural population below poverty line, 2004-05	[5]State Hunger Index Score, 2009
Andhra Pradesh	61.6	21.9	12044	1.2	55.6	57	11.2	19.5
Assam	63.7	21.5	2750	1.1	94.9	36	22.3	19.8
Bihar	89.6	6.7	14657	0.4	37.7	36	42.1	27.3
Gujarat	34.0	28.9	4661	2.2	56.8	53	19.1	24.7
Haryana	47.7	19.4	1603	2.2	19.5	31	13.6	20.0

TABLE 3—STATUS OF FARMERS' AND LAND RESOURCES FOR AGRICULTURAL DEVELOPMENT BY STATES IN INDIA 2005—*Contd.*

State	[1]% share of marginal farmers (below 1.00 ha)	[1]% share of small farmers (1.00-2.00 ha)	[1]Total Number of farmers ('000)	[1]Average size of holding, 2005 (ha)	[2]% Rain-fed area, 2008-09	[3]% degraded land of total geographical area	[4]% of rural population below poverty line, 2004-05	[5]State Hunger Index Score, 2009
Karnataka	48.2	26.6	7581	1.6	68.2	40	20.8	23.7
Kerala	95.6	3.1	6904	0.2	81.3	67	13.2	17.6
Madhya Pradesh	40.5	27.2	7908	2.0	56.5	59	36.9	30.9
Maharashtra	44.6	30.3	13716	1.5	81.8	43	29.6	22.8
Orissa	59.6	26.5	4356	1.2	60.9	39	46.8	23.8
Punjab	13.4	18.2	1004	4.0	2.2	18	9.1	13.6
Rajashtan	33.5	21.4	6186	3.4	64.8	40	18.7	21.0
Tamil Nadu	76.0	15.1	8193	0.8	41.9	41	22.8	20.9
Uttar Pradesh	78.0	13.8	22458	0.8	20.3	52	33.4	22.1
West Bengal	81.2	14.4	6992	0.8	40.8	31	28.6	21.0
India	64.8	18.5	129222	1.2	55.3	57	28.3	23.0

Source: [1]All India Report on Number and Area of Operational Holdings, 2005-06, Agriculture Census Division, [2]Department of Economics and Statistics, Ministry of Agriculture, [3]National Bureau of Soil Survey and Land Use Planning, Nagpur; "Planning Commission, Govt. of India; [5]India State Hunger Index: Comparisons of Hunger across States, International Food Policy Research Institute.

Distribution of farms Land into Various Activities and Source of Income by Size Group of Farmers

The land distribution for various activities and income from these activities by size group in India is presented in Table 4. It reveals that lower strata of marginal farmers with less than 0.01 ha of land were allocated highest share of land (68.81 per cent) to dairy activity, followed by crop cultivation (14.25 per cent), farming of goat and sheep (9.98 per cent) and farming of other animals (1.94 per cent) and received maximum income from dairy (77.60 per cent) followed by crop cultivation (10.04 per cent), farming of goat and sheep (5.33 per cent) and farming of other animals (5.01 per cent) in Kharif season, while in Rabi season this group of farmers were allocated their land for dairy (68.45 per cent), farming of goat and sheep (13.33 per cent), farming of other animals (6.94 per cent) and crop cultivation (6.89 per cent) and received income 66.20 per cent from dairy, 14.31 per cent from farming of other animals, 10.70 per cent from goat and sheep farming and 4.73 from crop cultivation. It implies that this group of farmers allocated maximum area for livestock sector and also received maximum income from this sector. The other size class of farmers such as small, semi-medium, medium and large and even upper strata of marginal farmers were allocated their land for crop cultivation (over 91 per cent) and also received highest share of income (over 94 per cent) from crop cultivation in both Kharif and Rabi season.

TABLE 4—PERCENTAGE DISTRIBUTION OF FARMED LAND POSSESSED BY TYPE OF AGRICULTURAL ACTIVITY FOR EACH SIZE CLASS OF LAND POSSESSED AND SOURCE OF INCOME, INDIA

Agricultural activity	Size class of land possessed and source of income from cultivation													
	Marginal				Small		Semi-medium		Medium				Large	
	<0.01		0.01-040	0.40-1.00	1.01-2.00		2.01-4.00		4.0-10.0				>10.0	
	% of land alloca-tion for activity	% of income from activity	% of land atocati on for activity	% of income from activity	% of land alloca-tion for activity	% of incom from activity	% of land alloca-tion for activity	% of income from activity	% of land alloca-tion for activity	% of income from activity	% of land alloca-tion for activity	% of income from activity	% of land alloc-ation for activity	% of income from activity
Season : Kharif														
Cultivation	14.25	10.04	93.30	95.91	95.94	97.15	96.50	97.30	96.11	96.71	96.71	97.41	97.51	97.95
Orchards and plantations	1.73	0.12	5.26	2.95	3.24	2.13	2.92	2.17	3.28	2.79	2.71	2.19	2.01	1.69
Dairy	68.81	77.60	0.82	0.76	0.35	0.36	0.28	0.29	0.31	0.28	0.30	0.25	0.23	0.20
Farming of goat sheep etc.	9.98	5.33	0.10	0.05	0.04	0.03	0.06	0.02	0.02	0.01	0.03	0.02	0.13	0.04
Piggery	0.88	0.45	0.01	0.01	0.01	0.01	0.00	0.0	0.01	0.01	0.0	0.0	00	00
Poultry/duckery	2.37	1.33	0.06	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.0	0.0
Fishery	0.03	00	035	0.18	0.35	0.26	0.15	0.11	0.22	0.16	0.13	0.03	0.06	0.06
Bee-keeping	0.01	0.12	0.00	0.0	0.0	0.0	0.00	0.0	0.00	0.0	0.01	0.0	0.0	0.0
Farming of other animals	1.94	5.01	0.09	0.10	0.05	0.05	0.09	0.09	0.04	0.04	0.11	0.10	0.06	0.05
Season : Rabi														
Cultivation	6.89	4.73	91.32	94.01	94.64	96.23	95.13	96.23	95.07	95.92	96.06	97.49	97.86	98.03
Orchards and plantations	0.86	0.48	6.30	3.91	4.22	2.76	4.09	3.13	4.17	3.44	3.24	2.0	1.91	1.73
Dairy	68.45	66.20	1.27	1.21	0.58	0.6	0.50	0.42	0.42	0.45	0.45	0.4	0.08	0.08
Farming of goat, sheep, etc.	13.33	10.70	0.35	0.21	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.0	0.0
Piggery	0.61	0.18	0.01	0.01	0.01	0.01	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0
Poultry/duckery	2.66	2.75	0.08	0.05	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.0
Fishery	0.25	0.63	0.50	0.43	0.44	0.29	0.17	0.12	0.24	0.13	0.21	0.06	0.09	0.10
Bee-keeping	0.01	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farming of other animals	6.94	14.31	0.17	0.17	0.06	0.05	0.06	0.06	0.05	0.03	0.02	0.02	0.06	0.06

Source: NSS Report No. 496: Some Aspects of Farming, 2003.

Employment Scenario in Rural India

The employment situation by broad group of industry in rural India during various rounds survey conducted on employment and unemployment in India is depicted in Table 5. It shows that number of employment have increased in primary sector and decreased in secondary and tertiary sectors for both male and female in usual principal status and usual status during 1989-90 to 1994-95. The reasons might be due to impact of abnormal year (1991 and 1992) therefore, females, children and elderly have joined in labour force due to misery during the period. However, number of employment has decreased in primary sector and increased in secondary and tertiary sector for both male and female in usual principal status and usual status during 1994-95 to 2009-10. It is also visualized that highest compound annual growth was recorded in usual principal status of male and usual principal status of female employment in tertiary sector. Highest negative compound annual growth was observed in primary sector in usual status for male employment. The reasons for deceleration in employment in primary sector might be due to implementation of MGNREGS as safety net hence, rural wages have increased in real terms resulted females, children and elderly people have withdrawn themselves from labour market due to income effect. The other factors such as easy access to credit, education, better job opportunities in secondary and tertiary sector and reducing in distress and increasing use of labour-saving technological change are also responsible for withdrawal from employment in primary sector.

TABLE 5—EMPLOYMENT SITUATION IN RURAL INDIA: PER 1000 DISTRIBUTION OF WORKERS EMPLOYED IN BROAD GROUP OF INDUSTRY FOR VARIOUS ROUNDS

Round	Survey period	Male						Female					
		Primary Sector		Secondary Sector		Tertiary Sector		Primary Sector		Secondary Sector		Tertiary Sector	
		ps	ps+ss	ps	ps+ss	ps	ps+ss	ps	ps+ss	ps	ps+ss	ps	ps+ss
45	July 1989-June 1990	716	717	120	121	164	162	800	814	130	124	70	61
51	July 1994-June 1995	752	756	104	103	144	141	862	871	88	83	50	46
55	July 1999-June 2000	712	714	127	126	161	160	841	854	93	89	66	57
61	July 2004-June 2005	662	665	157	155	181	180	814	833	108	102	76	66
66	July 2009-June 2010	497	628	260	193	243	178	675	793	177	130	148	76
	CAGR (%)	–8.2	–3.9	21.6	14.4	10.7	4.4	–3.9	–1.0	8.6	3.1	21.1	8.3

NOTE: ps and ps+ss denote usual principal status and usual status respectively.

Primary sector includes Agriculture, hunting and forestry and fishing; Secondary Sector includes Mining and quarrying, manufacturing, electricity, gas, water supply and construction; Tertiary sector includes Wholesale and retail trade, repair of motor vehicle and households goods, hotel and restaurants, transport, storage and communications, financial intermediation, real estate, renting and business activities, public administration and defence and social security, education, health and social work, other community, social and personal service activities, activities of private households as employers and production activities of private households.

Source: National Sample Survey on Employment and Unemployment in India (various round), Ministry of Statistics and Programme Implementation, GoI.

The changes in employment indicator during 2004-05 to 2009-10 in rural India are described in Table 6. It shows that LFPR and WPR in usual principal status and usual status for male has increased in smaller pace and for female labor decreased significantly. The indicators for unemployment (PU and UR) indicate that numbers of unemployed persons have decreased in both male and female workers might be due to implementation of MGNREGS in rural areas and shift of skilled labour in urban areas for better job opportunity. It implies that male labour participation rate has slightly increased due to job opportunities under MGNREGS and family income influenced the withdrawn of female workers for higher standard of living, children for education and elderly people for leisure time. It implies that WPR decline might be shift of children to school and college for education and other decent jobs in urban area. This argument is supported by Sundaram and Tendulkar (2006) that the female workers are moving out of labour force because of 'income effect' means if income of the households or male member increases, women may drop out of the labour force. Grote et al. (1998) indicate that increase in skilled wages would reduce child labour because the demand for education increases.

TABLE 6—CHANGES IN EMPLOYMENT INDICATORS (PER 1000) FOR ALL AGE IN RURAL INDIA

Particular	Labour Force Participation Rate (LFPR)			Workers Population Ratio (WPR)			Proportion Unemployed in Total Population (PU)			Unemployment Rate in Total Labour Force (UR)		
	Male	Female	Person	Male	Female	Person	Male	Female	Person	Male	Female	Person
61st (July, 2004-June, 05)												
(Usual Principal Status (ps)	546	249	401	535	242	391	12	8	10	21	31	25
(Usual Status (ps+s)	555	333	446	546	327	439	9	6	7	16	18	17
66th (July, 2009-June, 201 0												
(Usual Principal Status (ps)	548	208	382	537	202	374	11	5	8	19	24	21
(Usual Status (ps+s)	556	265	414	547	261	408	9	4	7	16	16	16
% change in 2009-10 over 2004-05												
(Usual Principal Status (ps)	0.2	–4.1	–1.9	0.2	–4	–1.7	–0.1	–0.3	–0.2	–0.2	–0.7	–0.4
(Usual Status (ps+s)	0.1	–6.8	–3.2	0.1	–6.6	–3.1	0	–0.2	0	0	–0.2	–0.1

Source: Author's calculation, data from 'Report on Employment and Unemployment Survey (2009-10) Labour Bureau, Ministry of Labour and Employment and NSSO, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

The perusal of Table 7 shows the distribution of households and casual labour in agriculture and allied sector in major states during 2009-10. It shows that 29, 14 and 22 per cent households were involved in self employment in agriculture, self employed in non-agriculture and agriculture labour respectively at all India level. The state of Andhra Pradesh ranks first in terms of highest share of households as agricultural labour, followed by Tamil Nadu and West Bengal. This group of households are reservoir and main source of supplier for unskilled and semi skilled labor in all sector of economy. The share of casual labour in rural areas was highest in Andhra Pradesh, followed by Tamil Nadu and Assam in case of male labour and Andhra Pradesh, Tamil Nadu and Karnataka in female labour. The casual labour employed in agriculture and allied sector 50 per cent and 68 per cent respectively at all India level and highest in Maharashtra and Andhra Pradesh in case of male and female respectively. The reasons for larger share of women workers in agriculture are generally due to unskilled nature of work in agriculture and allied activities, decline in man-land ratio which lead to out-migration of male workers and poverty. The casual women labour employed highest proportion in Andhra Pradesh, Gujarat and Karnataka respectively might be due to higher share of land degradation and out-migration of male workers.

TABLE 7—DISTRIBUTION OF HOUSEHOLDS AND CASUAL LABOUR IN AGRICULTURE SECTOR BY STATES IN INDIA, 2009-10

(Per cent)

State	% Share of households in rural India			%Share of casual labour in rural India		%Share of casual labour employed in agriculture and allied sector	
	Self employed in agriculture	Self employed in non-agriculture	Agri-culture labour	Male	Female	Male	Female
Andhra Pradesh	14.4	19.0	40.2	33.8	24.2	74.0	73.7
Assam	23.8	12.7	21.6	29.6	3.3	39.9	60.1
Bihar	18.2	12.5	20.2	23.0	3.0	39.2	59.2

TABLE 7—DISTRIBUTION OF HOUSEHOLDS AND CASUAL LABOUR IN AGRICULTURE SECTOR BY STATES IN INDIA, 2009-10—*Contd.*

(Per cent)

State	% Share of households in rural India			%Share of casual labour in rural India		%Share of casual labour employed in agriculture and allied sector	
	Self employed in agriculture	Self employed in non-agriculture	Agri-culture labour	Male	Female	Male	Female
Gujarat	40.8	11.6	23.6	22.1	12.7	57.8	72.5
Haryana	33.2	16.0	12.0	16.9	0.8	39.5	46.7
Karnataka	30.0	15.7	29.5	27.5	18.3	62.1	72.4
Kerala	15.9	11.0	18.9	29.2	6.6	39.8	60.5
Madhya Pradesh	36.3	13.1	16.2	17.8	5.5	38.8	53.1
Maharashtra	35.4	11.1	28.9	22.6	15.4	76.1	85.6
Orissa	19.8	16.9	25.7	25.9	6.0	49.8	60.9
Punjab	33.1	8.7	10.8	23.2	2.2	28.2	16.8
Rajashtan	25.1	14.9	23.5	20.5	6.7	45.6	46.3
Tamil Nadu	18.7	15.3	33.6	29.9	19.5	60.9	71.5
Uttar Pradesh	41.5	10.0	11.1	17.0	1.4	31.7	29.2
West Bengal	20.8	22.5	30.4	26.1	3.6	59.1	67.8
India	28.8	13.9	22.3	22.5	7.8	49.7	67.5

Source: Author's calculation, data from 'Report on Employment and Unemployment Survey (2009-10) Labour Bureau, Ministry of Labour and Employment, Government of India, New Delhi.

Changes in Agricultural Wage Rates after Implementation of MGNREGs in Major States

The nominal and real average wage rates for agricultural labour and changes between the year 2006 and 2010 is presented in Table 8. It shows that maximum changes observed in the state of Andhra Pradesh in nominal (130 per cent) and real (53 per cent) during 2006-2010. The state of changes in nominal wage rates but small even negative changes noticed in these states. The reasons for difference in the proportionate changes between nominal and real price of wage rates are variations in index in consumer price for agricultural laboures in respective States.

TABLE 8—CHANGES IN NOMINAL AND REAL AVERAGE DAILY AGRICULTURAL WAGE RATES (MALE) IN 2010 OVER 2006

State	Nominal average daily agricultural wage rates (Rs.)		% Change in 2010 over 2006	Real average daily agricultural wage rates (Rs.)		% Change in 2010 over 2006
	2006	2010		2006	2010	
Andhra Pradesh	61.5	141.4	129.8	16.0	24.6	53.2
Assam	68.6	104.8	52.8	19.0	19.1	0.5
Bihar	58.3	94.6	62.3	16.0	18.3	14.6
Gujarat	65.0	87.1	34.0	17.0	15.5	-9.0
Haryana	99.3	181.9	83.1	25.6	29.3	14.5
Karnataka	57.7	97.5	69.0	16.5	17.5	5.8
Kerala	204.1	301.7	47.8	56.0	57.1	2.0
Madhya Pradesh	48.7	77.3	59.0	13.2	14.1	7.3

TABLE 8—CHANGES IN NOMINAL AND REAL AVERAGE DAILY AGRICULTURAL WAGE RATES (MALE) IN 2010 OVER 2006—*Contd.*

State	Nominal average daily agricultural wage rates (Rs.)		% Change in 2010 over 2006	Real average daily agricultural wage rates (Rs.)		% Change in 2010 over 2006
	2006	2010		2006	2010	
Maharashtra	64.4	106.1	64.9	16.8	18.1	7.8
Orissa	57.5	105.0	82.7	16.6	20.2	21.6
Punjab	90.7	162.3	79.0	22.7	26.7	17.5
Rajasthan	83.2	139.4	67.7	21.1	23.7	12.2
Tamil Nadu	81.8	155.1	89.7	22.6	28.9	27.9
Uttar Pradesh	62.9	106.7	69.6	16.1	19.4	20.4
West Bengal	71.0	109.5	54.3	20.2	20.3	0.5

Source: a) Author's calculation with data on average daily rates for Agricultural Labour (Man) from Reports of the Commission for Agricultural Costs and Prices (Various issue), Department of Agriculture and Cooperation, Ministry of agriculture, Government of India, New Delhi and The Economic Times, Delhi Edition on 17 July, 2011.

Conclusions and Policy Implications

This article examined the changes in number and share of area under operational holdings in various size groups of farmers, land resources in major states, distribution of farms land into various activities and source of income by size group of farmers, changes in employment opportunities in rural India and changes in agricultural wage rates after implementation of MGNREGs in major states and its impact on viability of marginal and small farmers in present economic scenario. The results showed that number of marginal farmers has increased with 2.4 per cent compound annual growth rate, while number of large farmers decreased -2.5 per cent compound annual growth rate. The lower strata of marginal farmers with less than 0.01 ha. of land were allocated highest share of land (68.81 per cent) to dairy activity, followed by crop cultivation (14.25 per cent), farming of goat and sheep (9.98 per cent) and farming of other animals (1.94 per cent) and received maximum income from dairy (77.60 per cent) followed by crop cultivation (10.04 per cent), farming of goat and sheep (5.33 per cent) and farming of other animals (5.01 per cent) in Kharif season. The significant changes were recorded in nominal and real wage rates of agricultural labour in all major state except few states after implementation of MGNREGs. The study suggests that for ensuring sustainable viability of marginal and small farmers, the creation of job opportunities in rural areas along with suitable policy support for development of livestock sector and other allied activities especially dairy, goat and sheep farming would be panacea for resource-poor farming community in the future.

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Magnitude and Determinants of Indebtedness Among Small and Marginal Farmers : A Case Study of Patiala District in Punjab

Dharam Pal* Gian Singh**

Abstract

The small and marginal farmers are the backbone of Indian agriculture. Despite having such a significant role in the agricultural sector, most of them are under heavy debt. The present study determines and signifies the factors which contributed towards their indebtedness. Different sources from where the loans were availed and the purposes for which these were utilised by them have been studied to analyse their level of debt. The primary data was collected through the multi-stage random sampling technique from 110 households in all (41 belonging to the marginal farm-size category and 69 to the small farm-size category). The study was conducted in Patiala district of Punjab during the year 2007-08. The study found that most of the small and marginal farmers in Patiala district are under debt. The role of institutional and non-institutional sources is almost the same for an average sampled farm household. The farmers belonging to the larger farm-size category availed loans mainly from the institutional sources. It is encourging that on an average, small and marginal farmers are using major part of their borrowings (69.21 per cent) for productive purposes and the remaining (30.79 per cent) for unproductive purposes. It has been found that additional income from the subsidiary sources and higher education level are the factors which have helped to lessen the magnitude of thier indebtedness. It has also been observed that the factors like larger size of the family, larger ratio of credit from the non-institutional sources to that from the institutional sources, more use of loans for unproductive purposes and larger the farm-size have contributed to increase their burden of indebtedness.

The small farmers (having land between 2.5 and 5 acres) and marginal farmers (having land less than 2.5 acres) have been contributing significantly in the Indian agriculture. The literature available on small peasantry revealed that majority of the farmers are suffering from a major economic distress called indebtedness. There are several economic and non-economic factors which influencing their indebtedness. The major objective of the present study is to determine and signify the factors influencing indebtedness among the small and marginal farmers in Patiala district of the Punjab state. To analyse the debt level of the small and marginal farmers according to sources and purposes of debt is another objective of this study so that effective measures could be taken by the government, social organisations and farming community to lessen the debt burden of the small peasantry.

Data and Methodology

The present study based on multi-stage random sampling technique relates to the year 2007-08. Patiala district was purposely selected in the first stage. In the second stage, one village each was selected randomly from all the development blocks of the district. From these villages 110 households (41 belonging to the marginal farm-size category and 69 to the small farm-size category) were randomly selected and investigated, by taking 10 per cent households from the total number of small and marginal farmers. The data was collected from the sampled households through personal interviews. The outstanding amount of loan is taken as debt. To analyse the data, apart from using the mean values and percentages, the following multiple regression model was also used :

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6)$$

Where,

Y = Indebtedness (Rs.).

X_1 = Family-size (number).

X_2 = Ratio of credit from non-institutional sources to that from institutional sources.

X_3 = Income from subsidiary occupations (Rs.).

X_4 = Expenditure on unproductive purposes (Rs.).

X_5 = Educational level of the head of the family.

X_6 = Farm-size (areas).

The multiple regression model is used to determine and signify the factors influencing indebtedness among the small and marginal farm-size categories. The dispersion about an average value is measured by the Standard Error of the estimate.

Empirical Findings

Magnitude of Indebtedness

Punjab has played a vital role in transforming the country's image from a foodgrain deficit nation to a self-

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sufficient and stable economy (GOP, 2009). In fact, agriculture development has taken place at a very fast rate in Punjab state especially after the mid-sixties, due to technological change, called Green Revolution (Toor et al., 2006). Punjab is the state which has benefited the most from the so-called 'Green Revolution' (Talib and Majid, 1976). It helped in increasing the income levels as well as total foodgrain production. However, the Green Revolution is not completely green in the sense that the new technology in agriculture has benefited the farmers with larger holdings while those with smaller holdings lagged behind in the distribution of gains of Green Revolution. The small and marginal farmers were silent spectators to this revolution (Sinha, 1982). The large farmers gained more than the small farmers, an upward shift in their incomes (Johl, 1975), even the small farmers were unable to earn adequate per capita income from crop production because of their small land base (Bhalla and Chadha, 1982). As a result of their weak financial position, the small farmers were unable to reap the benefits of Green Revolution. Majority of the farmers due to their small output and income have negligible savings to meet the increased cost of crucial inputs like HYV seeds, fertilizers, irrigation, plant protection chemicals, etc. (Pandey *et al*., 1990). The bulk of the cultivators of the Punjab are born in debt, live in debt and die in debt (Darling, 1925). Though this was the case about nine decades back, the problem of indebtedness not only remained true today but it has aggravated further in the recent years (Narayanamoorthy and Kalamkar, 2005). In terms of per farmer debt Punjab comes on the top followed by Kerala, Andhra Pradesh, Tamil Nadu, Rajasthan, Karnataka, Maharashtra, Gujarat and Madhya Pradesh (Gill, 2009).

The data presented in Table 1 show the magnitude of indebtedness among the small and marginal farm households. The table highlights that more than 98 per cent of the sampled farm households are under debt. Regarding the debt position per household and per indebted household, the average amount is Rs. 111893.18 and Rs. 113965.27 respectively. Average amount of debt per household is found to be more in the case of the small farm-size category standing at Rs. 131964.50 as against the amount of Rs. 78114.63 for the marginal farm-size category. The average amount of debt per indebted household is also more in the case of the small farm-size category with the figure standing at Rs. 131964.50 whereas the corresponding figure for the marginal farm-size category is recorded at Rs. 82120.51. This positive relationship between the amount of debt and farm-size has an important implication (Singh and Toor, 2005). The loan advancing sources, i.e., institutional and non-institutional take into consideration the repaying capacity of the farm households, which is mainly indicated by their ownership of land. Despite many policy measures taken by the central and state governments, the indebtedness of farmers, especially marginal and small cultivators keeps increasing (Kaur and Singh, 2010).

TABLE 1—MAGNITUDE OF INDEBTEDNESS AMONG SMALL AND MARGINAL FARMERS

(Mean Values in Rs.)

Farm-size Categories	No. of Households		Amount Per Indebted Household	Amount Per Household
	No. of Sampled Households	No. of Households Under Debt		
Marginal Farmers	41	39	82120.51	78114.63
	(100)	(95.12)		
Small Farmers	69	69	131964.50	131964.50
	(100)	(100)		
All Sampled Farmers	110	108	113965.27	111893.18
	(100)	(98.18)		

Source: Field Survey, 2007-08.

NOTE: Figures given in parentheses represent percentages.

Indebtedness According to Source of Credit

The information regarding the role of various credit sources in the study area is presented in Table 2. The table evidently shows that non-institutional sources are playing a greater role in providing loans to an average marginal farm household, but in the case of average small farm household, institutional sources have an upper hand. The role of institutional and non-institutional sources is almost the same for an average sampled farm household.

The marginal farmers are under a total debt of Rs. 78114.63 out of which 57.65 per cent has been taken from non-institutional sources and remaining 42.35 per cent from institutional sources. While out of the total loan small farmers have taken 46.18 per cent from non-

institutional sources and 53.82 per cent from institutional sources.

Among institutional sources, co-operative societies/ banks are an important source of debt which accounts for 30. 10 per cent of the total debt by commercial and land development banks. This fact is supported by several studies which point out that co-operative loans were the major source of agricultural credit in India (Raghunath *et al.*, 1987; Goyal and Pandey, 1987; Naidu and Prasad, 1987) as well as in the Punjab state since independence (Kaur *et al*., 2009). On the other hand, in the case of non-institutional sources, commission agents are more important source of debt which account for 35.61 per cent of the total debt. Next in order of magnitude are the professional money-lenders, large farmers, relatives and friends and traders having 8.75 per cent, 2.29 per cent, 1.17 per cent and 1.35 per cent share in total debt respectively.

TABLE 2—DEBT INCURRED FROM DIFFERENT CREDIT SOURCES

(Mean Values in Rs.)

Sl. No.	Sources	Marginal Farmers	Small Farmers	All Sampled Farmers
A.	**Non-institutional Sources**			
	(i) Commission Agents	29800.73 (38.15)	45804.88 (34.71)	39839.70 (35.61)
	(ii) Professional Moneylenders	9233.15 (11.82)	10121.68 (7.67)	9790.50 (8.75)
	(iii) Large Farmers	2765.26 (3.54)	2441.34 (1.85)	2562.08 (2.29)
	(iv) Relatives and Friends	2249.70 (2.88)	752.20 (0.57)	1310.36 (1.17)
	(v) Traders	984.24 (1.26)	1821.11 (1.3 8)	1509.18 (1.35)
	Sub-total	**45033.08 (57.65)**	**60941.21 (46.18)**	**55011.82 (49.16)**
B.	**Institutional Sources**			
	(i) Co-operative Societies/Banks	19341.18 (24.76)	42202.24 (3 1. 98)	33681.30 (30.10)
	(ii) Commercial Banks	9225.34 (11.81)	22038.07 (16.70)	17262.42 (15.43)
	(iii) Land Development Banks	4515.03 (5.78)	6782.98 (5.14)	5937.65 (5.31)
	Sub-total	**33081.55 (42.35)**	**71023.29 (53.82)**	**56881.37 (50.84)**
	Total	**78114.63 (100.00)**	**131964.50 (100.00)**	**111893.19 (100.00)**

Source: Field Survey, 2007-08.

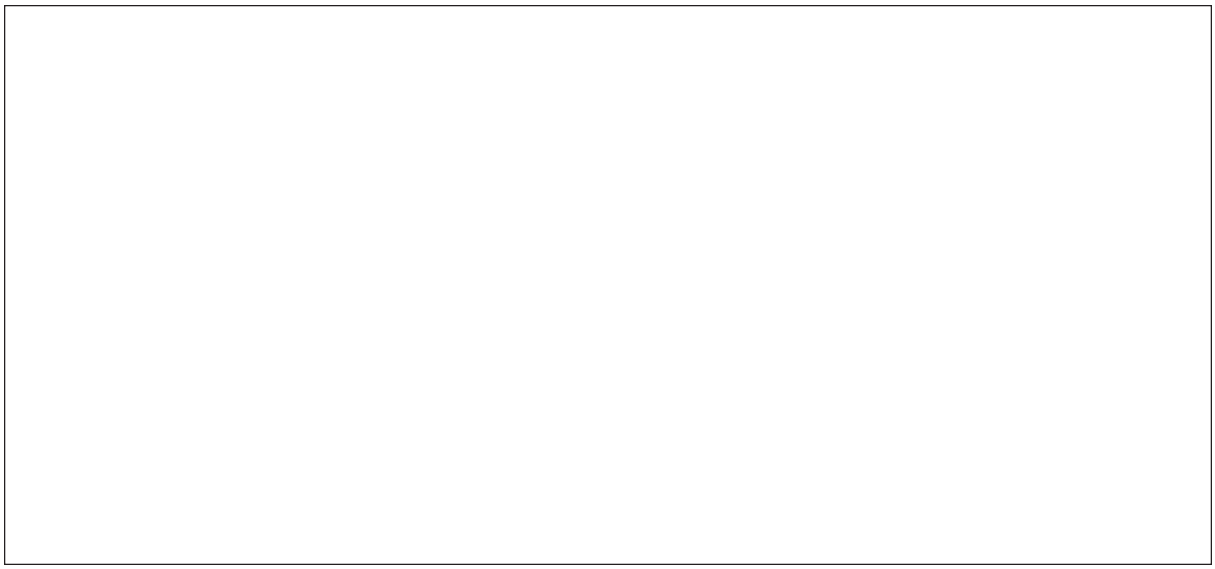
NOTE: Figures given in parentheses represent column-wise percentages.

The foregoing analysis clearly brought out that amongst institutional and non-institutional sources from where the small and marginal farm households take loans, commission agents appear at the first rank (GOP, 2004). The main reason behind it is that the small and marginal farmers find it easier to get loans from commission agents as compared to other sources for both productive as well as consumption purposes. The marginal and small farmers also find it convenient to get loans from non-institutional sources and avoid institutional sources due to their time consuming formalities and cumbersome procedures (Kaur and Singh, 2010).

The role of various credit sources in providing loans to the sampled farm-size categories is also clearly displayed by horizontal bars, presented in Figure 1.

Figure 1

Debt Incurred from Different Credit Sources



Purposes of Loans

The purpose for which the loan has been taken is an important task to discuss while dealing with indebtedness relating to the levels of living (Kaur and Singh, 2006). The various purposes for which the sampled farm-size categories are availing loans have been presented in Table 3. It is observed from the table that an average sampled farm household in Patiala district incurs Rs. 77436.74 and Rs. 34456.45 on productive and non-productive purposes respectively. The analysis indicates a good sign that on an average sampled farmers are using major part of their borrowings (69.21 per cent) for productive purposes and remaining (30.79 per cent) for unproductive purposes. The weaker section households mainly borrowed for the purchase of milch animals, minor irrigation and small farm equipments (Sharma and Ram, 1991).

TABLE 3—DEBT INCURRED FOR DIFFERENT PURPOSES

(Mean Values in Rs.)

Sl. No.	Purposes of Debt	Marginal Farmers	Small Farmers	All Sampled Farmers
A.	**Productive Purposes**			
	(i) Agricultural Inputs and Services	39283.85 (50.29)	71 181.65 (53.94)	59292.47 (52.99)
	(ii) Purchase of Milch Animals	11857.80 (15.18)	21879.71 (16.58)	18144.27 (16.22)
	Sub-total	51141.65 (65.47)	93061.36 (70.52)	77436.74 (69.21)
B.	**Non-productive Purposes**			
	(i) House Construction/Repairs	5100.89 (6.53)	10649.54 (8.07)	8581.41 (7.67)
	(ii) Purchase of Consumer Goods	6342.91 (8.12)	6162.74 (4.67)	6229.89 (5.57)

TABLE 3—DEBT INCURRED FOR DIFFERENT PURPOSES—*Contd.*

(Mean Values in Rs.)

Sl. No.	Purposes of Debt	Marginal Farmers	Small Farmers	All Sampled Farmers
	(iii) Expenditure on Health Care	3804.18 (4.87)	6901.74 (5.23)	5747.20 (5.14)
	(iv) Marriages and Other Socio-religious Ceremonies	9412.81 (12.05)	12312.29 (9.33)	11231.58 (10.04)
	(v) Redemption of Old Debt	2312.19 (2.96)	2876.83 (2.18)	2666.37 (2.38)
	Sub-total	26972.98 (34.53)	38903.14 (29.48)	34456.45 (30.79)
	Total	78114.63 (100.00)	131964.50 (100.00)	111893.19 (100.00)

Source: Field Survey, 2007-08.

NOTE: Figures given in parentheses represent column-wise percentages.

Amongst productive purposes, the highest loan for an average small and marginal farm household has been recordered in the case of agricultural inputs and services (52.99 per cent) followed by the purchase of animals (16.22 per cent), whereas the highest loan has been recorded on non-productive purposes in the case of marriages and other socio-religious ceremonies (10.04 per cent) followed by house construction/ repairs (7.67 per cent), purchase of consumer goods (5.57 per cent), expenditure on health care (5.14 per cent) and redemption of old debt (2.38 per cent). Almost the same trend is observed for the individual farm-size categories.

The highest expenditure on non-productive purposes, such as marriages and other socio-religious ceremonies and house construction is due to conservative approach towards maintaining fake social status, which is far away from reality (Singh, 1993). Majority of the farmers also take loans for consumption as well as for a variety of social obligations, which are unproductive and do not help to generate income. As the surplus income generated through crop cultivation is not assured and often is inadequate, the farmers are unable to repay the loan in time and thus the burden of debt goes on increasing (Narayanamoorthy and Kalamkar, 2005).

Determinants of Indebtedness

Punjab agriculture is beset with its own internal problems such as stagnating/declining yield, increasing cost, stagnating/declining returns, over mechanization, over use of fertilizers and pesticides and herbicides, depletion of ground water, high proportion of small and marginal farmers, disguised unemployment, stagnation of net sown area and gross area under crops, etc. (Ghuman, 200I). The liberlisation of economy in the 1990s has created a set of problems for the farming community in general and the small farmers in particular. The new economic policy advocates withdrawal of the state from the economic sphere by leaving it to the logic of market forces (Jodhka, 2006). The above factors result in that farming has become an unviable activity, particularly for the marginal and small farmers (Dev, 2008). The burden of indebtedness has been continuously compelling the farmers to commit suicides. By and large, the incidence of suicides has been higher among the small and marginal farmers, which have been moving from subsistence agriculture to the high value crops with a strong motivation to improve their social and economic status (Rao and Gopalappa, 2004).

The amount of debt at a given point of time is influenced by several economic and non-economic factors, such as family-size, ratio of credit from the non-institutional sources to that from the institutional sources, income from subsidiary occupations, expenditure on unproductive purposes, educational level of the head of the family and farm-size. The hypotheses related to these factors are tested by using multiple regression model and the results are presented (Table 4) as under:

(1) Larger the family-size, greater would be the magnitude of indebtedness-

The table reveals that the regression coefficient between family-size of the sampled farm-size categories and magnitude of indebtedness is found to be positive. This is because, as family-size increases, more expenditure is incurreds on the household activities, marriage and other social ceremonies, construction of house etc., while the surplus income generated through crop cultivation is not assured and often is inadequate. Moreover, on an average

the farmer's income in Punjab is nearly stagnant since early 1980s (Sidhu, 2004). Hence, the hypothesis stands proved.

(2) As ratio of credit from the non-institutional sources to that from the institutional sources increases, the magnitude of indebtedness also increases-

As discussed earlier, the role of institutional and non-institutional sources is almost the same for an average sampled farm household. Therefore, the ratio of credit from the non-institutional sources to that from the institutional sources is nearly unity. The analysis points out that the relationship between the factor, i.e., 'ratio of credit from the non-institutional sources to that from the institutional sources and the magnitude of indebtedness is found positive and very high for the sampled farm-size categories taken together or considered category-wise. It strongly proves that as ratio of credit from the non-institutional sources to that from the institutional sources increases, the magnitude of indebtedness also increases.

TABLE 4—FACTORS DETERMINING INDEBTEDNESS (RESULTS OF MULTIPLE REGRESSION ANALYSIS)

S. No.	Independent Variables	Marginal Farmers	Small Farmers	All Sampled Farmers
1.	Family-size	0.3407	0.5105	0.4550
		(0.2419)	(0.3088)	(0.2815)
2.	Ratio of Credit from the Non-institutional	1.2607	1.2245	1.2377
	Sources to that from the Institutional Sources	(0.3850)	(0.4626)	(0.4383)
3.	Income from Subsidiary Occupations	–1.1897	–0.2642	–0.6312
		(0.5637)	(0.3924)	(0.3825)
4.	Expenditure on Unproductive Purposes	2.0641	2.5791	2.2143
		(0.5637)	(0.4897)	(0.5268)
5.	Educational Level of the Head of the Family	–0.4599	–0.8132	–0.6724
		(0.2849)	(0.3070)	(0.2989)
6.	Farm-size	0.4854	0.2698	0.3224
		(0.2879)	(0.1850)	(0.2648)
	R^2	0.61	0.67	0.63

Source: Field Survey. 2007-08.

NOTE: Figures given in parentheses indicate Standard Error of Coefficient.

Dependent Variable: Indebtedness

In spite of the various measures to rejuvenate farm credit, the flow of credit to agriculture sector remained quantitatively and qualitatively poor. The institutional sources of credit meet 51 per cent of the credit requirements of the farm sector. The non- institutional sources were mainly approached by the farmers due to lack of security assets with them, frequent needs, inadequate supply of institutional credit, undue delays, sophisticated procedure and malpractices adopted by institutional lending sources (Singh and Sekhon, 2005). Due to ill-effects of non-institutional credit, provision of institutional credit for agricultural purposes has assumed great significance in recent years. The need is much greater in the case of small and marginal farmers as they lack self- financing capacity (Sankaraiah and Naidu, 1983). Due to hue and cry created by the farmers' organizations and political activists, commission agents are becoming hesitant to advance loans to the farmers, particularly, to the ones who are in distress (Kaur *et al*, 2009). Agricultural credit policy has been progressively institutionalised for providing timely and adequate credit to the farmers for increasing agricultural production and productivity (GOI, 2000).

(3) Higher the Income from Subsidiary Occupations, Lower is the Magnitude of Indebtedness—

The table reflects a negative regression coefficient between the factor 'income from subsidiary occupations' and the magnitude of indebtedness for the sampled farm-size categories taken together or considered category-wise. The magnitude of negative regression coefficient in the case of marginal farm-size category (-1.1897) is greater than that in small farm-size category (-0.2642) which reflects that subsidiary income helps more the marginal farmers in lowering their debt than the small farmers. This is due to the fact that farm business income in the case of marginal farmers is merely 67.71 per cent of the total whereas the corresponding figure for small farmers is 84.49 per cent (Pal, 2008). It indicates that with subsidiary occupations the total income of a farmer increases, which helps in curtailing his indebtedness. In the rural areas, the small

and marginal farmers were not given needed credit and were thus credit starved. Many agencies have been started and strengthened by the government for the economic upliftment of these farmers and credit being provided to the weaker sections for various activities (Sinha, 1982). The small farms are not viable unless they are supported with additional income from other sources. Holdings are becoming smaller, forcing many marginal farmers to look for alternative sources of income, such as animal husbandry and agricultural labour (GOP, 2004).

(4) Expenditure on unproductive purposes and the magnitude of indebtedness are positively related-

The regression coefficient is found to be positive and very high between the factor, viz. 'expenditure on unproductive purposes' and the magnitude of indebtedness for the sampled farm-size categories taken together or considered category-wise. It indicates that as the expenditure on unproductive purposes like marriages and other socio-religious ceremonies, purchase of consumer goods, expenditure on health care and house construction increases, it plunges the farmers into more indebtedness. Hence, the above hypothesis stands proved.

It is also generally said that farmers in Punjab spend too much on 'so-called' non-productive (consumption) purposes, but this is not true in the case of small and marginal farmers who are struggling to meet their basic necessities of life, viz. food and clothing. They have to spend some income on socio-religious ceremonies as required by the society. Various other studies conducted outside fanning in different contexts have pointed out that large expenses on health care, death and marriage ceremonies in India are met with loans on high interest taken from the money-lenders which make the families fall into poverty and indebtedness (Krishan *et al*., 2003; Krishna, 2003; Pawar *et al*., 1991; Jodha, 1988). In fact, the non-availability of consumption loans from formal institutions leads farmers to use productive loans for consumption purposes. The NSSO data show that only 20 per cent of the credit was used for so-called consumption purposes (Singh, 2006), which indicates that income from various sources of the small and marginal farmers is not sufficient to meet their minimum level of consumption.

(5) Higher the level of education of the head of the family, lower is the indebtedness-

The analysis points out that the regression coefficient between education level of the head of the family and magnitude of indebtedness is found to be negative. It establishes an inverse relationship between education level and indebtedness, thereby leading to the fact that as the education level improves the indebtedness comes down. Hence, it proves the hypothesis that higher the education level of the head of the family, lower is the indebtedness. Education is considered the single largest determinant of socio-economic transformation. Moreover, education affects the inner core of economic activities both in the market and household sphere. Further, educational investment is more productive and enduring, and it generates a return more than any other form of physical investment (Gill *et al.*, 2010). In fact, an educated farmer can arrange institutional loan with lower rate of interest and can also encourage family members for subsidiary occupations to supplement the household income, resulting in low magnitude of indebtedness (Kaur and Singh, 2010).

(6) Bigger the farm-size, higher would be the magnitude of indebtedness-

The table reveals that the regression coefficient between farm-size and indebtedness is found to be positive for the sampled farm-size categories taken together or considered category-wise. The positive relationship between farm-size and indebtedness implies that the capability of the farmers to take and pay back loans increases with an increase in their landholding. Farmers with landholdings above 5 acres have greater access to bank credit over the period of time as compared to small and marginal farmers despite the fact that majority of the farmers (approx. 70 per cent) are marginal farmers (Kaur and Kaur, 2009).

The coefficient of multiple determination (R^2) is 0.63 for all the sampled farm households. This suggests that the explanatory variables explain 63 per cent variation in the dependent variable. The magnitude of coefficient of multiple determination is more in the case of small farmers and lower for marginal farmers. The above analysis suggests that by improving the educational level of the farmers, increasing household income through subsidiary occupations, encouraging them to get loan from institutional sources, educating them to control the size of the family and unproductive expenditure, the magnitude of rural indebtedness in Punjab can be curtailed to some extent.

Conclusions and Policy Implications

1. Almost all the small and marginal farmers in Patiala district are under debt.
2. The role of institutional and non-institutional sources is almost the same for an average sampled farm household. Among institutional sources, co-operative societies/banks are an important source of debt and on the other hand, the first rank goes to commission agents among the non-institutional sources.
3. The larger farm-size category of farmers availed their loan mainly from institutional sources.

4. It is encouraging to note that on an average, small and marginal farmers in Patiala district are using major part of their borrowings (69.21 per cent) for productive purposes and remaining (30.79 per cent) for unproductive purposes.

5. It has been found that more income from the subsidiary sources and the higher level of education help to lessen the magnitude of indebtedness.

6. It has also been observed that households having larger size of the family, larger ratio of credit from the non-institutional sources to that from the institutional sources, more expenditure on unproductive purposes and larger the size of the farm are under high burden of indebtedness.

The above analysis indicates that farmers belonging to the marginal and small farm size categories in Patiala district are under high burden of indebtedness. To improve the economic condition and overcome the problem of debt among the small and marginal farmers, effective measures should be taken by the government, social organisations and farming community. To overcome the problem of non-availability of required amount of credit at proper time and reasonable rate of interest, the government must exercise a strong check on the activities of non-institutional credit sources and provide institutional credit facilities to the marginal and small farmers at low rate of interest with easy repayment facilities. To raise the income levels of the farmers, the government should encourage the farmers in starting subsidiary occupations. Apart from it, the government must ensure remunerative prices of agricultural produce taking into account the cost or production and consumer price indices. Implementation of land reforms in favour of the marginal and small farmers will result in increasing their farm-size and farm business income and consequently will reduce their indebtedness. Quality education should be provided to the children of the farmers so that they may get jobs in the non-agriculture sectors and help their parents and other family members in reducing their debt. Farmers should be educated about the benefits of a small family through media. To reduce unproductive expenditure, a mass campaign should be launched against intoxicants and the conservative social values, the symbol of social status, which imposes unbearable expenditure on unproductive purposes, such as marriages and other socio-religious ceremonies. The small and marginal farmers also need to be educated to manage their living and consumption expenditure within their means.

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Impact of the National Horticulture Mission Scheme in Rajasthan

1.1 Introduction

Endowed with diverse soil and climate conditions, India produces a wide variety of fruits, vegetables, root and tuber crops, flowers, ornamental plants, medicinal and aromatic plants, spices, condiments, plantation crops and mushrooms. These crops form a significant part of total agricultural produce in the country. India has made significant strides in area expansion, overall increase in production and productivity of horticultural crops. The horticultural crops play a unique role in India's economy by improving the income of the rural people. Cultivation of these crops generates lot of employment opportunities for the rural population. India with more than 71.5 million tonnes of fruits and 133.7 million tonnes of vegetables is the second largest producer of fruits and vegetables in the world next only to Brazil (for fruits) and China (for vegetables). India is the largest producer of fruits likes mango, banana, papaya, sapota, pomegranate and aonla. As a result of synergy between focused research, technological and policy initiatives, horticulture in India has become a sustainable and viable venture for the small and marginal farmers. Besides, the sector has also started attracting entrepreneurs for taking up horticulture as a commercial venture. A large number of programmes are in operation for further development sector in the country. The production, productivity and export of horticultural output have significantly increased over few decades in the country. The demand of horticultural produce is also on rise due to increasing population, changing food habits, realization of high nutritional value of horticultural crops and greater emphasis on value addition and export. Therefore, there is a great scope for the horticulture industry to grow and flourish in our country. Thus Government of India has launched National Horticulture Mission (NHM) scheme to facilitate further development of horticultural crops in India and to ensure forward and backward linkages with the active participation of all the stakeholders.

National Horticulture Mission (NHM) has been implemented in 2005-06 in 18 States and 3 Union Territories of India excluding the states covered under Horticulture Mission for North East and Himalayan States (HMNEH) to promote holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushroom, spices, flowers, aromatic plants, cashew and cocoa. NHM is a centrally sponsored scheme in which Government of India provided 100 per cent assistance to the State Missions during Tenth Plan. With effect from the XI Plan (2007-08), the State Government is contributing 15 per cent of the share (GoI, 2010).

The main objective of the Mission is to promote the holistic growth of the horticulture sector through area based regionally differentiated cluster approach for development of horticultural crops having comparative advantage. The mission envisages an end- to-end approach covering production, post harvest management (PHM), primary processing and marketing for which, assistance is being provided to farmers, entrepreneurs, besides organizations in the public and private sector. Since the programme has entered in the sixth year, there was a need to access and analyze the impact of the programme vis-a-vis objectives of the NHM scheme especially for the major focused crops in terms of area expansion, increase in production and productivity. Since the focus is on cluster approach for holistic development of potential crops, it was necessary to undertake in-depth study in respect of selected crops taken up for development.

In Rajasthan, the NHM scheme is being implemented in 24 districts with cluster approach by the Rajasthan Horticulture Development Society through District Mission Committees involving farmers, societies, NGOs, grower associations, SHGs, state institutions etc. The districts of Rajasthan covered under the program include Alwar, Ajmer, Banswara,Barmer, Baran, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jaipur, Jalore, Jaisalmer, Jhalawar, Jhunjhunu, Jodhpur, Karauli, Kota, Nagaur, Pali, Sawai Madhopur, Sirohi, Sri Ganganagar, Tonk, and Udaipur. The focus crops identified under NHM for Rajasthan state include aonla, mandarin, kinnow, ber, 'lemon, guava, bael, pomegranate, papaya, spices, flowers, medicinal and aromatic plants. The major activities being undertaken through NHM in the state are production and distribution of planting material, vegetable seed production, area expansion, rejuvenation of old and senile orchards, creation of community water resources, protected cultivation, IPM/ INM, organic farming, pollination support through bee-keeping, development of post harvest management and marketing infrastructures and human resource development.

1.2 Objectives and Methodology

The major objectives of the study were to assess the impact ofNHM in terms of increase in area, production and productivity of identified horticultural crops covered under NHM, keeping 2004-05 as the base year for the state of Rajasthan in general and for the identified crops/districts in particular; to assess the extent to which the scheme

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has helped in creating employment opportunities and enhancement of income of the farmers in Rajasthan and to suggest measures for improving the implementation strategy of NHM in Rajasthan.

The present study covering selected districts of Rajasthan state is a part of a major project that covers 16 states of India to study the impact ofNHM scheme. For the state of Rajasthan, the study was conducted in four districts, viz., Alwar, Jaipur, Chittorgarh and Banswara. The study covers the implementation of the NHM programme from 2005-06 to 2008-09. A total of 200 households were selected from 77 villages of four allotted districts of Rajasthan. Members of Growers Associations, Pradhan/Pramukh of village, block, district level and state level concerned functionaries were also interviewed. While selecting the sample, care was taken to represent all the section of the society such as small and marginal farmers, SC/ST farmers and women folk, so that outreach of the programme to these sections is also reflected in the study. Data were analyzed using simple statistical tools such as averages, percentages and growth rates.

1.3 Major Findings of the Study

1.3.1 Area, Production and Productivity of Horticultural Crops in the State

Rajasthan with its huge geographical area of 342.699 lakhs hectares has attained the status of being largest state of India. The agriculture in Rajasthan is primarily rainfed. The rainfall is highly inadequate (average annual rainfall is 575 mm) and variable both in time (3 out of 5 years are drought year) and quantum (23.55 cm to 99.9 cn). The arid and semiarid areas constitute about two-third of total geographical area of the state. The state is full of potential as the diverse agro-climatic conditions are very much favoring growing of large number of horticultural crops like fruits, vegetables, spices, flowers and medicinal & aromatic plants throughout the year.

As far as the status of area, production and yield of horticultural crops in the state of Rajasthan is concerned, the area under horticultural crops as a proportion of cultivable area was found to increase from 3.14 per cent during TE 2004-05 to 3.41 per cent during TE 2008-09. The total area under all horticultural crops has increased from 3,23,347 hectares during TE 1980-81 to 8, 71,539 hectares during TE 2008-09 in Rajasthan. The total production from all horticultural crops has increased from 1,84,794 MT during TE 1980-81 to 18,48,466 MT during TE 2008-09 in Rajasthan. The district-wise analysis of horticultural area in the state revealed that the horticultural area as a proportion of cultivable area was highest of 25.74 per cent in Jhalawar district and was lowest of 0.26 per cent in Hanumangarh district during TE 2008-09.

As regards the growth of area and production of various types of horticultural crops like fruits, vegetables, spices, flowers and medicinal crops in Rajasthan from TE 1980-81 to TE 2008-09, it was observed that there were so many ups and downs in growth of both area and production of various types of horticultural crops during the period from TE 1980-81 to TE 2008-09. However, the instability in growth of yield was much higher than the instability in growth of area under these crops over the years. The area under horticultural crops like fruits, vegetables, spices and medicinal crops in Rajasthan during the period TE 1980-81 was 11777 hectares, 38660 hectares, 251911 hectares and 21000 hectares respectively. The production of various types of horticultural crops, viz., vegetables, spices and medicinal crops in Rajasthan during the period TE 1980-81 was 64038 MT, 118075 MT and 2681 MT respectively (Table 1).The area under fruits, vegetables, spices, flowers and medicinal crops in Rajasthan during the period TE 2008-09 was 29069 hectares, 130539 hectares, 495405 hectares, 3142 hectares and 213385 hectares respectively. The production of fruits, vegetables, spices, flowers and medicinal crops in Rajasthan during the period TE 2008-09 was 483200 MT, 792788 MT, 473541 MT, 4241 MT, 94697 MT and 1848466 MT respectively. The annual growth rate of area and yield of all horticultural crops was 4.47 per cent and 11.01 per cent respectively between TE 1980-81 and TE 1990-91. While the annual growth rate of area of horticultural crops has further increased to 4.63 per cent during the period of TE 1990-91 - TE 2000-01, the annual growth rate of yield of horticultural crops has declined to 0.74 per cent during the same period.

The district-wise analysis of area and production of different types of horticultural crops for the periods TE 2004-05 and TE 2008-09 reveals that the horticultural area was also highest of 1, 05,186 hectares in Barmer district and was also lowest of 872 hectares in Dungarpur district during TE 2008-09. The production of horticultural crops during the same period was highest (283982.9 MT) in Jhalawar district followed by 176428.4 MT in Jodhpur district, 165224.2 MT in Sri Ganganagar district. As far as the growth rate of area and yield of horticultural crops in various districts is concerned, it may be noted that, between TE 2004-05 and TE 2008-09, Rajsamund, Hanumangarh and Sirohi occupied first three positions with 15.1 per cent, 11.43 per cent and 10.64 per cent of annual growth in area under horticultural crops respectively. On the other hand, Sri Ganganagar, Bharatpur and Hanumangarh occupied first three positions with 43.44 per cent, 23.05 per cent and 16.20 per cent of annual growth in production of horticultural crops respectively between the same periods.

TABLE 1—AREA, PRODUCTION AND YIELD OF HORTICULTURE CROPS IN RAJASTHAN (1980-81 TO 2008-09)

(A) Area and production of horticulture crops (area in hectares, production in metric tonnes)

Year	Fruits		Vegetables		Spices		Flowers		Medicinals		Total Horti.	
	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
TE 1980-81	11777	0	38660	64038	251911	118075	0	0	21000	2681	323347	184794
TE 1990-91	15713	72729	54091	261599	303857	253470	0	0	59826	1133	433486	588930
TE 2000-01	20536	239076	94667	401366	417511	342218	1847	2665	124775	75530	659335	1060855
TE 2008-09	29069	483200	130539	792788	495405	473541	3142	4241	213385	94697	871539	1848466

(B) Growth rate in area and yield of horticulture crops in Rajasthan (%)

	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield
1980-81 to 1990-91*	3.78 (0.75)	–6.35 (–1.84)	4.00 (6.94)	7.19 (5.82)	3.55 (2.66)	14.93 (6.50)	NA NA	NA NA	11.67 (4.27)	–8.71 (–2.53)	4.47 (4.87)	11.015 (9.46)
1990-91 to 2000-01*	–0.28 (–1.303)	8.09 (3.16)	5.46 (9.13)	–2.33 (–2.95)	3.61 (1.91)	0.41 (0.31)	–2.60 (–0.39)	3.57 (0.68)	9.51 (6.03)	–1.31 (–0.87)	4.63 (3.20)	0.74 (0.83)
2000-01 to 2008-09*	4.99 (16.85)	8.99 (3.48)	3.48 (1.98)	6.44 (5.08)	–2.14 (–0.66)	–2.97 (–0.46)	9.07 (3.43)	3.14 (0.81)	5.63 (3.97)	–3.95 (–2.24)	0.64 (0.29)	7.47 (3.46)

NOTES: (I) TE denotes the triennium avarage. 'Prod.' implies production.

(2)* The growth rate for the decennial period are based on semi log time trend and the figures in the parentheses are respective ' t' values.

Sources: (1) Vital horticulture Statistics, 1998-99, Directorate of Horticulture, Rajasthan,Jaipur.

(2) Rajasthan Horticulture Statistics 2002-03,Directorate of Horticulture, Rajasthan,Jaipur .

(3) Unpublished data CD, Directorate of Horticulture, Rajasthan,Jaipur (for data from 2002-03 to 2008-09) .

(4) 50 Years of Agricultural Development in Rajasthan, Directorate of Agriculture, Jaipur [(from 1980-81 to 1982-83,for fruits), (from 1980-81 to 1994-95, for medicinals)].

The decadal analysis of the annual growth of four selected horticultural crops (aonla, papaya, coriander and mango) reveals that the first two decades, i.e., 1980-81 to 1990-91 and 1990-91 to 2000-01 have had remarkable growth in area and production of coriander crop. The growth in area under mango was noteworthy during 1980-81 to 1990-91, while the growth in production of mango was striking during 1990-91-2000-01. The growth of area and production of papaya and aonla was much better during last two decades, i.e., 1990-91 to 2000-01 and 2000- 01 to 2008-09. Particularly, the growth of area and production of aonla was outstanding during the second decade of our study, i.e., 1990-91 to 2000-01. The area under, aonla, papaya, coriander and mango in Rajasthan during the period TE 1985-86 was 8 hectares, 227 hectares, 110154 hectares and 442 hectares respectively. The production of aonla, papaya, coriander and mango during the same period was 8 MT, 469 MT, 40462 MT and 4026 MT respectively. The area under aonla, papaya, coriander and mango during the period TE 2008-09 was 1611 hectares, 435 hectares, 196396 hectares and 6231 hectares respectively. The production of aonla, papaya, coriander and mango during the same period was 12845 MT, 10108 MT, 198267 MT and 88586 MT respectively.

The annual growth rate of area and yield of aonla was 27.93 per cent and 5.86 per cent respectively during the period from TE 2000-01 to TE 2008-09. The annual growth rate of area and yield of papaya was 2.15 per cent and 13.83 per cent respectively during the same period. The annual growth rate of area and yield of coriander was 3.31 per cent and -2.09 per cent respectively during the same period ofTE 2000-01—TE 2008-09. The annual growth rate of area and yield of mango was -0.69 per cent and 0.08 per cent respectively during the same period.

The district-wise analysis of area and production of selected four horticultural crops for the periods TE 2004-05 and TE 2008-09 reveals that the area under aonla was highest in Ajmer district (133.1 hectares) and was lowest of 0.0 hectares in 4 districts of Rajasthan during TE 2004-05. Likewise, the area under aonla was also highest (252.3 hectares) in Ajmer district and was lowest of 0.0 ha in Dungarpur district of Rajasthan during TE 2008-09. In the case of papaya, the area coverage was highest of 49.5 hectares in Chittorgarh district and was lowest of 0.0 hectares in 5 districts of Rajasthan during TE 2004-05. Chittorgarh district also occupied first position in terms of area under papaya with 62.2 hectares during TE 2008-09. The production of papaya in Chittorgarh district was also highest of 1647.8 MT and 4749.6 MT during TE 2004-05 and during TE 2008-09 respectively. No output of papaya was realized in 5 districts during TE 2004-05 and in 6 districts during TE 2008-09 in Rajasthan. As far as the

district-wise analysis of area and production of coriander is concerned, the area under coriander was also highest (81555.0 hectares) in Jhalawar district and was lowest of 0.7 hectares each in Barmer, Dungarpur and Hanumangarh districts of Rajasthan during TE 2008-09. The production of coriander was highest of 81948.0 MT in Baran district, followed by 66313.0 MT and 44487.3 MT in Jhalawar district and Kota district respectively. The area under mango was also highest (779.1 hectares) in Udaipur district and was lowest of 0.0 hectares in 3 districts of Rajasthan during TE 2008-09. The production of mango was highest of 17789.4 MT in Chittorgarh district, followed by 10610.5 MT and 9380.7 MT in Udaipur district and Banswara district respectively during the same period.

1.3.2 Household Characteristics, Cropping Pattern and Production Structure

Among the sample farmers, 44 were marginal farmers, 45 were small farmers, 57 were medium farmers and 54 were large farmers. The average household (HH) size for entire sample was 7.47 persons. The average number of earners in a sample household was 2.93. It was good to find that about 67.5 per cent of all members of sample households belonged to 16-60 years age group which considered as a productive age group. Only 7.0 per cent were aged above 60 years. All respondents of our sample households were heads of their households. About 22.3 per cent members of sample households were illiterate and 69.7 per cent of them were literate from primary level to graduate level.

As far as the cast composition of selected farmers is concerned, about 51 per cent sample households (HHs) belonged to OBC category, 32.5 per cent HHs belonged to ST category, 2.5 per cent HHs belonged to SC and remaining 14 per cent HHs belonged to general caste category. The majority of decisions were taken by male members in the case of about 92 per cent of our sample HHs. As far as the main occupation of the sample HHs is concerned, about 78.8 per cent of working members of sample HHs were engaged in farming, 10.2 per cent were engaged in self business, 10.98 per cent were salaried or pensioners and only 0.78 per cent were wage earners.

The net sown area (NSA), net operated area (NOA) and gross cropped area (GCA) of sample households was found to be 8.95 acres, 9.01 acres and 16.76 acres per HH respectively and the cropping intensity in the study area was 187 per cent. As regards the nature of tenancy in leased- in land in the study area, near about 0.06 acres per HH was found to be leased in by the sample farmers and the entire leased in lands were leased in by the farmers in the form of fixed rent in cash. The total rainfed area was 8.36 per cent in the case of all sample farmers which implies that about 91.6 per cent of NOA of sample farmers was irrigated from various sources, mainly through tube wells run by electric and diesel. This is particularly because the selected farmers were beneficiaries of NHM and were having sufficient irrigated area so as to cultivate various cash crops. The per-household credit from all sources for sample farmers was Rs. 143740 out of which the credit amount from various institutional sources excluding government programmes was Rs. 88034.4 (61.2%). The contribution of institutional sources to total credit for farming by marginal farmers, small farmers, medium farmers and large farmers was 63.1 per cent, 35.6 per cent, 32.0 per cent and 72.1 per cent respectively. All farmers taken together, per acre loan of Rs 9924.8 was received by a sample farmer from various institutional sources and per acre loan of Rs 6237.1 was availed by a sample farmer from various government programmes. All farmers taken together used the credit amount of Rs 137360 (95.6%) per household in various productive activities such as agriculture and allied activities.

The value of farm asset holdings of marginal farmers was Rs. 73470 per HH while that of small, medium and large farmers were Rs. 213124, Rs. 457572 and Rs. 645250 respectively. All farmers taken together, a household had farm assets of Rs. 41213 per acre of NSA. The livestock was found to be a major component of total asset holdings for all categories of farmers.

The per-HH area under *Kharif* crops, *Rabi* crops and horticultural crops cultivated by the sample farmers was 7.62 acres, 5.48 acres, and 3.67 acres respectively. The total area under HYV was 15.50 acre per HH and its share in GCA was 92.47 per cent for all farmers category. Among various *Kharif* crops, maize was found to be an important crop cultivated by farmers of all categories and the share of maize in total GCA varied from 12.5 per cent to 27.1 per cent. The total area under horticulture crop in all categories was 3.67 acres per HH (21.89 per cent of GCA). The area under horticulture crop for all selected farmer categories ranged between 19.6 per cent and 27.1 per cent of GCA. Our four study crops aonla, papaya, mango and coriander were cultivated by the sample farmers in 0.82 acres, 0.30 acres, 0.59 acres and 1.12 acres per HH respectively. Out of 16.76 acres of GCA per HH, 16.20 acres constituting about 96.6 per cent was irrigated in the case of sample farmers. Similarly, out of 8.95 acres of NSA per HH, about 8.26 acres constituting about 92.3 per cent was irrigated in the case of our sample farmers. About 7.11 acres (93.4%) of total *Kharif* area and 5.42 acres (98.9%) of total Rabi area were irrigated whereas about 3.67 acres (96.6%) of total horticultural area was irrigated during the reference year 2008-09. The area under organic farming was nil for all categories of farmers except large farmers. The total area under organic farming was only 5.6 acres which was cultivated by only one farmer. Thus the average area under organic farming per HH was only 0.10 acres in the case of large farmer category and 0.03 acres in the case of all farmers taken together.

The gross value of output across all size groups of farmers was Rs. 347821 per household (HH), while the

total cost of cultivation of all crops including material cost and labour cost was Rs. 184988 per HH (Table 2). Thus the net return from cultivation of all types of crops was Rs. 162833 per HH. The material cost was more than the labour cost for all size groups of farmers. The per-HH material cost and labour cost ratio was in the ratio of 64.1: 35.9 in the case of all farmers taken together. The average family income generated by our sample farmers from various farm and non-farm activities was Rs. 272065 per HH.

TABLE 2—VALUE OF OUTPUT, COST AND NET RETURNS PER HOUSEHOLD FOR THE 2008-09—AGGREGATE OF ALL CROPS (Rs/HH)

Farmer category	Value of output (main + byproduct)	Material Cost	Labour Cost	Total Cost of production	Net returns (Farm business income)	Non-farm income	Total Income
Marginal	68939	24085	18084	42169	26769	17915	44684
Small	174281	65843	35604	101447	72835	103491	176326
Medium	364894	115316	62170	177486	187406	132193	319599
Large	701654	242422	135441	377863	323789	164185	487974
Total	347821	118642	66347	184988	162833	109232	272065

NOTE: Labour cost includes the imputed value of family labour.

Source: Field survey data.

When we analyze the per-acre value of crop output, cost of production and net return instead of per-HH values, we get entirely different kind of scenario. The net return from all crops was highest for medium farmers (Rs. 11261 per acre of GCA and Rs. 22904 per acre of NSA) instead of large farmers. The total cost of production in case of all farmers. category was Rs. 20675 per acre of NSA and Rs. 11038 per acre of GCA. The net returns from crop production in the case of all farmers category was Rs. 18199 per acre of NSA and Rs.. 9716 per acre of GCA.

1.3.3 The Production Structure and Resource Use under Horticulture Crops

As far as the economics of production of selected horticultural crops is concerned, it was found that only the cultivation coriander and papaya could generate reasonable amount of annual net returns for the sample farmers. The long duration crops like aonla and mango did not reach to fruit bearing stage in the case of majority of NHM beneficiary farmers. Thus the net average returns were not very impressive in the case of these two long duration sample crops. In the case of aonla, the average total cost of cultivation for all farmers category was Rs. 20899 per acre, out of which, the total variable cost was Rs. 18584 per acre (88.9%) and total fixed cost was Rs. 2316 per acre. Out of this total fixed cost, Rs. 2093 (10.0%) was spent towards the material component and only Rs. 223 (1.1%) was spent towards the labour component. On an average, about 11.3 quintals of output of aonla was realized from an acre of land by sample farmers (Table 3). The per-acre total revenue generated was highest (Rs. 18428) in the case of medium farmers and was the lowest (Rs. 13 770) in the case of large farmers. Since the total revenue was less than the total cost in case of all categories of farmers, the per-acre net return was found to be negative in all cases. On an average, about Rs. 5277 was the net loss from an acre of aonla during the reference year 2008-09: Some aonla growers were also worried about the low production due to frost and low temperature during winter season that resulted in late bearing of fruits and small sized fruits.

TABLE 3—COST OF CULTIVATION, PRODUCTION AND NET RETURNS FROM SELECTED HORTICULTURAL CROPS (2008-09)

(Rs. per acre)

	Marginal	Small	Medium	Large	All farmers
		Aonla			
Total cost	22694.1	21300.4	21714.9	19697.2	20898.9
Total revenue	15027.0	14982.9	18427.6	13770.2	15622.4
Total revenue – total cost	–7667.0	–6317.5	–3287.3	–5927.1	–5276.6
Total revenue – total variable cost	–6785.1	–3265.4	–1456.7	–3527.9	–2961.5
Output per acre (quintals)	38.9	35.9	46.4	34.8	38.9

TABLE 3—COST OF CULTIVATION, PRODUCTION AND NET RETURNS FROM SELECTED HORTICULTURAL CROPS (2008-09)—*Contd.*

(Rs. per acre)

	Marginal	Small	Medium	Large	All farmers
		Papaya			
Total cost	19425.3	22144.5	34998.6	34640.4	28559.6
Total revenue	33513.8	44636.9	60320.9	49486.2	46791.2
Total revenue – total cost	14088.4	22492.4	25322.3	14845.8	18231.6
Total revenue – total variable cost	18019.9	28603.7	38406.8	28783.5	28005.1
Output produced per acre	47.5	81.7	83.4	56.9	65.7
		Coriander			
Total cost	0.0	10964.5	11657.7	11859.8	11758.8
Total revenue	0.0	17280.0	19021.0	16364.6	17193.3
Total revenue – total cost	0.0	6315.5	7363.3	4504.8	5434.5
Total revenue – total variable cost	0.0	8772.3	9926.1	7547.3	8290.9
Output produced per acre	0.0	5.6	6.1	5.7	5.8
		Mango			
Total cost	9233.4	12359.3	14165.6	19894.8	15612.1
Total revenue	0.0	0.0	40218.7	9296.1	15056.0
Total revenue – total cost	–9233.4	–12359.3	26053.1	–10598.8	–556.1
Total revenue – total variable cost	–8820.3	–11562.8	29220.0	–7397.8	1838.3
Output produced per acre	0.0	0.0	49.2	4.5	15.6

Source: Calculated from field survey data.

The analysis on economics of cultivation of mango crops also resulted in similar kind of outcomes with a net loss of Rs. 556 per acre. Only medium category of farmers could generate a net positive return of Rs. 26053 from an acre of mango by the reference year 2008-09 since some of them had availed NHM assistance for renovating their existing mango orchards. The main reason of getting negative returns from long duration crops like aonla and mango was that the majority of our sample farmers had planted these two crops for last three to four years. During the early stages, the annual investment was high but the output was nil or very low and the revenue generated was very less. Therefore, net annual returns were very low. However, majority expressed that the net return would be positive in near future.

So far as the economics of cultivation of shorter duration crops like coriander and papaya is concerned, the sample farmers had generated the net positive returns from both the crops. The total cost of cultivating papaya crop in the case of all farmers category was Rs. 28560 per acre, out of which, the total variable cost was Rs. 18786 per acre (65.8%) and total fixed cost was Rs. 7400 per acre (25.9%). The production of papaya was 72.3 quintals per acre on an average for the sample farmers. The production of papaya varied from as lowest as 46.1 quintals per acre in the case of marginal farmers to the highest of 103.8 quintals per acre in the case of small farmers. The per-acre net revenue generated was Rs. 18232 for all farmers category. The main reason of getting positive net returns from cultivation of papaya was that the life span of papaya crop was near about three years and the maximum production was realized by the sample farmers by the reference year 2008-09. Similarly, the per-acre net revenue generated from an acre of coriander was, on an average, Rs. 5434 in the case of all farmers. The net output produced by all farmers was 5.80 quintals per acre of coriander. The total cost of cultivating coriander crop in the case of all farmers category was Rs. 11759 per acre.

The analysis on the net returns from various horticultural and non-horticultural crops generated by sample farmers of different categories during 2008-09 reveals that the net returns of *kharif* crops for all farmers category was Rs. 9661 per acre. The net return from *rabi* crops was Rs. 11860 per acre which was higher than that from *kharif* crops because *kharif* crops mainly depended upon monsoon while *rabi* crops were provided irrigation facility. However, the average net return from horticulture crops was Rs. 6627 per acre which was lower than the both *kharif* and *rabi* averages. The aggregate net returns from all crops *(kharif, rabi* and horticultural) was Rs. 18199 per acre of NSA and Rs. 9716 per acre of GCA. The marginal farmers, small farmers, medium farmers and large farmers generated net return of Rs. 14082, Rs 17557, Rs. 22904 and Rs. 16608 per acre of NSA respectively. It is expected that the average net return from horticultural crops would further increase once the long duration crops cultivated under NHM scheme like aonla, mango, anar, bael and citrus etc. start giving output by the next few years.

So far as the use of human labour is concerned, it may be noted that about 30.5 human-days was required for an acre of *kharif* crops on an average, while various horticultural crops required an average of 39.8 man-days per acre. The horticultural crops were more labour intensive compared to non-horticultural crops for which the average man-days required for an acre of horticultural crops was higher than that of non-horticultural crops. Considering the cases of our study crops, it was found that, an average of 54.6 man-days was required for an acre of aonla. In the case of mango, papaya and coriander, about 42.0 man-days, 93.2 man-days and 20.4 man-days were used per acre respectively. As regards the activity wise uses of human labour in horticultural crops, out of an average of 39.8 man days per acre per acre of horticultural crops, only about 27.3 man-days were used for various recurring activities and about 12.5 man-days were used for various fixed activities undertaken per acre of horticultural crops.

The analysis on the selling of output of selected horticultural crops, viz., aonla, papaya, coriander and mango through various marketing channels reveals that, wholesale market and pre-arranged selling were the major marketing channels for the sample farmers. In the case of papaya, out of total selling of 73.14 quintals/HH through various channels, as high as 62.65 per cent was sold in the wholesale market. In the case of coriander and aonla, respectively 98.84 per cent and 54.52 per cent were sold in the wholesale market. However, the case of mango was an exception. On an average, about 18.31 quintals of mango per HH was marketed through various channels out of which 80.56 per cent was sold on pre-arranged contract and 19.44 per cent was sold through intermediaries at farm gate. As regards the on-farm processing activities using the selected horticultural crops, it was unfortunate to find that none of the sample households in our study areas cultivating allotted four selected horticultural crops were involved' in processing activity supported by NHM. However, some sample farmers were involved in processing of other crops.

1.3.4 Impact of NHM on the Expansion of Horticultural Crops

While analyzing the impact of NHM on area and yield of selected horticultural crops (aonla, papaya, coriander and mango) during a period from 2004-05 to 2009-10, it was found that the extent of expansion of area under these crops was impressive but the overall increase in yield was not satisfactory in case of crops like coriander and mango. In the case of mango crop, the yield rate actually declined from 64 quintals per acre in 2004-05 to 3.62 quintals per acre in 2009-10. In the case of coriander, the average yield stagnated around 5.49 quintals per acre during a period of six years, i.e., 2004-05 to 2009-10. Though the variability of coriander yield was lowest among the study crops, the growth rate of coriander yield was also lowest. The growth rate of yield in the case of aonla and papaya was phenomenal compared to that of mango and coriander. It was noticed that the area under the selected horticultural crops grew tremendously from 2004-05 to 2008-09 but started falling during 2009-10 because of lack of expansion of marketing facilities, pests and weather related risks.

As far as the area under rejuvenation/protection, resources procurement through NHM and the resulted increase in productivity is concerned, no cases of rejuvenation are found in the case of aonla, papaya and coriander. Four farmers were found in the case.of mango who were involved in rejuvenation activities through NHM. The average area under rejuvenation of mango was 0.20 acres per HH. Only about 8 per cent sample farmers cultivating. mango were supported for rejuvenation/ protection. The average increase in productivity as a result of rejuvenation was 22.50 quintals per acre of mango. The rejuvenation activities under NHM in the study districts were not performed well for the selected crops.

As regards the sources of NMH resource procurement for our sample farmers during the period from 2004-05 to 2009-10, it was found that about 75 per cent of total NHM resource procurement by our sample farmers was through Department of Horticulture. The private nursery provided 15 per cent whereas the private shops provided 10 per cent of total NHM resource procurement by the beneficiary farmers. The majority of sample farmers were benefitted though various promotional activities undertaken through NHM. About 98 per cent farmers said that they made use of available good quality planting material like nursery through NHM. About 50.5 per cent farmers were found to use poly-house with ventilation, insect proof netting, fogging and sprinkler irrigation. As high as 91 per cent farmers said that they used and promoted

integrated nutrient management (INM) or integrated pest management (IPM). Also 40.5 per cent farmers said that they established new garden or seed production unit with the use of NHM assistance. However, there were so many other activities and provisions under NHM that could not benefit the sample farmers. None of the farmers were associated with upgrading the existing tissue culture unit, soil sterilization and steam sterilization system with boilers, precision farming implements, e.g., computer, GIP, GIS, sensors and application control. Not a single farmer was found to use the modernized post harvest management system like pack house, storage unit, mobile processing unit etc. Thus there is huge scope for expanding these activities among farmers. However, it was true that some farmers did not fulfill eligibility criteria to avail some of the facilities provided under NHM.

The planting material, fertilizer, pesticides and other inputs and drip/sprinkler were the major items for which subsidy was provided to the beneficiary farmers. Few farmers have also received subsidy for the activities like establishing vermi compost units and model nursery. The amount of subsidy provided by NHM for planting material was highest of Rs. 7295 per HH for aonla crop and was lowest of Rs. 2398 for papaya crop. The amount of subsidy provided through NHM for fertilizer, pesticides and other inputs was maximum of Rs. 17022 per HH for aonla crop whereas the papaya farmers received minimum amount of subsidy of Rs. 5595 per HH for the same. The total aggregate investment for planting material was highest of Rs. 10239 per HH in the case of aonla crop and was lowest of Rs. 3401 per HH in the case of papaya crop. The aggregate investment on fertilizer, pesticide and other inputs was highest of Rs. 23891 per HH in the case of aonla crop. The aggregate investment on fertilizer, pesticide and other inputs in the case of papaya, coriander and mango was Rs. 7935, Rs. 19298 and Rs. 18399 per HH respectively. However, the volume of investments on-so many provisions of NHM was grossly inadequate for a holistic growth of horticulture sector. The farmers cultivating aonla received subsidy amount of 71.2 per cent of investment for each of the planting material and fertilizer pesticides and other inputs. On an average, the farmers cultivating aonla received 50.2 per cent subsidy for drip/sprinkler. There is need of more awareness generation and better monitoring of the programme so as to encourage the farmers to invest more on many other provisions of NHM.

Capacity building and human resources development through training, frontline demonstration, publicity and training of the trainers is an integral part of NHM programme. It was found that the training was provided to the sample farmers through various sources on an average of 1.62 times per HH per year. On an average, the training session arranged for about 2.82 days per HH per year through different agencies. State Horticulture Department and Krishi Vigyan Kendra (KVK) were found to arrange more number of trainings of 0.65 and 0.61 times per HH per year respectively whereas the Cooperatives/Local Bodies and Non-Government Organizations (NGOs) arranged less number of the training and dissemination activities of 0.01 times per HH per year each. It was noticed that about 26 per cent training sessions were organized within village or nearby village through different agencies out of which the State Horticulture Department and Krishi Vigyan Kendra (KVK) organized 14.5 per cent and 9.5 per cent training sessions respectively.

The perceptions of the beneficiary farmers about their experiences in cultivating variousf horticultural crops with the help of NHM assistance are very helpful in reviewing the performance of the Mission. About 96 per cent of all sample farmers said that NHM helped them by providing seedling/nursery for increasing the area under horticultural crops. On an average, 93.5 per cent of all farmers expressed that NHM helped them by providing material inputs for increasing the area under horticultural crops. About 92.5 per cent of all farmers were of opinion that financial assistance through NHM was a good point. About 63 per cent of all farmers also opined that building infrastructure and capacity building measures such as awareness camps, training etc. were beneficial provisions of NHM.

Regarding the effects of NHM on the income levels of the farmers, about 34.5 per cent of all farmers revealed that their income has increased up to 20 per cent after adopting horticultural crops. It was unfortunate that about 51.5 per cent of all farmers revealed that their income has not increased yet though they have adopted horticultural crops through NHM. On an average, about 98 per cent of all farmers expressed that the farmers in their villages were aware about the NHM since they were benefited through the subsidies provided through NHM. Regarding the changes required so as to make NHM more effective, about 33.5 per cent farmers suggested that subsidy provision for fencing should be incorporated in NHM programme. About 42.5 per cent of all farmers suggested that more subsidy amount should be given to the beneficiary farmers through the Mission keeping in view the inflationary price rise. Also about 49.5 per cent farmers suggested that processing facilities should be provided and necessary infrastructures should be developed in their villages or nearby villages. As high as 77 per cent of all farmers suggested that single phase electricity connection for farmers would reduce their electricity bills.

1.4 Policy Suggestions

Rajasthan offers excellent horticulture development potential in spite of several biophysical as well as development constraints. The endeavors over the past decade made for planned and systematic development of horticultural in the state have started producing inspiring results. However, there are several challenges that have to be addressed properly so as to strengthen the horticulture sector in study districts of Rajasthan in particular and in

India in general. In order to meet the challenges ahead, major emphasis should be on ensuring availability of quality planting material in required quantity and in required time, priority to meet the future needs, protected cultivation to improve the productivity levels, organic farming for capitalizing the niche markets, mechanization to bring efficiency and competence, post harvest infrastructure to match the mammoth expansion, value addition to venture new products, transfer of technology to make the extension systems more accountable, radical reforms in database management, venturing in to new opportunities like genetic modified organisms (GMOs), branding of Indian horticultural crops etc.

As far as the four specific study crops in four study districts are concerned, followings are the major suggestions for strengthening the implementation of NHM in Rajasthan.

1. The large degree of spatial and temporal variations was observed in the area and yield of different horticultural crops during the reference periods in Rajasthan. The productivity and area coverage under the selected crops also fluctuated to a large extent over the years and across the districts of Rajasthan mainly due to water shortage and periodic occurrence of drought. For instance, the cases of high mortality of plantation crops were found in Ganau block of Banswara district due to insufficient irrigation during summer as the farmers were small with less resources and their lands were largely under rainfed conditions. Thus the area under assured irrigation in Rajasthan needs a special attention in various parts of Rajasthan including the study districts. Micro irrigation systems like drip irrigation with plastic mulching should be promoted so as to increase the water use efficiency. It was noticed that the filtration units for sprinkler and drip irrigation systems were not working properly at some places. The filtration units. should be checked and realigned regularly.

2. For expansion of area under irrigation, provisions under Mahatma Gandhi National Rural Guarantee Act (NREGA) could also be utilized under convergence programme. The measures should be taken for convergence of different programmes like: Watershed Programmes, National Agriculture Development Programme (Rashtriya Krishi Vikas Yojana), National Horticulture Mission, Scheme of Artificial Recharge of Ground Water through Dug well, BRGF, with NREGA for developing irrigation infrastructures in rural areas of Rajasthan.

   As far as convergence of NHM scheme with NREGA is concerned, Krishi Vigyan Kendras (KVKs) in the pilot districts of Rajasthan have provided plans for technical training on vermin compost, production of planting material of vegetables and fruits, bee-keeping and seed production. The State Government has undertaken sub schemes, Harit Rajasthan for convergence of NREGA with other Departments. However, there is a need to accelerate this convergence programme in various districts with effective planning and implementation.

3. Cold and frost was found to be a major problem in the case of aonla and papaya cultivation in the study districts of Rajasthan which caused high mortality of plants. So it is suggested that frost and cold resistant varieties may be supplied to the farmers in Rajasthan. The sample farmers expressed that they did not get access to resource persons those could have helped them in sorting out their immediate problems such as pest attack, mortality of plants, application of required amount/ type of pesticides and plant protection chemicals etc. and various other problems relating to cultivation of horticultural crops. Thus it is suggested that the team constituted by the Horticulture Department should visit the orchards periodically and suggest preventive/protection measures so that the confidence level of farmers could be raised.

4. The loss of horticultural crops has occurred at many cases due to unavoidable natural calamities along with pest attack. However, there is no provision for crop insurance for horticultural crops unlike agricultural crops. So there is a need of introducing crop insurance for horticultural crops that will improve the confidence level of farmers cultivating horticultural crops.

5. However, the horticultural supervisors those were assigned the duties of helping the farmers at their field were of the opinion that they were putting their best possible efforts in meeting their targets and in helping out the horticulture growers in their jurisdiction. However, as there are around 5 supervisors covering each of the study districts, each has territory extending up to 200 km and the T A and DA that they get for their field visits were grossly insufficient, even that amount was found pending with the department since years in the case of some supervisors, it is unlikely that they discharge their duties in effective manner. So necessary steps should be taken up to sort out the problems relating to the field supervisors. The staffing should also be increased to share the work load so that the farmers don't suffer.

6. Sufficient staff needs to be outsourced at both district and block level for effective implementation of NHM programme in the state. Additional workforce need to be appointed on the full time basis exclusively for the work relating to implementation of NHM programme. They should be paid good amount as salary keeping in view the volume of the work. Good amount of salary and TA/DA allowance would make them not to leave the job so quickly which would be beneficial for the field work relating to the Scheme.

   It was also noticed that, though staff strength for Agriculture Department is more than sufficient, the same for Horticulture Department is highly inadequate at various study districts. If transfer of some staff could be made from Agriculture Department to Horticulture Department, it would increase the performance of the Programme. Particularly the work undertaken under Horticulture Department has increased manifold due to increased importance of horticultural crops, but the staff strength has not increased to that extent. Even one supervisor is in charge of two/ three blocks which is not possible. Furthermore, the allowance given towards T A and other field expenses are grossly inadequate for which the staff members are forced to spend a part of their salary for office work. Thus, it is suggested to make necessary arrangements to maintain proper coordination between Agriculture Department and Horticulture Department and to transfer some staff from Agriculture Department to Horticulture Department so as to facilitate smooth implementation of the Scheme.

7. The problem of marketing of the horticultural crops was one of the major issues for the sample farmers. The sample farmers did not get reasonable price for their products due to unavailability of markets in their nearby areas. Sometimes political factors created hindrances for the farmers. For example, an aonla mandi in Chomu district was ready for operation and but its inauguration was not yet materialized, since the political people wanted to wait for the right time to take political mileage (Annexure Plate 10). Such kind of lingering should not be allowed keeping in view the existing serious marketing problems related to the produce. More number of marketing infrastructures and arrangements need to be established so that farmers get reasonable price of their products.

8. One of the reasons for less demand for aonla in the region is the lack of processing facilities. There are very few processing units available for aonla in Jaipur. Since aonla is mainly used only after the processing, the presence of insufficient number of processing units forced the farmers to sell their products at very low price. On the other hand, there is huge potential to establish more aonla processing units in the study district of Rajasthan. Thus it is suggested to expand processing activities and units in Jaipur district and other areas which will act as incentives for the aonla growers.

9. The cost of cultivation is taken as the basis for granting subsidies for the horticultural crops. The cost of cultivation calculated by the government is far less than the actual cost incurred by the farmers. So what the government proclaims about 75 per cent subsidy is actually 40-50 per cent. So it is recommended that government should revise the norms on cost of cultivation for the horticultural crops. In case of rejuvenation of mango, the rate of subsidy should also be increased by 50 -75 per cent.

10. As per the norms laid down under NHM, the market linkages, returns to farmers, production advantage and export potential are the basis of selecting some crops as the focus crops for the Rajasthan state under NHM. These crops include fruits (mandarin, kinnow, pomegranate, mango, papaya, bael, ber, aonla, guava, lime, sweet orange), spices (coriander, cumin, fenugreek, fennel, mehandi) and flowers (Dutch rose, desi rose and gerbera). The subsidies under NHM are being provided for growing these focus crops in Rajasthan. However, it was observed that some of the sample farmers were not very serious in taking care of these focus crops. In fact, their focus remained on some other kinds of inter crops. The farmers were found to adopt intercropping practices in fruits orchards and promoting vegetable cultivation as intercrop which is appreciable. It was expressed by the some sample farmers that it was the inter crop rather than the main crop for which they survived. Since the subsidy was available for these focus crops only, they cultivated these crops to get subsidy. However, they promoted other kinds of inter crops which were truly profitable for them. For example, a farmer got subsidy for cultivating mango, but cultivated chili as the inter crop which was actually his main crop. In Kakrali Jat village of Alwar district, a farmer said that he wanted to plant papaya on bunds but due to rigid NHM norms he planted them in field and none of them survived because of water logging. Thus it is suggested that. NHM norms should be flexible ones keeping in view the requirements of the farmers.

11. It was observed that the subsidy amount was sometimes given in cash and in some other cases as Cheque. The payment of subsidy in some cases was delayed. As the farmer invests a big amount to start up and if his subsidy gets delayed he has to face agony from the suppliers from whom he has taken the inputs on credit. So it is suggested that the subsidy amount should be paid to the farmers in time. Some deadline should be fixed for the payment of subsidy amount and it should be adhered to.

12. Freedom should be given to the farmers for choosing the crop they want to take up. Presently as subsidy are given for few selected crops, even though the farmer is not convinced about the suitability of these crops. He takes it up eyeing at the subsidy amount. Moreover targets on area expansion under a crop are given to supervisors so they just consider the financial condition and interest of the farmer keeping aside the suitability criteria. Ultimately the farmers makes a huge crop loss just to gain a small amount in the form of subsidy and the supervisor meets his area targets but looses on the production front. The solution of this would be to give subsidy on crops which a farmer aspires to grow and targets should be, along with survival of plants, on production in the form of marketable surplus or arrival at Mandi, particularly in the case of short-duration crops.

13. As far as the supply of planting material and seedling is concerned, the nature of requirement of the farmers and the time limits should be strictly followed. Most of the farmers arranged the planting material for area expansion activity through their own sources without having any quality check since the planting materials were not supplied in time by the Horticultural Department and other approved sources. In some cases it was seen that there was high mortality of plants because of late arrival of the required planting materials. In case of mango growers, our sample farmers preferred more inarching plants than the grafted ones. Many farmers complained about the shortage of quality saplings. Since the Horticultural Department could not provide the required variety of saplings in desired quantity, they had to purchase them from the private nurseries with higher survival risks. It was also noticed that the proper coordination among various stake holders like Krishi Vigyan Kendra (KVK) and Horticulture Department was lacking. While the farmers were complaining about unavailability of papaya plants at Horticulture Department nurseries, the Horticulture Department could have advised the farmers through the supervisors to collect the same from KVK where a large number of good quality saplings were dying because of lack of access to farmers. Thus it is suggested to develop a good rapport among all the government and non-government organizations in a district so as to help the farmers in the best possible way.

    It is also suggested to develop more number of government nurseries that can provide the required number of plants and quality planting material at reasonable price. There should be proper guidelines for the sale of plants through nurseries established under NHM and some targets must be given to each owner to raise plants for the sale under subsidy scheme. These nurseries must have sufficient number of mother plants for propagation.

14. Fencing was found to be a costly affair for the sample farmers. However it was a necessity for growing high value horticultural crops since wild animals (e.g., groups of blue bulls/Nilgai) were found very active in some regions. Once they attack the field and destroy the plants, farmers face a loss of 2-3 years of efforts and money. Since these are high value crops, they have to be protected from human beings also. Presently those who are not able to afford fencing rely on natural fencing (thorny species of plants) which occupies much of their cultivable land. The community guards are also being appointed but they also fail in defending from wild animals. It was demanded by almost all the sample farmers that fencing activity should also be included in subsidy norms for horticultural crops. It was suggested by the farmers that about 80 per cent subsidy should be provided on fencing.

15. Under the present scheme subsidy are given only when area is more than 0.4 hectares in case of general caste and OBC categories and 0.2 hectares in the case of SC/ST farmers. There should not be upper and lower limits if area expansion is the target. Moreover if such limits have to be put, it should be on the basis of land holding size and not the caste category of the households. If the subsidy can be provided irrespective of land holding size, a large number of poor marginal and small farmers could be benefitted through NHM and the pace of area expansion would be exemplary. Furthermore, it was noticed that the land fragmentation and small landholding size were the major causes for non-expansion of horticultural area since the main focus of farmers was to grow cereals for their survival. Only if some area was left out, they diverted that for horticulture

or cash crops. Thus the emphasis should be on covering these large numbers of marginal and small farmers for further expansion of area under horticulture crops in the state for which relaxing the ceiling on land holding size as the eligibility criteria for getting NHM subsidy assumes utmost importance.

16. Farmers were getting compulsorily 3 phase electricity connection for irrigation which was costly particularly for the small and marginal farmers. They were charged fixed rental for electricity which very often came for just 3 hours a day. They were bound to pay rental even though they didn't use it to that extent. The sample farmers suggested that they should be given single phase connection and bill should be issued on the meter basis.

17. The sample farmers were found to attend a number of training and awareness camps. However, it was noted that the farmers need more training on organic farming practices and awareness about timely pruning, use and maintenance of drip/ sprinkler irrigation systems and plant protection measures. Imparting training for pest management to the farmers is also necessary. The awareness camps regarding various components of NHM and procedures and norms for the farmers to avail the subsidies for different activities under NHM need to be arranged more frequently and at more number places so that majority of farming community would be benefitted. Extensive publicity of the NHM programme is needed at the block level and GP level. Permanent display boards with NHM logo needs to be displayed wherever NHM assistance has been provided which can also raise the publicity of the Scheme. There is also a need to intensify the publicizing of the NHM programmes through print and electronic media.

18. The major activities undertaken under NHM were production and distribution of planting material, vegetable seed production, area expansion, rejuvenation of old and senile orchards, creation of community water resources, protected cultivation, IPM/INM, organic farming, pollination support through bee-keeping, development of post harvest management and marketing infrastructures and human resource development. Except few activities like area expansion, distribution of planting material and human resource development, the performance of NHM in our study areas was not satisfactory. The poor performance in the case of our sample farmers was observed in terms of promotion of processing activities, rejuvenation, development of post harvest management and marketing infrastructures, protected cultivation and organic farming. It is suggested to step up these neglected activities under NHM so as to facilitate a healthy and balanced growth of horticulture sector in Rajasthan.

19. Farm mechanization is very essential for promotion of horticultural crops. However, there is no specific provision under NHM to subsidize the farm mechanization of farmers. It is therefore suggested to provide subsidies to purchase some essential agricultural tools for cultivating horticultural crops. Small size tractors should be given to farmers on subsidized rate so as to enable them to cultivate and weeding in space between the standing crops. The use of recently launched small size tractors would reduce the planting gaps, particularly in the case of fruit crops that, in turn, would increase the number of plants and thus production and productivity. Some farmers opined that the grading machines should also be made available on subsidy by the Government. So that they can fetch better prices in the market.

20. Though huge amount of money is being spent on different activities under NHM, we observed that the existing database on these horticultural crops is poor for conducting secondary research. It is noteworthy that we had to use data from different sources for different years due to unavailability of time series data at a single source. Since the data provided by different sources were found to vary a lot for a specific year, the chance of producing misleading results from the analysis of these time series data cannot be denied. It is worth-mentioning that horticulture is an important segment of agriculture sector, which, in turn, is one of the major components of national economy along with manufacturing, and services sectors. Therefore, the quality of relevant data inputs is extremely important in the context of realistic and effective policy planning process. Thus it is extremely important to seriously consider various issues and problems confronting horticulture data sector through appropriate policy intervention so as to build up-to-date and reliable database on various horticultural crops which would help in research and development of these crops.

D. Commodity Reviews

(i) Foodgrains

During the month of May 2012 the Wholesale Prices of food grains displayed a rising trend. Wholesale Price Index (Base 2004-05=100) of food grains, pulses and Cereals rose by 1.55 per cent, 3.46 per cent and 1.10 per cent respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of May 2012	WPI for the Month of April 2012	WPI A year ago	Percentage change during A month	Percentage change during A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	178.3	176.8	169.7	0.85	5.07
Wheat	1.116	178.8	174.7	167.4	2.35	6.81
Jowar	0.096	240.8	236.8	237.4	1.69	1.43
Bajra	0.115	210.5	209.5	198.4	0.48	6.10
Maize	0.217	220.5	225.2	208.6	–2.09	5.70
Barley	0.017	212.7	210.2	181.0	1.19	17.51
Ragi	0.019	228.4	223.5	186.2	2.19	22.66
Cereals	3.373	184.5	182.5	174.5	1.10	5.73
Pulses	0.717	218.3	211.0	187.2	3.46	16.61
Foodgrains	4.09	190.4	187.5	176.7	1.55	7.75

Source : Office of the Economic Adviser, M/o Commerce and Industry.

Behaviour of Wholesale Prices

The following Table indicates the State wise trend of Wholesale Prices of Cereals during the month of May, 2012.

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Rice	Mixed	Jharkhand		Kerala Haryana Karnataka Uttar Pradesh West Bengal	Gujarat Assam Tamil Nadu
Wheat	Mixed	Gujarat	Karnataka	M.P. Uttar Pradesh Haryana Rajasthan	Jharkhand
Jowar	Mixed	Tamil Nadu Gujarat	Maharashtra Karnataka	Rajasthan A. P.	U. P.
Bajra	Mixed	Maharashtra A. P.	Haryana Tamil Nadu Karnataka Gujarat	Rajasthan	Delhi U. P.
Maize	Mixed	U. P. Karnataka A.P.	Jharkhand	Uttar Pradesh Haryana Rajasthan	Gujarat

Procurement of Rice

1918 thousand tonnes of Rice (including paddy converted into rice) was procured during May 2012, as against 1862 thousand tonnes of Rice (including paddy converted into rice) procured during May 2011. The total procurement of Rice in the current marketing season i.e 2011-2012, upto 30-05-2012 stood at 32813 thousand tonnes,as against 28500 thousand tonnes of rice procured, during the corresponding period of last year. The details are given in the following table :

PROCUREMENT OF RICE

(in thousand tonnes)

State	Marketing Season 2011-12 (up to 30-06-12)		Corresponding Period of last Year (2010-11)		Marketing Year (October-September) 2010-11		2009-10	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	7316	21.36	8218	26.82	9610	'28.10	7555	23.58
Chhatisgarh	4114	12.01	3022	9.86	3743	10.95	3357	10.48
Haryana	1981	5.78	1659	5.41	1687	4.93	1819	5.68
Maharashtra	158	0.46	205	0.67	308	0.90	229	0.71
Punjab	7731	22.57	8635	28.18	8635	25.25	9275	28.95
Tamil Nadu	1596	4.66	1355	4.42	1543	4.51	1241	3.87
Uttar Pradesh	3345	9.77	2352	7.68	2554	7.47	2901	9.06
Uttarakhand	365	1.07	396	1.29	422	1.23	375	1.17
Others	7641	22.31	4799	15.66	5695	16.65	5282	16.49
Total	**34247**	**100.00**	**30641**	**100.00**	**34197**	**100.00**	**32034**	**100.00**

Source: Department of Food and Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2012-2013 upto May, 2012 is 34266 thousand tonnes against a total of 26087 thousand tonnes of wheat procured during last year. The details are given in the following table.

PROCUREMENT OF WHEAT

(in thousand tonnes)

State	Marketing Season 2012-13 (up to 30-06-2012)		Corresponding Period of last Year (2011-12)		Marketing Year (April-March) 2011-12		2010-11	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	8665	22.96	6882	24.80	6928	24.45	6347	28.19
Madhya Pradesh	8493	22.50	4905	17.67	4965	17.52	3539	15.72
Punjab	12831	33.99	10953	39.46	10958	38.67	10209	45.35
Rajasthan	1909	5.06	1279	4.61	1303	4.60	476	2.11
Uttar Pradesh	4982	13.20	3282	11.82	3461	12.21	1645	7.31
Others	867	2.30	454	1.64	720	2.54	298	1.32
Total	**37747**	**100.00**	**27755**	**100.00**	**28335**	**100.00**	**22514**	**100.00**

Source : Department of Food and Public Distribution.

(ii) Commercial Crops

Oilseeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 183.9 in May, 2012 showing a rise of 3.3 per cent and 19.2 per cent over the previous month and over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed anincreasing trend over the previous month. The WPI Groundnut seed (1.8 per cent), Rape and Mustard (3.8 percent), Cottonseed (0.4 per cent), Niger Seed (6.5 per cent) Gingelly seed (0.7 per cent), Sunflower seed (3.4 per cent), Safflower seed (10.6 per cent) and Soyabean (10.8 per cent) increased over the previous month. However, the WPI of Copra (5.1 per cent) decreased over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 146.0 in May, 2012 showing a rise of 1.2 per cent and 10.5 per cent over the previous month and over the previous year. The WPI of Mustard Oil (0.1 per cent), Copra oil (0.3 per cent), Sunflower Oil (0.5 per cent) and Gingelly Oil (1.0 per cent) decreased compared to the previous month. However, the WPI of Cottonseed Oil (5.5 per cent), Groundnut Oil (2.2 per cent) and Soyabean Oil (0.3 per cent) increased over the previous month.

Fruits and Vegetable

The Wholesale Price Index (WPI) of Fruits and Vegetable as a group stood at 208.1 in May, 2012 showing a fall of 3.3 per cent over the previous month. However, it increased by 14.6 per cent over the previous year.

Potato

The Wholesale Price Index (WPI) of Potato stood at 198.7 in May, 2012 showing a rise of 14.3 per cent and 68.1 per cent over the previous month and over the previous year.

Onion

The Wholesale Price Index (WPI) of Onion stood 139.3 in May, 2012 showing a fall of 0.2 per cent and 7.3 per cent over the previous month and over the previous year.

Condiments and Spices

The Wholesale Price Index (WPI) of Condiments and Spices (Group) stood at 200.4 in May, 2012 showing a fall of 3.4 per cent and 19.8 per cent over the previous month and year respectively. The Wholesale Price Index of Chillies (Dry) and Turmeric decreased by 4.7 per cent and 1.0 per cent over the previous month. However, the WPI of Black Pepper increased by 1.1 per cent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 202.3 in May, 2012 showing an increase of 1.9 percent over the previous month. However, it decreased by 19.4 per cent over the previous year.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 217.0 in May, 2012 a fall of 2.3 per cent and 15.4 per cent over the previous month and over the previous year respectively.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF MAY, 2012

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over the	
	May, 2012	April, 2012	May, 2011	Month	Year
Oil Seeds	183.9	178.0	154.3	3.3	19.2
Groundnut Seed	235.0	230.9	188.8	1.8	24.5
Rape and Mustard Seed	179.9	173.3	132.2	3.8	36.1
Cotton Seed	146.7	146.1	140.3	0.4	4.6
Copra (Coconut)	90.4	95.3	125.0	–5.1	–27.7
Gingelly Seed (Sesamum)	257.9	256.1	194.8	0.7	32.4
Niger Seed	195.8	183.8	147.0	6.5	33.2
Safflower (Kardi Seed)	149.2	134.9	143.3	10.6	4.1
Sunflower	174.7	168.9	161.6	3.4	8.1
Soyabean	202.5	182.7	141.3	10.8	43.3
Edible Oils	146.0	144.2	132.1	1.2	10.5
Groundnut Oil	192.5	188.3	154.4	2.2	24.7
Cotton Seed Oil	161.8	153.4	146.6	5.5	10.4
Mustard and Rapeseed	151.4	151.6	124.9	–0.1	21.2
Soyabean Oil	158.8	158.3	142.0	0.3	11.8
Copra Oil	115.8	116.2	117.9	–0.3	–1.8
Sunflower Oil	134.0	134.7	129.1	–0.5	3.8
Gingelly Oil	155.9	157.5	143.3	–1.0	8.8
Fruits and Vegetables	208.1	215.3	181.6	–3.3	14.6
Potato	198.7	173.8	118.2	14.3	68.1
Onion	139.3	139.6	150.3	–0.2	–7.3
Condiments and Spices	200.4	207.4	250.0	–3.4	–19.8
Black Pepper	488.8	483.6	359.7	1.1	35.9
Chillies (Dry)	225.1	236.1	288.5	–4.7	–22.0
Turmeric	143.6	145.1	299.3	–1.0	–52.0
Raw Cotton	202.3	198.6	251.0	1.9	–19.4
Raw Jute	217.0	222.2	256.6	–2.3	–15.4

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	—	250.00	130.00	—	—	—	—	—	—	—
Guntur	Tadikonda	Dec., 2011	8	200.00	175.00	110.00	200.00	160.00	110.00	160.00	—	—	—	—	—
Rangareddy	Arutla	Dec., 2011	8	200.00	120.00	—	150.00	120.00	—	150.00	120.00	—	220.00	200.00	—
Karnataka															
Bangalore	Harisandra	July to Sep., 2011	8	200.00	150.00	—	200.00	150.00	—	250.00	180.00	—	300.00	300.00	—
Tumkur	Gedlahali	July to Sep., 2011	8	150.00	150.00	—	140.00	145.00	—	150.00	—	—	150.00	150.00	—
Maharashtra															
Nagpur	Mauda	Dec., 2009	8	100.00	80.00	—	—	—	—	—	—	—	—	—	—
Ahmednagar	Akole	June, 2009	8	80.00	70.00	—	—	—	—	—	—	—	83.5	85.00	85.00
Jharkhand															
Ranchi	Gaintalsood	May, 2011 & June, 2011	8	100.00	100.00	—	90.00	90.00	—	58.00	58.00	—	170.00	150.00	—

1.1 Daily Agricultural Wages in Some States (Operation-wise)

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working hours	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	Feb.,11	M	8	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
			W	8	—	—	120.00	120.00	120.00	—	—	—	—
Bihar													
Muzaffarpur	Bhalui Rasul	Feb. &,	M	8	104.00	104.00	104.00	104.00	104.00	—	150.00	150.00	150.00
		March, 2010	W	8	—	104.00	104.00	104.00	104.00	—	—	—	—
Shekhpura	Kutaut	May &	M	8	150.00	—	—	—	150.00	—	220.00	—	—
		June, 2010	W	8									
Chhattisgarh													
Dhamtari	Sihaba	Jan., 2012	M	8	300.00	100.00	—	120.00	80.00	80.00	150.00	80.00	70.00
			W	8	—	—	—	80.00	70.00	—	—	—	—
Gujarat													
Rajkot	Rajkot	Nov., 2011	M	8	179.00	200.00	138.00	156.00	125.00	125.00	275.00	275.00	245.00
			W	8	—	137.00	133.00	134.00	125.00	87.00	—	—	—
Dahod	Dahod	Nov, 2011	M	8	71.00	71.00	71.00	71.00	71.00	—	143.00	150.00	150.00
			W	8	—	71.00	71.00	71.00	71.00	—	—	—	—
Haryana													
Panipat	Ugarakheri	Feb., 2011	M	8	180.00	180.00	180.00	200.00	180.00	—	—	—	—
			W	8	—	150.00	150.00	180.00	150.00	—	—	—	—

1.1 Daily Agricultural Wages in Some States (Operation-wise)—*Contd.*

May, 2012 (in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	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	—
			W	8	—	110.00	110.00	110.00	110.00	110.00	—	—	—
Kerala													
Kozhikode	Koduvally	Nov., 2011	M	4 to 8	670.00	450.00	—	450.00	560.00	—	500.00	—	—
			W	4 to 8	—	—	350.00	350.00	400.00	—	—	—	—
Palakkad	Elappally	Nov., 2011	M	4 to 8	400.00	300.00	—	275.00	356.3	—	400.00	—	—
			W	4 to 8	—	—	150.00	200.00	155.00	—	—	—	—
Madhya Pradesh													
Hoshangabad	Sangakherakalan	March., 2012	M	8	150.00	—	150.00	150.00	100.00	100.00	350.00	350.00	—
			W	8	—	—	150.00	150.00	100.00	100.00	—	—	—
Satna	Kotar	March, 2012	M	8	120.00	—	—	120.00	120.00	120.00	180.00	180.00	180.00
			W	8	—	—	—	120.00	120.00	120.00	—	—	—
Shyopur Kala	Vijaypur	March, 2011	M	8	100.00	100.00	—	100.00	150.00	50.00	150.00	150.00	150.00
			W	8	—	100.00	—	100.00	150.00	50.00	—	—	—
Orissa													
Bhadrak	Chandbali	Dec., 2011	M	8	—	—	—	200.00	170.00	50.00	230.00	—	—
			W	8	—	—	—	140.00	135.00	40.00	—	—	—
Ganjam	Aska	Dec., 2011	M	8	300.00	120.00	120.00	120.00	138.3	120.00	250.00	250.00	250.00
			W	8	—	60.00	100.00	100.00	100.00	100.00	—	—	—
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	—	—	90.00	95.00	—	99.44	—	—	—
Rajasthan													
Barmer	Vishala	Aug., 2011	M	8	N. A.								
			W	8	N. A.								
Jalore	Panwa	Aug., 2011	M	8	—	—	—	—	—	150.00	100.00	150.00	—
			W	8	—	—	—	—	—	—	—	—	—
Tamil Nadu													
Thanjavur	Pulvarnatham	Feb., 2012	M	6	—	N. R.							
			W	5	—	N. R.							
Tirunelveli	Malayakulam (Kurvikulam)	Feb., 2012	M	8	—	N. A.							
			W	8	—	—	—	—	—	—	—	—	—
Tripura													
Agartala	Govt. Agri. Farm				N. R.								
Uttar Pradesh													
Meerut	Ganeshpur	Jan., 2012	M	8	182.00	182.00	179.00	182.00	1182.00	—	289.00	—	—
			W	8	—	158.00	154.00	153.00	158.00	—	—	—	—
Chandbali	Dhanpur	Jan., 2012			N. R.								
Chanduli	Chanduli	Jan., 2012	M	8	120.00	140.00	120.00	124.3	120.00	—	172.90	—	—
			W	8	—	140.00	120.00	—	120.00	—	—	—	—

M-Man, W-Woman,

N. A. —Not Available N. R. —Not Reported

B. PRICES

2. Wholesale Prices of Certain Important Agricultural Commodities and Animal Husbandry Products at Selected Centres in India

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	May-12	Apr.-12	May-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1280	1285	1175
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1190	1150	NA
Wheat	—	Quintal	Madhya Pradesh	Sagar	1500	1500	1500
Jowar	—	Quintal	Maharashtra	Mumbai	2400	2300	3058
Gram	—	Quintal	Punjab	Abohar	NA	NA	NA
Maize	Yellow	Quintal	Uttar Pradesh	Bahraich	1130	1110	990
Gram Split	—	Quintal	Maharashtra	Mumbai	4400	4400	3400
Gram Split	—	Quintal	Bihar	Patna	4900	5000	3200
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6100	5700	5650
Arhar Split	—	Quintal	Maharashtra	Mumbai	5100	5050	6050
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	6200	5600	5100
Arhar Split	—	Quintal	Bihar	Patna	6275	6275	6000
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2700	2450	2600
Gur	Sort II	Quintal	Tamil Nadu	Chennai	2900	2900	2700
Gur	—	Quintal	Maharashtra	Mumbai	3250	3250	3083
Mustard seed	Rai UP	Quintal	West Bengal	Kolkata	3900	4000	2900
Mustard Seed	Raira	Quintal	West Bengal	Kolkata	3900	NA	NA
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3325	3075	2490
Linseed	—	Quintal	Maharashtra	Nagpur	4050	4100	NA
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	3340	3275	2850
Cotton Seed	Superior	Quintal	Maharashtra	Jalgaon	NA	NA	NA
Castor Seed	—	Quintal	Andhra Pradesh	Badepalli	NA	NA	NA
Sesamum Seed	Black	Quintal	Tamil Nadu	Chennai	4500	4500	4500
Cotton Seed	—	Quintal	Maharashtra	Mumbai	NA	NA	NA
Copra	FAQ	Quintal	Kerala	Alleppey	3975	4375	6650
Groundnut	—	Quintal	Maharashtra	Mumbai	6250	5900	6250
Groundnut	TMV 7	Quintal	Tamil Nadu	Chennai	4280	4280	4280
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1275	1450	1125
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1215	1163	923
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1950	1800	1281
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1815	1875	1365
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1331	1320	960
Castor Oil	—	15 Kg.	Uttar Pradesh	Kanpur	NA	NA	NA
Sesamum Oil	Agmark	15 Kg.	Tamil Nadu	Chennai	2040	2040	1875
Sesamum Oil	—	15 Kg.	Maharashtra	Mumbai	NA	NA	1163
Coconut Oil	—	15 Kg.	Kerala	Cochin	908	960	1560
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1650	1300	1050
Groundnut Cake	—	Quintal	Uttar Pradesh	Kanpur	NA	NA	NA
Cotton/Kapas	F414	Quintal	Punjab	Abohar	NA	NA	NA
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Thiruppur	NA	NA	NA
Wool	Fine	Quintal	Madhya Pradesh	Dabra	NA	NA	NA
Jute Raw	TD5	Quintal	West Bengal	Kolkata	2425	2315	3100

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA —*Contd.*

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	May-12	Apr.-12	May-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jute Raw	W5	Quintal	West Bengal	Kolkata	2425	2315	3175
Oranges	—	100 No.	Maharashtra	Mumbai	NA	NA	NA
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	NA	NA	NA
Oranges	Big	100 No.	Tamil Nadu	Chennai	550	550	610
Banana	Basarai	100 No.	Maharashtra	Jalgaon	500	400	860
Banana	Singapore	100 No.	West Bengal	Kolkata	300	NA	NA
Cashewnuts	—	Quintal	Maharashtra	Mumbai	42000	40000	44666
Almonds	—	Quintal	Maharashtra	Mumbai	40000	40000	34166
Walnuts	—	Quintal	Maharashtra	Mumbai	52000	50625	62500
Kishmish	—	Quintal	Maharashtra	Mumbai	12000	11833	13666
Peas Green	—	Quintal	Tamil Nadu	Chennai	NA	6000	2400
Tomatoes	—	Quintal	Tamil Nadu	Chennai	1500	1700	1200
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	2000	2200	1700
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1200	1200	1000
Potatoes	Red	Quintal	Bihar	Patna	880	750	750
Potatoes	Desi	Quintal	West Bengal	Kolkata	1100	1040	680
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	NA	NA	1519
Onions	Bombay	Quintal	West Bengal	Kolkata	NA	NA	NA
Turmeric	Erode	Quintal	West Bengal	Kolkata	7000	NA	NA
Turmeric	Nadan	Quintal	Kerala	Cochin	7200	7200	13500
Chillies	—	Quintal	Bihar	Patna	8125	8400	8800
Black Pepper	Palai	Quintal	Kerala	Alleppey	NT	NT	NT
Ginger	Dry	Quintal	Kerala	Cochin	7500	8100	14000
Cardamom	Big	Quintal	West Bengal	Kolkata	95000	95000	110000
Cardamom	Small	Quintal	West Bengal	Kolkata	100000	70000	120000
Milk	Cow	100	NCT of Delhi	Delhi	3400	3400	NA
Milk	Buffalo	100	West Bengal	Kolkata	3200	3200	2800
Ghee Deshi	Agmark	Quintal	West Bengal	Kolkata	33000	NA	NA
Ghee Deshi	—	Quintal	Uttar Pradesh	Khurja	NA	NA	NA
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	25500	25500	23500
Fish	Rohu	Quintal	West Bengal	Kolkata	13000	NA	NA
Fish	Sea Prawns	Quintal	Tamil Nadu	Chennai	18000	18000	NA
Eggs	Madras	1000 No.	West Bengal	Kolkata	3000	3100	2320
Tea	Medium	Quintal	Assam	Guwahati	NA	NA	14000
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	13000	13000	14000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	28000	28000	25000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	13200	13200	12000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2280	2225	2300
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2200	2150	2200
Tobacco	Bidi /Tobacco	Quintal	West Bengal	Kolkata	4500	4000	3250
Rubber	—	Quintal	Kerala	Kottayam	18900	19000	21200
Arecanut	Rashi	Quintal	Tamil Nadu	Chennai	30000	30000	24000

NA :—Not Available

NT :—Not Transaction

C. CROP PRODUCTION

3. Sowing and Harvesting Operations Normally in Progress During July, 2012

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Winter Rice, Jowar (K), Bajra, Maize (K), Ragi (K), Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca.	Autumn Rice
Assam	Winter Rice, Castorseed.	Autumn Rice, Jute
Bihar	Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta.	Jute
Gujarat	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Sannhemp.	—
Himachal Pradesh	Summer Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Sesamum, Sannhemp, Summer Potato (Plains).	Winter Potato (Hills)
Jammu & Kashmir	Autumn Rice, Jowar (K), Bajra, Small Millets (K), Urad (K), Mung (K), Winter Potato, Ginger, Tobacco, Sesamum, Jute, Onion.	Tobacco, Sesamum, Onion
Karnataka	Autumn Rice, Winter Rice, Jowar(K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Winter Potato (Plains), Summer Potato (Plains), Black Pepper, Chillies (Dry), Tobacco, Groundnut, Castorseed Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Kardiseed, Onion, Tapioca.	Summer Rice, Maize, Sweet Potato, Sannhemp
Kerala	Ragi, Sweet Potato, Tapioca.	Sesamum, Tapioca
Madhya Pradesh	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets(K), Tur (K), Mung (K), Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed.	—
Maharashtra	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato (Plains), Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sannhemp, Nigerseed.	—
Manipur	Winter Rice, Tur (K), Sesamum (K), Sweet Potato, Maize.	—
Orissa	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Summer Potato (Plains), Chillies (Dry), Groundnut, Castorseed, Cotton, Mesta.	Chillies (Dry)
Punjab and Haryana	Autumn Rice, Summer Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Groundnut, Castorseed, Sweet Potato, Turmeric, Sannhemp.	Small Millets (K), Potato

3. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING JULY, 2012—*Contd.*

State	Sowing	Harvesting
(1)	(2)	(3)
Rajasthan	Autumn Rice, Jowar (K), Bajra, Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Sannhemp.	—
Tamil Nadu	Autumn Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Tur (K), Urad (K), Summer Potato (Hills), Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Sannhemp, Onion, Tapioca.	Jowar (R), Summer Potato (Hills), Sugarcane, Chillies (Dry) Sesamum, Cotton, Sannhemp.
Tripura	Winter Rice, Urad (K), Mung (K), Sesamum.	Onion, Autumn Rice
Uttar Pradesh	Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Groundnut, Castorseed, Sesamum, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Tapioca.	Small Millets (R), Chillies (Dry).
West Bengal	Autumn Rice, Winter Rice, Tur (K), Ginger, Chillies (Dry).	Autumn Rice, Maize, Chillies (Dry), Sesamum, Jute
Delhi	Summer Rice, Jowar (K), Bajra, Maize, Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato (Plains), Chillies (Dry), Cotton, Sweet Potato.	Winter Potato (Plains), Onion
Andaman and Nicobar Islands	Autumn Rice, Winter Rice.	—

(K)—Kharif (R)—Rabi.

MGIPRRND—3266 Agri./2012—600