AGRICULTURAL SITUATION IN INDIA

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PART I

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The Journal is brought out by the Directorate of Economics and Statistics, Ministry of Agriculture. It aims at presenting a factual and integrated picture of the food and agricultural situation in India on month to month basis. The views expressed, if any, are not necessarily those of the Government of India.

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

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PART II

STATISTICAL TABLES

Abbreviations used

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

A. General Survey

Trends in Foodgrain Prices

During the month of December, 2012, the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains increased by 1.74 per cent from 212.5 in November, 2012 to 216.2 in December. 2012.

The Wholesale Price Index Number of Cereals showed an increase of 2.85 per cent from 203.2 to 209.0 whereas Pulses showed a decrease of 2.34 per cent from 256.3 to 250.3.

The Wholesale Price Index Number of Wheat and Rice increased by 1.43 per cent and 3.37 percent respectively during the same period.

The Government of India has fixed the Minimum Support Prices (MSP) of Wheat for 2012-13 season at Rs. 1350 per quintal.

Rainfall : With respect to rainfall situation in India, the year is categorized into four seasons : winter season (January-February), pre monsoon (March-May); South West monsoon (June-September) and post monsoon (October-December). South West Monsoon accounts for more than 75 per cent of annual rainfall. The actual rainfall received during the winter season 2013, as on 16-1-2013 has been 2.1 mm as against the normal at 9.3 mm.

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

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

TABLE 1— PROCUREMENT IN MILLION TONNES

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

* Position as on 2-8-2012. ** Positions as on 21-12-2012

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

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

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

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

P=Provisional.

Growth of Economy :

As per the Advance Estimates of the Central Statistics Office (CSO), the growth in Gross Domestic Product (GDP) at factor cost at constant (2004-05 prices) is estimated at 5.0 per cent in 2012-13 with agriculture, industry and services registering growth rates of 1.8 per cent, 3.1 per cent and 6.6 per cent respectively. As per the First Revised Estimates, the growth in GDP at factor cost at constant (2004-05) prices is estimated at 6.2 per cent in 2011-12. At disaggregated level, this (First Revised 2011-12) comprises growth of 3.6 per cent in agriculture and allied activities, 3.5 per cent in industry and 8.2 per cent in services. The growth in GDP is placed at 5.3 per cent in the second quarter of 2012-13.

TABLE 3— GROWTH OF GDP AT FACTOR COST BY ECONOMIC ACTIVITY

(at 2004-05 Prices)

Industry	Growth			Percentage Share in GDP		
	2010-11	2011-12 IR	2012-13 AE	2010-11	2011-12 IR	2012-13 AE
1. Agriculture, forestry and fishing	7.9	3.6	1.8	14.5	14.1	13.7
2. Industry	**9.2**	**3.5**	**3.1**	**28.2**	**27.5**	**27.0**
a. Mining and quarrying	4.9	-0.6	0.4	2.2	2.1	2.0
b. Manufacturing	9.7	2.7	1.9	16.2	15.7	15.2
c. Electricity, gas and water supply	5.2	6.5	4.9	1.9	1.9	1.9
d. Construction	10.2	5.6	5.9	7.9	7.9	7.9
3. Services	**9.8**	**8.2**	**6.6**	**57.3**	**58.4**	**59.3**
a. Trade, hotels, transport and communication	12.3	7.0	5.2	27.3	27.5	27.5
b. Financing, insurance, real estate and business services	10.1	11.7	8.6	17.2	18.1	18.7
c. Community, social and personal services	4.3	6.0	6.8	12.8	12.8	13.0
4. GDP at factor cost	**9.3**	**6.2**	**5.0**	**100.0**	**100.0**	**100.0**

(IR): 1st Revised Estimates; AE: Advance Estimates

TABLE 4—QUARTERLY ESTIMATE OF GDP

(Year-on-year in per cent)

	2010-11				2011-12				2012-13	
Industry	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1. Agriculture, forestry & fishing	3.1	4.9	11.0	7.5	3.7	3.1	2.8	1.7	2.9	1.2
Industry	**8.3**	**5.7**	**7.6**	**7.0**	**5.6**	**3.7**	**2.5**	**1.9**	**3.6**	**2.8**
2. Mining & quarrying	6.9	7.3	6.1	0.6	–0.2	–5.4	–2.8	4.3	0.1	1.9
3. Manufacturing	9.1	6.1	7.8	7.3	7.3	2.9	0.6	-0.3	0.2	0.8
4. Electricity, gas & water supply	2.9	0.3	3.8	5.1	8.0	9.8	9.0	4.9	6.3	3.4
5. Construction	8.4	6.0	8.7	8.9	3.5	6.3	6.6	4.8	10.9	6.7
Services	**10.0**	**9.1**	**7.7**	**10.6**	**10.2**	**8.8**	**8.9**	**7.9**	**6.9**	**7.2**
6. Trade, hotels, transport & communication	12.6	10.6	9.7	11.6	13.8	9.5	10.0	7.0	4.0	5.5
7. Financing, insurance, real estate & bus. Services	10.0	10.4	11.2	10.0	9.4	9.9	9.1	10.0	10.8	9.4
8. Community, social & personal services	4.4	4.5	–0.8	9.5	3.2	6.1	6.4	7.1	7.9	7.5
9. GDP at factor cost (total I to 8)	**8.5**	**7.6**	**8.2**	**9.2**	**8.0**	**6.7**	**6.1**	**5.3**	**5.5**	**5.3**

Source: CSO

Economics and Resource Use Efficiency of Important Vegetables in Punjab

SUNNY KUMAR, SANJAY KUMAR, JASDEV SINGH AND PRABHJIT SINGH

Introduction

At the global level, vegetables occupy the area of 53.97 million hectares with an annual production of 1012.52 million tonnes. India has been growing vegetables for several centuries and is the second largest producer of vegetables in the world (after China), accounting for roughly 14 percent of the world's production. The production of vegetables.in India in 2010-11 stands at over 146.5 million tonnes from an area of 8.5 million hectares put to vegetable cultivation (National Horticulture Board, 2011). In Punjab, the monoculture of rice-wheat crop rotation has led to over exploitation of natural resources, depletion of soil fertility and higher susceptibility of crops to the attack of various insect pest and diseases. Further, income of the farmers growing grain crops like wheat and paddy has fallen in recent years mainly due to agrarian crisis of stagnating productivity, falling income and growing indebtedness. Now, a stage has reached where further improvement in productivity seemed to be limited and hence leading to stagnation of the income of the farming community. Farm economists are suggesting for diversification but due to non-availability of infrastructure, assured prices of wheat and paddy, ineffective price policy for other crops and economically unviable competing crops, the situation has become further aggravated for the farmers of the Punjab State. Thus, in order to improve incomes, provide gainful employment and save the natural resources from further degradation, diversification from grain crops to vegetables emerges as a major strategy for agricultural growth. In Punjab, there has been continuous increase in acreage under the vegetables. The total area under vegetable crops has increased from about 55 thousand hectares in 1990-91 to about 188.44 thousand hectares in 2010-11 (Government of Punjab, 2011). Potato, peas, chilies, onion and cauliflower are the important crops of the state occupying about 45, 10, 6, 5 and 4 per cent of the total area under vegetables in the state. But still there is scope to increase the area under vegetables in the state. The economic aspects can play an important role in diversification of Punjab agriculture towards these vegetable crops. Also, there is need to study whether there is proper utilization of resources for vegetable cultivation in the state. Therefore, the present study was undertaken to know economics and resource use efficiency of important vegetables in the state.

II. Methodology

The study was based on primary as well as secondary data. The study was conducted inJalandhar district of the state as it is the leading district amongst all the districts in terms of total area under vegetables in the state. The secondary data were used to identify the most important vegetables in the selected district. Amongst these, the four most important vegetables viz. potato, pea, chilli, and cauliflower were selected for the detailed economic analysis. Further, one block with the largest area/production of selected vegetables from the district viz.Jalandhar west (potato), Shahkot (peas and chilli), and Phillaur (cauliflower) were selected to ensure wider coverage of the sample. Village clusters growing the selected vegetables were identified in each block and three villages from each block were selected at random in the sample survey. The sample of 30 farmers each growing the selected vegetables was taken from selected villages making the total sample of 120 vegetable growers.

Based on the rational significance of the results, the following Cobb-Douglas production function was chosen as the better fit over linear form to study the efficiency of each variable input in major vegetable production.

$$Y = a \pi x^{bi}. e_i$$

Where;

Y = Production of vegetable (Quintals/hectares)

a = intercept

X_1 = Expenses on seed per hectare

X_2 = Expenses on fertilizer per hectare

X_3 = Expenses on irrigation per hectare

X_4 = Expenses on labour per hectare

X_5 = Expenses on farm yard manure per hectare

X_6 = Expenses on insecticides per hectare

b_i = (i = 1 to 5) are the regression coefficients.

The resource use efficiency could be judged based on marginal value productivity (MVP), which indicates the increase in the gross returns (Rs/hectares) from the use of an additional unit of a given input while keeping the level of other inputs constant. The marginal value productivity

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(MVP) of the i-th input was calculated by using this formula.

$$MVP = b_i \left\{ \frac{\overline{Y}}{\overline{X}} \right\} P_y$$

Where

$\overline{Y}$ = average yield of vegetable crop per hectares at geometric mean level of all inputs.

$\overline{X}$ = Geometric mean level of i-th resource,

b_i = Productivity elasticity of i-th input,

P_y = Price of the product

III. Economics of vegetables cultivation

The cost analysis for various vegetables were carried out on the basis of the variable cost and fixed cost concepts as presented in Table 1. The total cost of cultivation on per hectare basis amongst the selected vegetables was found to vary between Rs. 112954.79 for cauliflower to Rs. 80866.50 for potato. Further, the net returns were calculated on the basis of different costs such as variable cost, fixed cost and total cost for various vegetables which were shown in Tables 2. The results revealed that gross returns and net returns were the highest among the cauliflower crop, which were Rs. 165669.60 and Rs.52714.81 respectively and least amongst the potato crop with corresponding figures of Rs. 86058.30 and Rs.5191.80 respectively. During the reference period of study (2010-11), the potato prices in the market were lower due to over production of potato in the area. As potato prices are highly sensitive to the arrivals in the market, therefore, during some of the years the crop provides lower returns to the farmers. The analysis was carried out for various vegetables selected for the study which has been depicted in following paragraphs:

Potato

The cost of cultivation for potato has been depicted in Table 1. The total cost on per hectare basis was found to be Rs. 80866.50 which consists of Rs. 51724.06 (63.96 per cent of the total cost) as total variable cost and Rs. 29142.44 (36.04 per cent of the total cost) as fixed cost. Amongst the different items of variable cost, the highest cost was incurred on seed amounting to Rs. 19791.67 which was about 38.26 per cent of the total variable cost. Expenses of labour, fertilizers, irrigation, insecticides and farm-yard manure were other important components of the variable cost. It depicts seed buying accounts for major input of potato crop. Amongst fixed cost items, the highest cost was incurred on rental value of owned land amounting to Rs. 14568.75 which was about 49.99 per cent of the total fixed cost and rent paid for lease-in-land accounted for the lowest proportion of fixed cost. The average yield of potato crop was 20192 kg'ha and average price was Rs. 426.27 per quintal. The potato growers were found to fetch gross returns and net returns to the tune of Rs. 86058.30/ha and Rs. 5191.80/ha respectively. The total cost on per hectare basis was found to be Rs. 80866.50. The table also depicted net returns over variable cost and net returns over fixed cost which were Rs. 34334.24/ha and Rs. 56915.86/ha respectively.

Peas

The results showed that on an average, farmers spent Rs. 84379.70 per hectare on the cultivation of pea crop consisting of 59.54 per cent as total variable cost and 41.46 per cent as fixed cost. Amongst variable cost items, the highest cost was incurred on hired labour amounting to Rs. 23625.00/ha which constituted 47.03 per cent of the total variable cost items. It showed that peas cultivation was highly labour intensive. So labour was the most important input of peas cultivation and labour availability at the right time was crucial for peas production. Expenses on seed, fertilizers and plant protection chemicals were other important components of the variable cost contributing 7.69, 10.27 and 4.14 per cent to the total variable cost, respectively. Under fixed cost items, the highest cost was incurred on rental value of owned land which constituted about 54.36 per cent of the total fixed cost. Table 2 showed that productivity of the peas crop was 8393 kg/hectares and average price received by the producer was Rs. 1143.52 per quintal. On per hectare basis, the peas growers fetched the gross returns to the tune of Rs. 95975.64 while net returns were found to be Rs. 11595.94. The table further shows that per hectare net returns over variable cost and net returns over fixed cost were Rs. 45741.78 and Rs. 61830.50 respectively.

Chilli

The information incorporated in Table 1 pertaining to the chilli crop revealed that average per hectare cost of cultivation was Rs. 85233.03. It consists of Rs.56165.63 (65.89 per cent of the total cost) as total variable cost. Amongst different items of variable cost, the highest share was incurred on hired labour which was tune to the 46.51 per cent of the total variable cost.

TABLE 1— Cost of Cultivation of Major Vegetable Crops, Sample Households, Punjab 2010-11

(Rs./ha.)

Cost structure	Potato	Peas	Chilli	Cauliflower
Seed	19791.67	6489.00	9808.33	19225.00
	(24.47)	(7.69)	(11.51)	(17.02)
Fertilizer	7696.25	8666.00	6299.67	9529.17
	(9.52)	(10.27)	(7.39)	(8.44)
Irrigation	2797.50	1545.00	2025.00	1625.00
	(3.46)	(1.83)	(2.39)	(1. 44)
Human labour				
I. Family labour	1866.67	1629.00	1601.67	5420.87
	(2.31)	(1.93)	(1.88)	(4.80)
II. Hired labour	10533.33	23625.00	26120.83	34091.67
	(13.03)	(28.00)	(30.65)	(30.18)
Machine labour	883.32	1863.30	3615.00	2435.84
	(1.09)	(2.21)	(4.24)	(2.16)
Farm yard manure	2123.33	2345.56	2263.49	2143.42
	(2.63)	(2.78)	(2.66)	(1.90)
Insecticides/pesticides/ weedicides	5583.33	3491. 70	3625.00	2252.13
	(6.90)	(4.14)	(4.25)	(1.90)
Interest on variable cost @ 7% for half crop period	448.66	579.30	807.31	671.33
	(0.55)	(0.69)	(0.95)	(0.59)
Total variable cost	51724.06	50233.86	56165.63	77394.49
	(63.96)	(59.54)	(65.89)	(68.52)
Fixed Cost				
Rental value of owned land	14568.75	16743.75	17068.75	16687.50
	(18.02)	(19.84)	(20.03)	(14.77)
Rent paid for lease-in-land	4224.94	7367.25	4437.88	7342.50
	(5.22)	(8.73)	(5.21)	(6.50)
Land revenue, taxes and cesses	—	—	—	—
Dep. on implements & buildings	7387.55	6336.32	3954.90	7479.40
	(9.14)	(7.51)	(4.64)	(6.62)
Interest on fixed capital	2962.20	3698.52	3605.87	4050.90
	(3.66)	(4.38)	(4.23)	(3.59)
Total Fixed cost	29142.44	34145.84	29067.40	35560.30
	(36.04)	(41.46)	(34.11)	(31.48)
Total cost	80866.50	84379.70	85233.03	112954.79
	(100.00)	(100.00)	(100.00)	(100.00)

Note:-Figures in parentheses are the percentage of their respective total cost.

It showed that the chilli cultivation was highly labour intensive particularly during picking and harvesting stage. Expenses on seed, fertilizer, insecticides, machine labour and farm-yard manure were other important components of the variable cost. Under fixed cost items, the highest cost was incurred on rental value of owned land amounting to 20.03 per cent of total fixed cost and interest on fixed capital accounts for the lowest fixed cost amounting to 4.23 per cent of the total cost. The average productivity of chilli crop was 9446 kg/ hectares and average price received by the producer was Rs. 1216.17 per quintal. The chilli growers were found to fetch gross and net returns to the tune of Rs. 114879.42/ ha and Rs. 29646.03/ha respectively. The table also shows that per hectare net returns over variable cost and net returns over fixed cost were Rs. 58713.79/ha. and Rs. 85812.02/ha respectively.

Cauliflower

The cost of cultivation for cauliflower was calculated and presented in Table 1. Amongst different vegetables, total cost on per hectare basis was found to be the highest amongst cauliflower crop (Rs. 112954.79/ha). The variable cost constituted 68.52 per cent of the total cost. Amongst variable cost components, the highest share was incurred on hired labour constituted 44.05 per cent of the total variable cost. The lowest proportion was spent on irrigation which was 2.10 per cent of the total variable cost. It showed that the cauliflower cultivation was highly labour intensive. Expenses on seed, fertilizer, insecticides and farm-yard manure were other important components of the variable cost. The highest proportion of fixed cost was incurred on rental value of owned land which constituted 46.93 per cent to the total fixed cost interest on fixed capital accounts for the lowest fixed cost amounting to 11.39 per cent of the total fixed cost. The returns were also calculated and presented in Table 2 for the cauliflower. The production of the crop was 28133 kg/hectares and average price was about Rs. 588.88 per quintal. Gross returns and net returns were found to be Rs. 165669.60 and Rs. 52714.81 for cauliflower crop in study area respectively. This table also shows net returns over variable cost and net returns over fixed cost were to the tune of Rs. 88725.11/ha and Rs. 1301 09.30/ha. respectively.

TABLE 2—Returns Structure of Major Vegetable Crops Sample Households, Punjab, 2010-11

(Rs./ha.)

Returns Structure	Potato	Peas	Chilli	Cauliflower
Yield, kg ha^{-1}	20192	8393	9446'	28133
Sale price, Rs. q^{-1}	426.27	1143.52	1216.11	588.88
Variable cost	51724.06	50233.86	56165.63	77394.49
Fixed cost	29142.44	34145.84	29067.40	35560.30
Total cost	80866.50	84379.70	85233.03	112954.79
Gross returns	86058.30	95975.64	114879.42	165669.60
Net returns	5191.80	11595.94	29646.03	52714.81
Net returns over variable cost	34334.24	45741.78	58713.79	88275.11
Net returns over fixed cost	56915.86	61830.50	85812.02	130109.30

IV. Resource use efficiency of vegetable production

Table 3 depicted that seed and farm yard manure was not found to be significant variables affecting the productivity amongst all the vegetables selected for the study. Fertilizer was found be significant variable affecting the productivity of potato and chilli crops, while expenses on insecticides turned out be significant amongst potato and cauliflower crop. The expense on labour was found to be significant in peas and cauliflower crops. The value of R^2 was the highest in chilli (0.84) followed by pea, potato and cauliflower with respective values of 0.74, 0.64 and 0.48. The marginal value product (MVP) for selected vegetables was also calculated and presented in Table 4. The marginal value product for labour in case of peas and cauliflower while fertilizer for potato and chillies were found to be positive and significant showing under utilization of these resources. The crop-wise detail is provided in following paragraph.

TABLE 3—Resource use Efficiency for Major Vegetables, Sample Households, Punjab, 2010-11

Particulars	Potato	Peas	Chilli	Cauliflower
Intercept	–93.79^{NS}	13.72***	10.35***	12.69***
	(108.26)	(4.15)	(3.20)	(3.50)
Seed	–0.59^{NS}	0.08^{NS}	0.07^{NS}	–0.05^{NS}
	(0.56)	(0.18)	(0.08)	(0.10)
Fertilizer	0.67**	0.09^{NS}	0.18**	–0.05^{NS}
	(0.31)	(0.15)	(0.08)	(0.14)
Irrigation	0.004^{NS}	–0.11**	–0.06***	0.04^{NS}
	(0.04)	(0.05)	(0.02)	(0.16)
Labour	–0.17^{NS}	0.07*	–1.06^{NS}	0.14 **
	(0.45)	(0.04)	(0.96)	(0.06)
Farm yard manure	–0.04^{NS}	–0.52^{NS}	0.25^{NS}	0.23^{NS}
	(0.60)	(0.44)	(0.21)	(0.44)
Insecticides	0.50*	–0.14^{NS}	–0.10^{NS}	–0.11*
	(0.27)	(0.11)	(0.09)	(0.06)
R^2	0.64 **	0.74**	0.84**	0.48**

Note: *, ** and *** denotes significant at 10%, 5% and 1% respectively.

^{NS} denotes Non significant.

Figures in parentheses are standard errors.

Potato

Fertilizer and insecticides inputs were found to significantly affect the productivity of the potato. Their coefficients were worked out to be 0.67 and 0.50 and were positive. In terms of magnitude, it has been observed that one per cent increase in the use of fertilizer and insecticides, the productivity may increase by 0.67 and 0.50 per cent respectively. Thus there is need to increase to investment in fertilizer and insecticides, if the vegetable grower wants to improve upon potato production. Seed, irrigation, labour and farm yard manure were not found to be significant variables affecting the productivity of the crop. The results further showed that the value of R^2 came out to be 0.64 indicating that explanatory variables included in the model jointly explained 64 per cent of the total variation in the productivity of potato crop.

The value of marginal value product was positive for fertilizer and insecticides indicating underutilization of this resource. This shows that an extra rupee spent on fertilizer and insecticides will add Rs. 7.49 and Rs. 7.71 to the value productivity of potato crop. The value of marginal value product was negative for seed and labour under potato crop indicating excessive use of these resources. All other coefficients such as seed, irrigation, labour and farm yard manure were found to be non-significant.

Peas

To explain the factors affecting the productivity of peas, Cobb-Douglas equation containing seed, fertilizer, labour, farm yard manure and insecticides inputs as explanatory variables was fitted. The coefficient of labour was found to be positive and significant while irrigation was observed to be negative and significant. It shows that there was underutilization of labour and more labour can be employed to increase the production. Negative significant sign for irrigation coefficient indicated that irrigation is already in excessive use and these expenses need to be curtailed. Rest of the variables turned out to be non significant which indicated that there was no need to make any change in their level as they would have no significant effect on the production of this crop. The value of R^2 came out to be 0.74 indicating that explanatory variables included in the model jointly explained 74 per cent of the total variation in the productivity of pea crop.

The marginal value product was positive for labour indicating underutilization of this resource. The values of coefficients shows that with an extra rupee spent on labour the farmer will add Rs.0.25 to the value productivity of pea. The value of marginal value product was negative for irrigation under pea crop indicating excessive use of the resource. The value shows that with an extra rupee spent on irrigation, the production is decreased by 0.11 per cent.

TABLE 4—THE MARGINAL VALUE PRODUCT (MVP) OF IMPORTANT INPUTS FOR MAJOR VEGETABLES, SAMPLE HOUSEHOLDS, PUNJAB, 2010-11

(Rs.)

Particulars	Potato	Peas	Chilli	Cauliflower
Seed	–2.57	1.18	0.82	–0.43
Fertilizer	7.49	1.00	3.28	–0.87
Irrigation	0.12	–6.83	– 3.40	4.08
Labour	–1.18	0.25	–3.89	0.55
Farmyard manure	1.62	–21.28	12.69	17.78
Insecticides	7.71	–3.85	–3.17	–8.09

Chilli

Chilli crop is another major vegetable in study area for which the functioned analysis have been done. The coefficient of fertilizer was positively significant having value 0.18 and irrigation was negatively significant having value -0.06. This shows that when one per cent of fertilizer is increased the production is increased by 0.18 per cent. Negative significant sign for irrigation coefficient indicated that the irrigation expenses are higher and needs to be curtailed. The equation containing seed, fertilizer, labour, farm-yard manure and insecticides inputs as explanatory variables turned out to be the best one explaining 84 per cent of the total variation in the production of this crop. The much higher value of the R^2 reflected that the variables included in equation are really representative.

The marginal value product was positive for fertilizer indicating underutilization of this resource. The values shows that with an extra rupee spent on fertilizer the farmer will add worth Rs. 3.28 to the value yield of chilli, while negative coefficient for irrigation under chilli crop indicating excessive use of the resource. All other coefficients such as seed, labour, farm yard manure and insecticides were found to be non-significant.

Cauliflower

The expenses on labour and insecticides were found to be significantly affecting the productivity of cauliflower with 0.14 and -0.11 as the respective coefficients in terms of positive significance, it has been observed that production of cauliflower may be increased by 0.14 per cent as the result of increase of one per cent utilization of labour in production process of cauliflower. Negative significance for insecticides coefficient indicated that this input is already in excessive use and hence need reduction if more production from this crop is to be obtained. The combined effect of all these selected variables led to explain 48 per cent of the total variation in the production of the crop.

The value of marginal value product was positive for labour indicating underutilization of this resource. The values shows that with an extra rupee spent on labour the farmer will add worth Rs..0.55 to the value productivity of cauliflower crop, while negative for insecticides under cauliflower crop indicating excessive use of the resource. All other coefficients such as seed, fertilizer, irrigation and farm yard manure were found to be non-significant.

V. Conclusion

The total cost of cultivation on per hectare basis amongst the selected vegetables was found to vary between Rs. 112954.79 for cauliflower to Rs. 80866.50 for potato. The results revealed that gross returns and net returns were the highest among the cauliflower crop, which were Rs. 165669.60 and Rs. 52714.81 respectively and least amongst the potato crop with corresponding figures of Rs. 86058.30 and Rs. 5191.80 respectively. Fertilizer was found be significant variable affecting the productivity of potato and chilli crops, while expenses on insecticides turned out be significant amongst potato and cauliflower crop. The value of R^2 was the highest in chilli (0.84) followed by pea, potato and cauliflower with respective values of 0.74, 0.64 and 0.48. The MVP for labour in case of peas and cauliflower while fertilizer for potato and chillies were found to be positive and significant showing under utilization of these resources. The study emphasized the need to curtail the over use of irrigation !n case of peas and chilli crops while insecticides for cauliflower crop; supply of electricity for minimum 8 hours a day and strengthening the extension activities to boost the vegetable production in the state.

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"Investment and Functional Analysis of Commercial Floricultural Nursery Cultivation in East Godavari District of Andhra Pradesh"

MAYURI K*, HYMA JYOTHI S** AND RAO DVS***

Introduction

India has ancient heritage when it comes to floriculture. Commercial floriculture is however is of recent origin. A consistent increase in demand for cut and potted flowers has made floriculture as one of the important commercial enterprises in Indian agriculture. During 2008-2009, the total area under floriculture was estimated to be more than one and half lakh hectares (Source: National Horticulture Board, Ministry of Agriculture, GOI). The popularity of floriculture is catching up with progressive farmers in many states pursuing it and this trend is more pronounced in the foothills of the Himalayas. Although India's share in the global market for flowers and flower products is minimal, the growth potential is large. Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu and West Bengal have emerged as the major floriculture centres. A number of exported-oriented floricultural units have been set up in the last decade and half. Liberalization and Plant, fruits and seeds order, 1989, also known as new seed policy have already made it feasible to import international varieties of planting material.

The planting material has a vital role in floriculture in producing healthy and quality produce which in turn affects our exports. The floricultural nurseries are the unlts which supply the planting material to the floriculture farmers. So an in depth study of these floricultural nursery units is essential. The present study is an attempt in this direction, to know the investment pattern and the factors affecting the gross returns in the floricultural nursery business.

METHODOLOGY

The study was conducted in East Godavari district of Andhra Pradesh. Multi-stage purposive random sampling was followed for the study. Kadiyam mandal was selected as it has the highest area under floricultural nurseries. The top four villages having the highest area under floriculture nurseries were selected from Kadiyam mandaI for the purpose of the study. The selected villages were Kadiyapulanka, Vemagiri, K.Savaram, Muramanda. Two different size categories were made in the sample respondents based on the mean nursery area i.e., category I having less than one hectare nursery area and category II having nursery area more than one hectare. From each category 15 nursery enterprises were selected randomly, making total sample size of 30 floricultural nurseries.

The specific objectives for the study are as under.

1. To study the capital investment pattern of commercial floricultural nurseries.
2. To analyze the factors affecting the returns in floricultural nursery management.

Capital Investment Analysis

Undiscounted and discounted cash flow techniques were used to analyse the investment and find out the technical feasibility and economic viability of investment in floricultural nurseries.

(i) Pay-back Period: The Pay-back Period (PBP) is the duration of time in years taken to liquidate the investment.

Pay-Back Period = l/E

Where, 1= investment of the project

E=annual net cash inflows.

(ii) Net Present Worth (NPW): The net present worth represents the discounted value of the future net cash inflows to floricultural enterprise.

$$\text{Net present worth} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}$$

Where, n = number of years

i = discount rate @ 12%

B^t = benefit in rupees for t^{th} year

C_t = cost in rupees for t^{th} year

(iii) Benefit-cost ratio (BC ratio): It is the ratio between the discounted cash inflows and discounted cash outflows.

$$\text{Benefit cost ratio} = \frac{\sum_{t=1}^{n} B_t/(1+i)^t}{\sum_{t=1}^{n} C_t/(1+i)^t}$$

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(iv) lnternal Rate of Returns (IRR): It is the rate of returns which equates the discounted benefits with discounted costs.

$$IRR = \left\{ \begin{array}{l} \text{Lower} \\ \text{discount} + \\ \text{rate} \end{array} \right\} \left\{ \begin{array}{l} \text{Difference} \\ \text{between} \\ \text{the two} \\ \text{discount rates} \end{array} \right\} \left\{ \frac{\text{Present worth of cash flow at lower discount rate}}{\text{Absolute difference between. present worth of the cash flow at the two discount rates}} \right\}$$

Functional Analysis

Regression analysis was employed using multiple linear regression to identify the factors affecting the output (gross income). The general form of multiple linear regression is given below.

$$Y = a + b_1 X^1 + b^2 X^2 + b_3 X_3 + \text{————} + b_n X_n$$

Where, Y = Gross returns in rupees (Dependent variable)

X_1 to X_n = Inputs (Independent variables)

b_1 to bn = Regression coefficients

a= Constant

X_1 = Human labour expenditure

X_2 = Fertilizers expenditure

X_3 = Plant protection chemicals expenditure

X_4 = Polythene bags expenditure

X_5 = Planting material expenditure

RESULTS

INVESTMENT ANALYSIS

Feasibility of investment in floricultural nurseries in East Godavari district of Andhra Pradesh was studied by using the evaluation criterion such as pay-back period, net present worth, benefit-cost ratio and internal rate of return, the discounted establishment cost and operational cost and gross returns were considered over the economic life span of the nurseries.

Pay-Back Period

It is the period required to repay the initial investment incurred in establishing the floricultural nursery. The pay-back period for floricultural nursery was found to be 2.92 and 2.52 years for category I and category II nurseries respectively and on an overall 2.72 years. This indicates that the floricultural nursery entrepreneurs were in a position to recover the establishment cost in about three years.

Net Present Worth

The difference between the present value of the future costs and returns gives the net present worth of investment in floricultural nursery business. The net present worth discounted at 12 per cent per hectare was found to be Rs. 27,03,004.31 for category I, Rs. 32,62,576.45 for category II nurseries and on an overall was Rs. 29,82,790.38. The higher and positive NPW indicates the future net returns are worth to compare with present investment and returns.

Benefit-Cost Ratio

It indicates the net returns per rupee of investment during the economic life period of floricultural nursery. The benefit-cost ratio in the present study was found to be 1.59 for category I, 1.69 for category II and 1.64 on an overall for floricultural nursery. This indicates that the investment in floricultural nursery is economically feasible and financially sound.

Internal Rate of Return

The internal rate of return measures the rate of return that can be realised in the nursery. This technique has been indicated as important and scores over the other techniques of evaluation, since it considers the reinvestment opportunities which are absent in other criteria. In the present study the internal rate return that can be obtained by investment in floricultural nursery was found to be 113.09 per cent and 133.95 per cent for category I and category II nurseries respectively and for overall sample 123.52 per cent. Since the IRR for commercial floricultural nursery was very high it was considered as economically feasible.

FUNCTION ANALYSIS

The multiple linear regression analysis was used to assess the factors influencing the changes in gross returns of the commercial floricultural nursery. The independent variables taken were expenditure on human labour, fertilizers, plant protection chemicals, polythene bags and plant material were used for analyzing the impact on gross returns of commercial floricultural nursery.

The functional analysis for overall sample nurseries is presented in table 2. It is evident that for overall sample nurseries the coefficient of multiple determination (R^2) was found to be 80.83 per cent. It indicated that 80.83 per cent variation in the dependent variable (gross returns) was explained by taken independent variables.

The production factor of human labour was positively significant at one per cent probability level and plant

material and polythene bags were found to be positively significant at five per cent probability levels, indicating their significant impact on gross returns of floricultural nursery enterprise. It implied that one per cent increase in expenditure on human labour, plant material and polythene bags could increase the gross returns by 2.14, 1.80 and 1.03 per cent respectively, when all the other factors were kept constant at their geometric mean levels. The coefficients of other variables viz., fertilizers and plant protection chemicals were found to be positive but not significant and have lesser influence on gross returns.

Conclusion

The investment in commercial floricultural nursery was found to be economically feasible when compared to other perennial horticultural crops. The pay-back-period is about three years, net present worth was Rs. 29,82,790.38, benefit-cost ratio was 1.64 and internal rate of return was 123.52 per cent. Among the selected independent variables, expenditure on human labour, plant material and polythene bags shown significant and positive impact on gross returns of floricultural nursery enterprise.

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TABLE 1—Capital Investment Analysis in Commercial Floricultural Nurseries

S. No.	Investment appraisal techniques	Category I	Category II	Overall
1.	Pay-back period (years)	2.92	2.52	2.72
2.	Net present worth discounted @ 12% (Rs. / ha)	27,03,004.31	32,62,576.45	29,82,790.38
3.	Benefit-cost ratio discounted at 12%	1.59	1.69	1.64
4.	Internal rate of return (percentage)	113.09	133.95	123.52

TABLE 2—Results of Multiple Linear Regression Analysis for Overall Sample.

S. No.	Variables	Notation	Standard error	Coefficients	t- value	R^2 Value
1.	Constant	A	46,235.04	4,24,374.65	9.18	
2.	Human labour expenditure	X^1	0.50	2.14**	4.26	
3.	Fertilizers expenditure	X_2	0.99	0.99^{NS}	1.00	
4.	Plant protection chemicals expenditure	X_3	1.01	$O. 77^{NS}$	0.76	0.8083
5.	Polythene bags expenditure	X_4	0.43	1.03*	2.42	
6.	Plant material expenditure	X_5	0.73	1.80*	2.47	

Number of observations = 30

**Significant at one percent level

*Significant at five per cent level

^{NS} Non-significant

Model = $Y = 4,24,374.65 + 2.14 X_1** + 0.99 X_2 + 0.77 X_3 + 1.03 X_4* + 1.80 X_5*$

ANNEXURE I—ESTABLISHMENT COST OF COMMERCIAL FLORICULTURAL NURSERY

(Rs. per hectare)

S.No.	Cost particulars	Category I	Category II	Overall
A.	**Labour cost**			
1.	Land preparation	24,500.00 (0.97)	24,666.65 (0.95)	24,583.33 (0.96)
2.	Bed preparation	13,583.32 (0.54)	13,666.65 (0.53)	13,624.99 (0.54)
3.	Planting	79,000.00 (3.14)	79,166.67 (3.06)	79,083.34 (3.10)
4.	Manures and fertilizers	19,333.32 (0.77)	19,500.00 (0.75)	19,416.66 (0.76)
5	Weeding	13,750.00 (0.55)	14,083.32 (0.54)	13,916.66 (0.55)
6	Irrigation	18,833.32 (0.75)	18,916.65 (0.73)	18,874.99 (0.74)
7	Plant protection	12,333.32 (0.49)	12,166.65 (0.47)	12,249.99 (0.48)
	Total labour cost	1,81,333.28 (7.21)	1,82,166.59 (7.04)	1,81,749.94 (7.12)
B.	**Material cost**			
1.	Planting material	6,30,833.32 (25.09)	6,47,166.65 (25.00)	6,38,999.99 (25.05)
2.	Farm yard manure	52,041.00 (2.07)	55,100.00 (2.13)	53,570.50 (2.10)
3.	Fertilizers	59,709.31 (2.37)	63,990.67 (2.47)	61,849.99 (2.42)
4.	Plant protection chemicals	41,375.32 (1.65)	47,437.00 (1.83)	44,406.16 (1.74)
5.	Polythene bags	1,20,666.67 (4.80)	1,22,666.67 (4.74)	1,21,666.67 (4.77)
6.	Growth regulators	33,041.00 (1.31)	36,200.00 (1.40)	34,620.50 (1.36)
7.	Soil	5,63,500.00 (22.41)	5,80,333.32 (22.42)	5,71,916.66 (22.42)
8.	Borewell	3,20,000.00 (12.73)	3,25,000.00 (12.56)	3,22,500.00 (12.65)
9.	Farm building	2,13,700.00 (8.50)	2,25,000.00 (8.69)	2,19,350.00 (8.60)
10.	Implements and machinery	2,98,000.00 (11.85)	3,03,223.00 (11.71)	3,00,611.50 (11.78)
	Total material cost	23,32,959.40 (92.79)	24,06,217.3 1 (92.96)	23,69,588.36 (92.88)
	Establishment cost (A+B)	25,14,292.68 (100.00)	25,88,383.90 (100.00)	25,51,338.29 (100.00)

ANNEXURE II—MAINTENANCE COSTS OF COMMERCIAL FLORICULTURAL NURSERY

(Rs. per ha.)

S. No.	Cost particulars	Category I	Category II	Overall
A.	**Operational cost :**			
1.	Human Labour	2,16,961.67 (12.02)	2,17,029.83 (11.67)	2,16,995.75 (11.85)
	(a) Hired labour (b) Owned labour	1,88,961.67 28,000.00	1,92,029.83 25,000.00	1,90,495.75 26,500.00
2.	Machine Labour	1 0, 115.65 (0.56)	11,916.65 (0.64)	11,016.15 (0.60)
3.	Manures	27,916.65 (1.55)	29,000.00 (1.56)	28,458.33 (1.56)
4.	Fertilizers	48,165.50 (2.67)	50,333.33 (2.71)	49,249.41 (2.69)
5.	Plant Protection Chemicals	23,800.65 (1.32)	25,166.65 (1.35)	24,483.65 (1.34)
6.	Polythene bags	1,29,169.83 (7.16)	1,37,246.50 (7.38)	1,33,208.16 (7.27)
7.	Growth Regulators	11,525.00 (0.64)	12,791.65 (0.69)	12,158.33 (0.67)
8.	Plant material	1,31,547.00 (7.29)	1,37,031.33 (7.37)	1,34,289.16 (7.33)
9.	Soil	63,854.21 (3.54)	70,154.13 (3.77)	67,004.17 (3.66)
10.	Interest on working capital	82,882.02 (4.59)	86,333.76 (4.64)	84,607.89 (4.62)
	Total operational cost	7,45,938.17 (41.33)	7,77,003.82 (41.79)	7,61,471.00 (41.56)
B.	**Fixed cost**			
1.	Rental value of land	2,06,833.33 (11.46)	2,06,833.33 (11.12)	2,06,833.33 (11.29)
2.	Depreciation	71,458.35 (3.96)	71,991.65 (3.87)	71,725.00 (3.92)
3.	Interest on fixed capital	83,170.00 (4.16)	85,322.30 (4.59)	84,246.15 (4.38)
4.	Annuity value of establishment cost	6,97,491.26 (38.64)	7,18,042.88 (38.62)	7,07,767.07 (38.63)
	Total fixed cost	10,59,011.15 (58.67)	10,82,248.36 (58.21)	10,70,629.76 (58.44)
	Total costs (A+B)	18,04,949.32 (100.00)	18,59,252.18 (100.00)	18,32,100.75 (100.00)
	Gross returns	22,67,312.75	24,87,302.33	23,77,307.54
	Net returns	4,62,363.43	6,28,050.15	5,45,206.79

Performance of National Agricultural Insurance Scheme in India

Diana Sarungban. S. S. Raju,* K. N. Rao, and Amrit Pal Kaur

Introduction

Agriculture sector contributing 13.8 per cent (2011-12) to the national Gross Domestic Product is one of the important sectors of the Indian economy. Yields per unit area of all crops have grown since 1950, due to the special emphasis placed on agriculture in the five-year plans and steady improvements in agricultural technologies. However, agriculture in India is prone to various risks and uncertainties and lacks effective risk mitigation mechanisms. With the growing commercialization of agriculture alongwith increasing size of consumer constituency, any eventualities during agricultural production affecting supply of the produce to the consumers lead to heavy consequences to both the sides. Various mechanisms have been introduced over the years to help mitigate risk in agriculture either directly or indirectly. One such important one is agricultural insurance which can effectively address the yield risks-faced in agriculture.

Agriculture insurance was first initiated in 1972-73 when the General Insurance Corporation (GIC) of India introduced a crop insurance scheme on H-4 cotton and later included groundnut, wheat and potato. The first Individual Approach Scheme continued up to 1978-79 and covered only 3,110 farmers, and wound up then in the light of very adverse claim ratio and challenges in estimating losses at an individual farm level. On the basis of the feasibility study conducted by Professor V M Dandekar, an area yield' based Pilot Crop Insurance Scheme (PCIS) was launched by the GIC in 1979. The scheme covered cereals, millets, oilseeds, cotton, potato and chickpea and it was confined to loanee farmers availing loans from institutional sources, on a voluntary basis. Based on the success of PCIS a country-wide Comprehensive Crop Insurance Scheme (CCIS) was introduced by the Government during the year 1985-86. Till kharif 1999, the scheme was adopted by 15 states and 2 union territories. Both, PCIS and CCIS were confined only to farmers who had borrowed seasonal agricultural loans from financial institutions. The main difference of the two schemes was that PCIS was on voluntary basis, whereas CCIS was compulsory for loanee farmers in the participating states and union territories. CCIS covered 763 lakh farmers but suffered from various shortcomings like skewed indemnity payouts towards a particular state or crop, coverage confined to only loanee farmers, non-coverage of commercial/horticulture crops and delays in indemnity payment (Jain, 2004). CCIS was subsequently replaced by the National Agricultural Insurance Scheme (NAIS) w.e.f. from Rabi 1999.

National Agricultural Insurance Scheme (NAIS)

The NAIS, introduced in the country from 1999-2000 rabi season, is available to both the loanee and non-loanee farmers. The scheme operates on the basis of 'area approach' for widespread calamities and 'individual approach' for localised calamities like hailstorms, landslides, cyclones and floods. NAIS is presently implemented in 25 states and two union territories. All foodgrains, oilseeds and annual horticultural/commercial crops are eligible for insurance for which past yield data are available for adequate number of years. Among the annual commercial and horticultural crops, sugarcane, potato, cotton, ginger, onion, turmeric, chillies, coriander, cumin, jute, tapioca, banana and pineapple etc., are covered under the scheme. The concept of different premium rates for different crops was introduced. The premium rates applicable on the sum insured are: wheat - 1.5 per cent; bajra and oilseeds - 3.5 per cent; other rabi crops - 2.0 per cent, other kharif crops - 2.5 per cent (Raju and Chand, 2010). Actuarial rate applies for the annual commercial and horticultural crops. The Government of India and the concerned state/UT subsidy will share equally the subsidy of 10 per cent of the premium in the case of small and marginal farmers.

In the present study, performance of NAIS of five crops viz. paddy, wheat, groundnut, potato and cotton were analysed. The data for the analysis was collected from the Agriculture Insurance Company of India Limited., New Delhi, Economic Survey, 2011-12 and Agricultural Statistics at a Glance, 2011. Data for ten years (2001-2010) was considered for the crop level analysis at state level while three years (2007-2010) data was taken for the analysis at all-India level. The performance study was done using various indicators like area covered, claims ratio (Claims/Premium), percentage of premium to sum insured, percentage of claims to sum insured and percentage of farmers benefitted to the total farmers covered. A comparison of 'claims/sum insured' ratio and ‘claims/ premium’ ratio is used to indicate the magnitude of loss.

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Paddy

The performance of NAIS of Paddy crop in five major rice growing states viz. Andhra Pradesh, Chhattisgarh, Orissa, Uttar Pradesh and West Bengal were analysed and is given in Table 1. These five states accounted for more than 60 per cent of the NAIS insured paddy area of the country. For Andhra Pradesh, the claims were more than four times the premium paid during 2005-06 BE and 2009-10 BE. The claims/sum insured varied during the decade. The difference in claims/sum assured and premium/sum assured was the highest during 2005-06 BE and 2009- 10 BE with 7.97 per cent and 9.18 per cent, respectively. This implies a loss of 7.97 per cent and 9.18 per cent of the value of output during the respective year. As expected the percentage of farmers receiving claims to the farmers insured was lower for the years where the claim ratios were close to unity. The area covered under the scheme fluctuated over the years and ranged from 27.4 - 43.2 per cent.In Chhattisgarh, the claims was more than five times (5.54) the premium paid during 2001-02 BE and was lower during the succeeding years. The claims/sum assured ratio fluctuated highly over the years. The magnitude of loss of the assured value of output was 12.30 per cent in 2001-02 BE indicated by the difference between the premium/sum and claim/sum insured ratio. The percentage farmers benefited to farmers covered was lowest during 2005-06 BE (1.66 %) and highest in 2001-02 BE with 47.79 per cent. The area under paddy covered by the scheme increased over the years and was the highest during 2009-10 BE (45.80 %). The claims were low but the area under paddy NAIS is increasing in the state. This may be due to growing awareness of crop insurance in the state.

The area covered under NAIS was low in Orissa as compared to Andhra Pradesh and Chhattisgarh. During 2001-02 BE the claims ratio was more than 16 times the sum insured, and the magnitude of loss to the value of output was 14.36 per cent. The percentage of benefited farmers was highest during 2001-02 BE (46.34 %).

In Uttar Pradesh, the area covered rose over the years to 20.14 per cent in 2009-10 BE. The claims ratio ranged between 1- 2 in most of the years except during 2003-04 BE where the claims ratio was more than three implying that every rupee premium collected there was a claim of three rupees.

In West Bengal, which is one of the most important paddy growing states in India, the area covered by NAIS of paddy crop remained very low and has not reached even 5 per cent since its implementation. Claims during the initial years were low and the premium amount collected covered the claim amount.

It can be observed that penetration of NAIS of paddy has not reached 50 per cent of the area under paddy in the past ten years of its implementation in any of the five states. Over and above, in all the five states, claims were much higher than the sum assured, indicating a loss in the scheme.

TABLE 1—PERFORMANCE OF NAIS OF PADDY IN VARIOUS STATES

Year (BE)	Area Insured (%)	% area insured to all India insured area	Claims Ratio (Claims/Premium)	Claims / Sum insured (%)	Farmers Benefited/ Farmers Covered (%)
ANDHRA PRADESH					
2001-2002	35.4	22.23	2.58	6.45	22.71
2003-2004	43.2	21.82	1.09	2.73	13.56
2005-2006	27.4	19.58	4.13	10.33	38.33
2007-2008	29.9	16.18	0.72	1.79	6.42
2009-2010	38.1	18.88	4.59	11.49	33.38
CHHATTISGARH					
2001-2002	35.0	25.87	5.54	14.80	47.79
2003-2004	33.8	20.90	0.18	0.46	2.43
2005-2006	29.2	17.78	0.17	0.44	1.66
2007-2008	37.7	18.43	1.70	4.35	16.44
2009-2010	45.8	19.37	2.11	5.34	21.34
ORISSA					
2001-2002	23.0	19.44	6.21	16.86	46.34
2003-2004	17.4	12.92	0.85	2.31	5.61
2005-2006	18.3	12.52	0.61	1.56	5.01
2007-2008	16.3	9.47	1.13	2.87	8.64
2009-2010	22.1	11.16	2.17	5.45	14.58
UTTAR PRADESH					
2001-2002	6.06	6.42	1.46	3.66	19.73
2003-2004	3.58	13.22	3.33	8.32	24.88
2005-2006	5.49	7.97	1.75	4.38	22.28
2007-2008	11.59	8.86	1.67	4.17	12.65
2009-2010	20.14	13.77	1.34	3.35	12.71

TABLE 1—PERFORMANCE OF NAIS OF PADDY IN VARIOUS STATES —*Contd.*

Year (BE)	Area Insured (%)	% area insured to all India insured area	Claims Ratio (Claims/Premium)	Claims / Sum insured (%)	Farmers Benefited/ Farmers Covered (%)
WEST BENGAL					
2001-2002	4.06	4.73	0.06	0.15	3.57
2003-2004	3.58	3.45	0.54	1.36	9.98
2005-2006	3.61	3.07	3.12	7.81	21.77
2007-2008	3.44	2.61	3.61	9.03	21.55
2009-2010	4.22	2.84	1.44	3.61	15.23

Source: Authors' calculation based on data from AIC and Economic Survey 2010-11.

Wheat

Wheat being the second most important crop of India next to Paddy, NAIS of wheat was looked into. Performance of NAIS of wheat were analysed in three states i.e. Madhya Pradesh, Rajasthan and Uttar Pradesh which covers a major portion of the area under NAIS wheat in the country and is given in Table 2. Punjab the major wheat producer has not been considered because the state is not implementing NAIS. Haryana has started implementing NAIS, but wheat crop is not notified for insurance.

TABLE 2—PERFORMANCE OF NAIS OF WHEAT IN VARIOUS STATES

Year (BE)	Area insured (%)	% area insured to all India insured area	Claims Ratio (Claims/Premium)	Claims / sum insured (%)	Farmers Benefited/ Farmers Covered (%)
MADHYA PRADESH					
2001-2002	25.59	56.70	5.05	7.60	35.96
2003-2004	34.92	57.56	2.25	3.39	23.12
2005-2006	75.35	52.98	1.04	1.56	15.28
2007-2008	67.56	37.15	8.52	12.79	35.34
2009-2010	38.67	37.99	1.95	2.93	13.02
RAJASTHAN					
2001-2002	NA	NA	NA	NA	NA
2003-2004	0.80	0.76	0.19	0.29	1.23
2005-2006	24.12	15.32	1.56	2.30	14.18
2007-2008	21.28	15.40	1.82	2.73	20.27
2009-2010	15.57	9.24	1.00	1.49	15.03
UTTAR PRADESH					
2001-2002	6.41	37.29	1.14	1.71	19.30
2003-2004	7.85	32.68	1.44	2.16	24.97
2005-2006	8.54	23.71	5.01	7.53	43.14
2007-2008	13.31	34.28	3.40	5.10	23.11
2009-2010	15.34	37.82	0.87	1.31	13.96

Source: Authors' calculation based on data from AIC and Economic Survey 2010-11 NA: Not Available.

In Madhya Pradesh, the area covered reached 75.35 per cent during 2005-06 BE. The claims ratio was more than seven times during 2007-08. The percentage farmers benefited to the farmers covered was below 40 during the study period.

In Rajasthan the claims ratio was high during 2007-08 BE, during which the percentage farmers benefited was also the highest (20.27 %) compared to rest of the years. There was a loss of 1.26 per cent of the value of output during 2007-08 BE. During 2003-04 BE the claims ratio was lower than one which indicates that the premium collected was more than the claims. Therefore, the percentage farmers benefited was low during the years where the claims ratio was low. The percentage area covered was the highest during 2005-06 BE (24.12 %).

In Uttar Pradesh, the area covered under NAIS ranged from 8-15 per cent during 10 years of its implementation. The overall claims ratio was low except from the BE 2005-06 and 2007-08 where the ratio was 5.01 and 3.40, respectively. During 2005-06 BE, the loss to value of output was naturally high (6.03 %). The percentage farmers benefited to the farmers covered was 43.14 per cent during 2005-06, where the claims ratio was also the highest.

Among the three states, the area covered was the highest in Madhya Pradesh and was the lowest in Uttar Pradesh. The percentage farmers benefited was higher in Uttar Pradesh. In most of the years the claims ratio was higher than one indicating that in all the three states the loss to the scheme was more and was not economically viable to the insurance company.

Groundnut

The performance of NAIS of groundnut crop in five major groundnut growing states in India is given in Table 3. In Andhra Pradesh, the area covered rose gradually over the years and reached 90.58 per cent during 2009-10 BE. Overall, the claims ratio ranged from 4-7, reaching 10 times of the premium paid during 2005-06 BE, which was the highest. The claims/sum insured ratio and the percentage farmers benefited was also the highest during 2005-06 BE.

TABLE 3—PERFORMANCE OF NAIS OF GROUNDNUT IN VARIOUS STATES

Year (BE)	Area insured (%)	% area insured to all India insured area	Claims Ratio	Claims/ sum insured (%)	Farmers Benefited/ Farmers Covered (%)
ANDHRA PRADESH					
2001-2002	47.04	27.90	5.67	19.83	47.67
2003-2004	55.63	34.66	3.59	12.56	21.58
2005-2006	71.19	29.03	10.11	35.38	63.88
2007-2008	78.81	44.11	7.89	27.60	45.50
2009-2010	90.58	45.19	4.64	16.25	48.67
GUJARAT					
2001-2002	66.16	48.82	6.38	23.90	35.47
2003-2004	80.31	59.12	3.09	10.65	23.22
2005-2006	95.39	47.51	4.36	15.27	27.55
2007-2008	73.73	43.57	3.11	10.89	20.23
2009-2010	81.71	44.05	4.39	15.35	38.32
KARNATAKA					
2001-2002	18.94	6.02	4.02	15.26	53.65
2003-2004	15.54	5.00	6.93	28.37	92.20
2005-2006	22.67	5.21	4.45	15.52	42.39
2007-2008	21.12	5.77	2.94	10.30	19.82
2009-2010	17.51	4.21	3.64	12.75	36.43

TABLE 3—PERFORMANCE OF NAIS OF GROUNDNUT IN VARIOUS STATES—*Contd.*

Year (BE)	Area insured (%)	% area insured to all India insured area	Claims Ratio	Claims/ sum insured (%)	Farmers Benefited/ Farmers Covered (%)
MAHARASHTRA					
2001-2002	62.25	9.99	0.60	2.10	8.82
2003-2004	59.24	8.94	1.44	5.09	21.20
2005-2006	24.64	2.84	0.80	2.89	16.45
2007-2008	16.18	1.73	1.80	6.86	11.66
2009-2010	8.88	0.84	1.02	3.88	19.31
TAMIL NADU					
2001-2002	0.37	0.08	1.28	4.47	16.01
2003-2004	0.15	0.03	0.87	3.05	29.90
2005-2006	0.12	0.02	0.55	1.93	12.23
2007-2008	0.27	0.04	0.09	0.31	3.17
2009-2010	1.05	0.15	1.79	6.43	52.00

Source: Authors' calculation based on data from AIC and Economic Survey 2010-11.

In Gujarat, the area covered fluctuated over the decade and ranged from 66-95 per cent. The claims/sum insured ratio varied from 11-24 per cent. A loss of 20.40 per cent of the value of output was observed during 2001-02 BE where the claims ratio was the highest with more than six times of the value of premium paid. The percentage farmers benefited was the highest during 2009-10 BE with 38.32 per cent. Though the claims ratio was lower than that of2001-02 BE, the farmers benefited was higher in 2009-10 BE and this can be attributed to the higher area coverage during 2009-10 BE.

In Karnataka, the claims/sum insured ratio was more than 10 times the sum insured during 2001-2010. Almost 93 per cent of the farmers covered were benefited during 2003-04 BE, accordingly the claims ratio was also high during that year. The area covered was low ranging from 18-23 per cent of the total area under groundnut. The area coverage was highest at 22.67 per cent during 2005-06 BE.

The area under groundnut covered by the NAIS was initially high in Maharashtra covering 62 per cent of the groundnut area during 2001-02 BE and decreased over the years and reached all-time low during 2009-10 BE with only 8.88 per cent of the area covered. One reason for this appears to be the prominence of soybean, the area of which has been gradually increasing. The claims ratio was less than one or just above one in most of the years indicating that premium collected was higher than the amount which was claimed. There might be less risk leading to the lack of need to claim insurance because of which the popularity of the scheme must have reduced over the years in Maharashtra. The farmers benefited/farmers covered ratio was also low, the highest being 21 per cent.

Compared to the above four states discussed, the area covered was the lowest in Tamil Nadu. Further study may be needed to look into the reasons for low popularity of groundnut NAIS in Tamil Nadu. The claims ratio was low in all the years and in some years it is less than one indicating that the premium collected over the claims was higher.

The performance of the groundnut NAIS varies from state to state or region to region with the variation of the degree of risk. When it comes to the degree of risk, the top three states, viz. Andhra Pradesh, Gujarat and Karnataka have been consistently clocking very high claims to sum insured ratio, and the rain-fed nature of the crop is not mere coincidence. Put it another way, the actual premium rate for groundnut in these three states are expected to be quite high. Among the five states studied, it can be said that the groundnut NAIS was most skewed .in Gujarat while in Maharashtra the popularity declined over the years. In Tamil Nadu the penetration remained low since its implementation.

Potato

Potato is an important crop but its cultivation involves various risks caused by pests, diseases, weather, etc. The analysis of the performance of NAIS of potato crop in four states is presented in Table 4.

In Bihar the area covered increased over the years of its implementation though the coverage is low, the highest being 5.09 per cent during 2009-10 BE. The claims ratio was the highest during 2009-10 BE in which claims was almost 8.5 times of the premium collected. The highest percentage of farmers benefited to the farmers covered was during 2008-09 BE (91.82 %).

TABLE 4—PERFORMANCE OF NAIS OF POTATO IN VARIOUS STATES

Year (BE)	Area Covered (%)	% to all India potato area	Claims Ratio	Claims / sum insured (%)	Farmers Benefitted/ Farmers Covered (%)
BIHAR					
2001-2002	0.11	0.13	0.92	5.08	54.21
2003-2004	0.14	0.10	0.01	0.01	1.37
2005-2006	0.38	0.19	0.96	7.03	51.84
2007-2008	3.89	1.51	4.59	26.47	91.82
2009-2010	5.09	4.73	8.51	54.56	80.21
UTTAR PRADESH					
2001-2002	19.14	61.32	0.03	0.10	3.25
2003-2004	28.70	56.07	2.26	4.66	20.60
2005-2006	25.40	40.10	1.09	2.94	28.63
2007-2008	24.04	30.02	1.21	4.87	32.02
2009-2010	19.12	30.19	0.47	1.61	15.88
WEST BENGAL					
2001-2002	7.84	19.21	0.21	0.72	5.25
2003-2004	15.08	22.24	4.67	15.30	28.98
2005-2006	29.12	35.26	2.64	9.31	29.26
2007-2008	29.35	30.42	6.83	24.64	48.74
2009-2010	43.68	52.43	2.45	2.61	50.36

Source: Authors' calculation based on data taken from AIC and Economic Survey 2010-11.

The area covered was higher in Uttar Pradesh as compared to Bihar, however, a declining trend can be observed in the area coverage after 2003-04 BE. The claims ratio was more than two times the premium paid during 2003-04 BE. The farmers benefited ranged from as low as 3.25 per cent during 2001-02 BE to 32.02 per cent during 2007-08 BE.

In West Bengal, the area coverage increased over the years and as compared to the previous two states, the coverage was the highest with 43.68 per cent of the total area under potato. The claims ratio was also very high with the value of the claims ratio reaching 8.33 during 2007-08 BE.

From the analysis, it can be observed that the adoption of the NAIS scheme for potato was low in Bihar. Over the years lack of awareness or not facing serious risks in potato cultivation may be the reason for the low adoption. In West Bengal, high claims ratio can be observed in majority of the period except during 2001-02 BE, indicating that potato cultivation in West Bengal is prone to disease risk, and therefore, the adoption of the insurance scheme on potato is high leading to high area coverage. On the

insurance institution side, since most of the time the claims ratio was higher than one, the economic viability of the scheme is questionable.

Cotton

Cotton is an important fibre crop cultivated in India. India ranks first in the world in respect of acreage with about 8 million hectares under cotton cultivation and fourth in total seed cotton production. Table 5 gives an analysis of the performance of NAIS of cotton crop in four important cotton growing states in India.

In Andhra Pradesh, the area coverage ranged mostly from 12-17 per cent of the total cotton growing area. The claims ratio was less than one indicating that in Andhra Pradesh, cotton insurance was economically viable since its implementation. The farmer benefited too was less than 10 per cent of the farmers covered except during 2003-04 BE (12.68%).

In Gujarat, the area coverage fluctuated over the years and reached all-time low (1.02 %) coverage during 2007-08 BE, and rose steeply (42.34 %) during 2009-10 BE. The claims ratio was four times the premium collected during 2001-02 BE benefiting 71.38 per cent of the farmers covered by the scheme. The large number of benefitted farmers may be one of the reasons for the drastic increase in the area coverage during the successive biennium. However, during the rest of the period, the claim ratio remained low with a value less than one. This may imply that either risk in cotton cultivation in Gujarat as such is low or the risk covered under the NAIS of cotton is not very common in the state.

TABLE 5—PERFORMANCE OF NAIS OF COTTON IN VARIOUS STATES

Year (BE)	Area Covered (%)	% area to all India total	Claims Ratio	Claims/ sum insured (%)	Farmers Benefitted/ Farmers Covered (%)
ANDHRA PRADESH					
2001-2002	11.83	5.51	0.40	2.58	6.01
2003-2004	17.00	14.60	0.97	4.75	12.68
2005-2006	15.55	9.08	0.19	1.57	7.71
2007-2008	10.68	29.43	0.03	0.21	1.98
2009-2010	12.90	34.90	0.39	2.29	6.10
GUJARAT					
2001-2002	23.66	19.89	4.10	28.54	71.38
2003-2004	53.11	79.15	0.05	0.62	3.08
2005-2006	3.57	4.31	0.01	0.19	1.13
2007-2008	1.02	5.41	0.03	0.35	4.58
2009-2010	42.34	192.83	0.27	2.43	0.37
MADHYA PRADESH					
2001-2002	30.51	8.25	0.31	3.14	18.94
2003-2004	26.11	12.24	0.02	0.14	3.08
2005-2006	21.33	7.81	0.00	0.00	0.00
2007-2008	9.47	26.33	0.00	0.00	0.00
2009-2010	18.95	22.73	0.04	0.22	3.84

TABLE 5—PERFORMANCE OF NAIS OF COTTON IN VARIOUS STATES—*Contd.*

Year (BE)	Area Covered (%)	% area to all India total	Claims Ratio	Claims/ sum insured (%)	Farmers Benefitted/ Farmers Covered (%)
MAHARASHTRA					
2001-2002	71.11	51.83	0.07	0.61	5.77
2003-2004	31.78	35.79	0.22	1.32	5.87
2005-2006	11.27	18.86	0.15	1.15	7.81
2007-2008	7.43	25.90	0.14	1.96	9.55
2009-2010	42.54	29.45	0.88	1.58	34.77

Source: Authors' calculation based on data from AIC and Economic Survey 2010-11.

In Madhya Pradesh, the value of claims ratio was very less in all the years and was nil in some years. It can be conferred that risk level was low in cotton cultivation in Madhya Pradesh during the study period. The area coverage was low and showed a declining trend over the years.

The claims ratio was also less than one during the entire study period in the state of Maharashtra. The area coverage rose drastically during 2009-10 BE (42.54 %) after an all-time low (7.43 %) during 2007-08 BE. The percentage farmers benefitted was high during 2009-10 BE (34.77 %).

Overall, in the four states it is observed that the claims ratio was low indicating that the scheme was economically viable to the insurance companies for cotton crop as there was no loss in premium received by NAIS in these states. In three states, the area coverage increased steeply during 2009-10 BE, the reason which might be increased in awareness. The other reason for low claims/premium ratio in cotton is the introduction of Bt cotton has resulted in yield increases and lower crop failures and therefore reduced claims.

Performance of NAIS Crop-wise at All-India level

The performance of NAIS crop-wise viz. paddy, wheat, groundnut, potato and cotton at all India level during 2007-10 is given in Table 6. The area coverage of the crops was well below 40 per cent except for groundnut. An increasing trend in coverage area can be observed in cotton crop. In potato crop a declining trend can be seen where the area coverage declined from 31.08 -13.87 per cent during the study period. For wheat and paddy the area covered by NAIS is still very low (< 20 %). However, the area covered by NAIS paddy reached 26 per cent in 2009-10.

The claims ratio was less than unity in three crops i. e. groundnut, potato and cotton in 2007-08 and during the consecutive years, it was more than unity in majority of the crops. In 2009-10, the claims ratio was high in all the crops compared to other years and the highest can be seen in groundnut crop with a value of 9.06. The most potent reasons for the low claims/premium ratio in cotton and potato is the actuarially fixed premium rates that make it unaffordable for the farmers there by decline in coverage for these crops. Regarding financial viability, foodgrains and oilseeds have always received higher insurance coverage due to the applicability of the heavily subsidized flat premium rates fixed by the Government. There are still large gaps between the existing premium rates and actuarial rates for all the insured crops. Over time, the premium rates should be equal to the long term average claims to premium ratio or break -even cost. The average all India claims ratio (From NAIS inception to Rabi 2010-11) for crops like Paddy, wheat and Groundnut is 361 per cent, 358 per cent and 495 per cent respectively.

TABLE 6—PERFORMANCE OF NAIS CROP-WISE AT ALL-INDIA LEVEL

Crops	Area Covered (%)	Claims/ Premium ratio	Claims/Sum insured (%)	Farmers Benefited/ Farmers Covered (%)	Sum assured as % of Value of Crop Output
2007-08					
Paddy	18.21	3.87	9.41	15.55	9.81

TABLE 6—PERFORMANCE OF NAIS CROP-WISE AT ALL-INDIA LEVEL—*Contd.*

Crops	Area Covered (%)	Claims/ Premium ratio	Claims/Sum insured (%)	Farmers Benefited/ Farmers Covered (%)	Sum assured as '% of Value of Crop Output
Wheat	13.20	5.96	9.00	28.01	17.43
Groundnut	51.59	0.19	0.66	2.52	4.38
Potato	31.08	0.89	4.09	15.77	10.75
Cotton	3.77	0.03	0.24	0.80	69.00
2008-09					
Paddy	14.91	5.11	12.14	25.22	9.88
Wheat	13.99	3.19	4.83	16.84	13.83
Groundnut	52.98	9.06	31.45	53.26	3.23
Potato	21.16	4.35	32.17	78.87	6.60
Cotton	4.99	0.10	0.98	6.77	49.20
2009-10					
Paddy	26.02	3.79	9.36	31.73	5.12
Wheat	12.30	1.39	2.08	16.41	17.00
Groundnut	69.88	6.99	24.36	59.90	1.87
Potato	13.87	0.13	1.00	3.93	8.10
Cotton	5.53	0.58	4.20	15.04	27.08

Source: Authors' calculation based on data taken from AIC, Economic Survey 2010-11 and Agricultural Statistics at a Glance 2011.

The percentage crop output in value terms covered by the scheme fluctuated over the years for paddy, wheat and potato, in groundnut and cotton, the percentage coverage has declined over the years. In groundnut, the value declined from 4.38 to 1.87 per cent and in cotton it declined from 69 to 27.08 per cent.

In the decade of its implementation, the penetration of NAIS is till low though it differs from region to region and lacks financial viability. Various factors may be responsible for its low penetration among which the nature of the insurance products and its delivery system are some of the most important factors.

Penetration of NAIS

The penetration of NAIS at the all India level remained below satisfaction since its implementation. By 2010 the NAIS covered only 17.57 per cent of the total farmers in India and 17.24 per cent of the total Gross Cropped Area (GCA).

TABLE 7—PENETRATION OF NAIS AT ALL-INDIA LEVEL DURING 2000-2010

Year	Farmers Covered under NAIS (millions)	% of farmers covered to total farmers	Area insured under NAIS (million ha)	% of area insured to the GCA
2000-01	10.50	8.76	16.33	8.81
2001-02	10.65	8.75	16.03	8.52
2002-03	12.10	9.79	19.57	11.15
2003-04	12.39	9.88	18.82	9.90
2004-05	16.22	12.74	29.62	15.46

TABLE 7—PENETRATION OF NAIS AT ALL-INDIA LEVEL DURING 2000-2010—*Contd.*

Year	Farmers Covered under NAIS (millions)	% of farmers covered to total farmers	Area insured under NAIS (million ha)	% of area insured to the GCA
2005-06	16.72	12.94	27.75	14.35
2006-07	17.91	13.69	27.31	14.19
2007-08	18.44	13.91	28.14	14.42
2008-09	19.20	14.30	26.49	13.58
2009-10	23.90	17.57	33.64	17.24

NOTE: Data on farmers covered and area insured obtained from AIC. Data on total number of farmers obtained from Agricultural Census, Ministry of Agriculture, GoI and Gross Cropped Area (GCA) is obtained from Statistical Abstract of India, 2010.

CONCLUSION

Agricultural insurance since its inception during the 1970s has been launching many insurance products, it has served a very limited purpose. If crop insurance programme is to be made an important tool in risk management, the present level of coverage of crop insurance will have to be improved, at least by 3-4 folds (Raju and Chand, 2008). Under the NAIS, the total farmers and total area covered (Raju and Chand, 2010) in the country was very less. Moreover, as observed from the present study, the area covered for major foodgrain crops like paddy and wheat were still very low. Since majority of the Indian farmers are either small or marginal farmers, the insurance products need to be designed keeping the target group in concerned. Insurance products for the rural areas should be simple in design and presentation so that they are easily understood (Raju and Chand, 2009). Though the Modified National Agricultural Insurance Scheme (MNAIS) has been launched which takes into account the shortcomings of the NAIS for higher penetration among the farmers, a wider coverage can be achieved if the products design and delivery systems are more acceptable to the farmers and more players are brought in at the institutional side.

The high claims ratio is also one issue that has to be addressed since it threatens the economic viability of the scheme. In the present study, except for cotton, in all the other crops during the last ten years, the claims amount is higher than the premium collected. A balanced has to be brought to facilitate both the parties i.e. farmers and the insurance agency, for enhancing the viability of the insurance schemes. Linkage between banks and insurance companies is significant for success of agricultural insurance but other linkages which will be fruitful are cooperatives, trade associations, suppliers of inputs such as fertilizers, pesticides, seeds and farm equipments, processors of the produce, marketing organizations, extension services of the government, research institutions and universities concerned with agriculture (Jain, 2004). Developing these linkages will help establish a strong network of agricultural insurance across the country for aggressive service delivery.

Addressing all the complexities of the Indian agricultural system is and will be a difficult and a challenging task. A multi-pronged strategy is required to address the critical issues of stagnant agricultural growth, rural indebtedness and farmers' suicide (Nair, 2011) and agricultural insurance is one among the plethora of risk management tools. It is important that awareness, the coverage of the farmers and crop area be improved as soon as possible through changes and modifications to come to a viable insurance scheme.

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AGRICULTURAL PRICES IN INDIA

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

Climate Change and Wheat Yields in Punjab: The Impact of Rise in Temperature

R. S. Sidhu and Kamal Vatta*

Abstract

The present paper intends to establish the relationship between the rise in temperature and wheat yield in Punjab by using the data from 1975-2008 on wheat yield and daily temperature in Ludhiana district. The growing degree days were estimated to determine the extent of heat accumulation during different months of the growing season for wheat and cumulative growing degree days were also calculated. There has been gradual increase in the monthly degree days during the wheat production period over time and the March month has shown the highest increase followed by the month of January. The study could not establish any significant relationship between the heat accumulation and the wheat yields, while the fertilizer use has a positive and significant effect on wheat productivity. Availability of a larger dataset on temperature and yields for different locations in the state can throw further insight into such relationship.

Introduction

The Punjab state, with only 1.5 per cent of the geographical area of the country and production of about 20 per cent of wheat and 11 per cent of rice in India, is an outstanding success story of increasing food grain production. The Punjab state not only helped in improving food availability but also earned the name of 'food basket' of the country or 'granary ofTndia' by annually contributing 50-75 per cent wheat and 40-50 per cent rice to the central pool of foodgrains procured through the public agencies. Slowing down of agricultural growth, paddy-wheat monoculture, over exploitation of natural resources and declining profitability from farming are the major issues currently plaguing the Punjab economy (Sidhu, 2002). Though, rice yields have grown at less than 2 per cent per annum, wheat yields have followed a decline during the last decade. The highest level of wheat yield at 4563 kg/ha during 2000-01, were never achieved and the wheat yields even dipped to as low as 4193 kg/ha during 2005-06 after witnessing some recovery during the later years.

Climatic variations in the form of rise in temperature during the wheat production period may be cited as the major reason for decline in the wheat yields. The average monthly temperature during March has increased from 18.6 degrees Celsius during TE 1975-77 to 20.5 degrees Celsius during TE 2006-08. The increase in temperature can adversely affect the actual and potential wheat yields and the decline may amount to the extent of 38 per cent and 50 per cent, respectively with five degrees rise in temperature (Aggarwal and Rani, 2009). High temperature at anthesis can damage pollen formation in wheat which in turn reduces the grain set and hence the yield (Dawson and Wardlaw, 1989; Tashiro and Wardlaw; 1990). The rise in temperature has also been found to affect the quality of wheat grains (Nagarajan *et al*., 2009). The climate change is, thus, expected to adversely affect wheat production and productivity and hence food security across all the regions in India. It has economic implications as well in the form of rise in price and large scale hunger and deprivation in the country.

The present study intends to establish the relationship between increase in temperature and wheat productivity. It further establishes the effect of future rise in temperature on wheat production in the state in relation to the food security objective of the nation.

Database and Methodology

The study is based on the daily data on maximum and minimum temperature in Ludhiana district from the years 1975 to 2008 obtained from the Department of Agro-meteorology, Punjab Agricultural University, Ludhiana. The data on wheat yield in Ludhiana was obtained from various issues of the Statistical Abstract of Punjab. The analysis could not be extended to all the districts of the state due to lack of data on daily temperature.

Growing Degree Days (GDDs) were used to establish the relationship between rise in temperature and wheat yield in this study. Growing Degree Days are the measure of the extent of heat accumulation 'Over and above a given temperature and have largely been used to estimate the growth and development of plants and insects during the growing season. GDDs are always calculated over and above a given level of temperature (threshold temperature) and vary with the value of threshold temperature. There are three main methods to calculate the growing degree days which are explained below (McMaster and Wilhelm, 1997; Andresen, 2012).

1. **Simple Method :** The GDDs are calculated by comparing the daily mean temperature(T_{mean}) with the base temperature (T_{base}) or threshold temperature.

$$Tmean = (T_{max} + T_{min})/2$$

$$GDD = T_{mean} - T_{base}$$

Where, T_{max} and T_{min} are the daily maximum and minimum temperature, respectively. The degree days accumulate only when the mean temperature exceeds the base temperature, otherwise these are zero. The base

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temperature of 20 degree Celsius has been considered for this study. These daily GDDs can be added to get the growing degree days for a given period of time. The major limitation of this method is that it assumes the linear relationship between the heat accumulation and rise in temperature, which may not be true.

2. **Modified Growing Degree Days :** This method is modified simple method. In this method, upper and lower limits of the temperature are fixed. If the maximum temperature exceeds the maximum limit, it is fixed at the maximum value and when the minimum temperature falls below the lower limit, it is fixed at the lower limit. Rest of the procedure for calculating the GDDs is the same as in the first method. The formula for calculating modified GDDs is given below :—

$T_{max} = T_{upper}$ (if $T_{max} > T_{upper}$)

$T_{min} = T_{lower}$ (if $T_{min} < T_{1ower}$)

Where $T_{mean} = (T_{max} + T_{min})/2$

$GDD = T_{mean} - T_{base}$

3. **Beskerville Emin (BE) Method :** This method fits a sine curve to the maximum and minimum temperature and estimates the growing degree days by calculating the area of the curve above the base temperature. This method seems better than the simple and modified simple method of calculating theGDD method. The step-wise details of calculating the GDDs by this method are given below.

Step -1:

If $T_{max} < T_{base}$

GDD = 0, otherwise go to step-2.

Step-2:

$T_{mean} = (T_{max} + T_{min})/2$

Step-3:

If $T_{min} >= T_{base}$

$GDD = T_{mean} - T_{base}$, otherwise go to step-4.

Step-4:

$GDD = [(W*Cos(A)] - [(T_{base} - T_{mean})*(0.5*Pi) - A)]/Pi$

Where,

$W = (T_{max} - T_{min})/W$

$A = Arcsin [(T_{base} - T_{base})/W)]$

Arcsin is calculated in radians.

The third method has been used in this study to estimate the GDDs for wheat and the base temperature was considered to be 20 degree Celsius. The GDDs were calculated for all the months from October to March and then the estimates of the total GDDs during this period as well as during January and March were also calculated as the last three months are considered to be important as rise in temperature during these months is expected to have a significant adverse impact on the productivity of wheat.

Trends in Growing Degree Days

In general, there has been an increasing trend in the monthly degree days during the wheat production period, i.e. from October to March, except in the month of October and December. During October, the growing degree days have shown a decreasing trend from 1975 to 2008. The GDDs were the highest in 1975 at 429 and the least at 186 in 1997. For most of the years, the GDD values fluctuated between 186 and 307 with a little declining trend. In November, the degree days varied largely between 160 and 240, with the minimum degree days of 133 in 1997. December month showed relative cooling with degree days ranging between 40 and 120, with the minimum level of 14 in 1997. There has been a sharp and continuous increase in the degree days during January since 2005. March month has shown the highest increase in the degree days during the production period of wheat crop. Recent period has shown relatively sharper increase in the degree days as compared to the past period. The sharpest increase in the degree days during March is expected to have a significant negative impact on wheat productivity in Punjab.

Growing Degree Days during October Month, 1975-2008

Growing Degree Days during November Month, 1975-2008

Further, the growing degree days were estimated for the entire production period (October to March) and also for the months of January to March which are considered more critical for the wheat productivity. The trends in pooled degree days are given in Figure 2 and Figure 3. There has been a slow and gradual increase in the cumulative degree days during the wheat production from 1975-76 to 2007-08. In a similar manner, the cumulative degree days during January to March have also shown an increasing trend, which is relatively sharper as compared to the total wheat production period of October-March.

Figure 2: Cumulative Degree Days during October-March, 1975- 76 to 2007-08

Figure 3: Trends in Cumulative Degree days during January-March, 1975-76to 2007-08

Impact of Rising Temperature on Wheat Yield

To analyze the impact of growing degree days on the wheat yield, month-wise regression analysis was carried out and the results are given in Table 1. The wheat yield was regressed on monthly GDDs and amount of fertilizer use. The results reveal that rising temperature (month-wise) had no adverse impact on the wheat yields. However, temperature increase in December was favoring an increase in wheat yield. Fertilizer use has a positive and significant effect on wheat productivity.

TABLE 1—MONTH-WISE GROWING DEGREE DAYS AND THEIR EFFECT ON WHEAT PRODUCTIVITY

Variable	Coefficient
1. Constant	1400.22*
	(581.10)
2. Fertilizer use	1.67*
	(0.15)
3. GDDs in October	–0.61^{NS}
	(1.48)
4. GDDs in November	0.89^{NS}
	(2.52)
5. GDDs in December	8.17*
	(2.50)
6. GDDs in January	–3.30^{NS}
	(2.29)
7. GDDs in February	–0.10^{NS}
	(1.42)
8. GDDs in March	2.11^{NS}
	(1.63)

* Means significant at 5% level and NS means non-significant.

These growing degree days were further aggregated for the months of October to March as well as for January to March to estimate whether the cumulative heat due to rising temperature was having any adverse impact on wheat yield or not. The results of the regression are given in Table 2 and Table 3. Both the estimates reveal that the rising temperature had no significant effect on wheat productivity, while fertilizer use was the major determinant of wheat productivity.

TABLE 2—CUMULATIVE DEGREE DAYS (OCTOBER TO MARCH) AND THEIR EFFECT ON WHEAT PRODUCTIVITY

Variable	Coefficient
1. Constant	1750.90* (490.28)
2. Fertilizer use	1.49* (0.15)
3. Cumulative GDDs (Oct-March)	0.80^{NS} (0.55)

* Means significant at 5% level and NS means non-significant.

TABLE 3—CUMULATIVE DEGREE DAYS (JANUARY TO MARCH) AND THEIR EFFECT ON WHEAT PRODUCTIVITY

Variable	Coefficient
1. Constant	2420.40* (248.89)
2. Fertilizer use	1.51 * (0.16)
3. Cumulative GDDs (Jan-March)	-0.03^{NS} (0.80)

* Means significant at 5% level and NS means non-significant.

Finally, the current analysis could not establish any significant relationship between rising temperature and wheat yields. Availability of a larger dataset on temperature and yields for different locations in the state can throw further insight into such relationship.

Summary and Conclusions

There has been gradual increase in the monthly degree days during the wheat production period during the period from 1975 to 2008. March month has shown the highest increase in the degree days during the production period of wheat crop followed by the month of January. Further, the cumulative degree days for October to March well as for January to-March have also shown an increasing trend over this period. The rising temperature (month-wise) was found to have no adverse impact on the wheat yields, while the fertilizer use has a positive and significant effect on wheat productivity. In a similar manner, the cumulative degree days had no significant effect on wheat productivity, while fertilizer use was the major determinant of wheat productivity. The current analysis could not establish any significant relationship between rising temperature and wheat yieids. Availability of a larger dataset on temperature and yields for different locations in the state can throw further insight into such relationship.

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Hulling and Milling Ratio for Paddy in Punjab*

Effective price policy coupled with relatively better technology available, has resulted into the emergence of paddy and wheat crops as the most secure and profitable ones in the Punjab state. The foodgrain production of Punjab, which was 26.95 million tonnes in year 2009-10, has stood second in country after Uttar Pradesh. Punjab accounts for around 5.36 percent of total rice area in India while its share is 12.36 per cent in total rice production in the country. Punjab is also a major contributor of food-grains to the central pool, although its share has declined for paddy from 45 per cent in 1980-81 to 27 per cent in 2010-11. But still, Punjab is the largest contributor of wheat to the central pool while it ranks second after Andhra Pradesh for contribution of paddy. The trade of paddy is affected by regulating controls of Govt. of India and State Government with announcement of minimum support price and procurement policy every year. The minimum support price for the paddy is ensured to the farmers while auction. In the case of rice milling also there exist a wide range of technology with low productive small mills having simple machinery on the one hand and high productive and highly automatic mills with sophisticated machinery on the other hand. Most of the rice milling units has installed .local fabricated un standardized milling plants leading to low productivity, high broken and unshelled paddy percentage and other rejections. Very few units including large and medium have installed semi/fully automatic plants leading to good quality, productivity and low rejections. Most of the SSI rice millers are not following standardization, quality assurance and management systems and also are not aware of right processing techniques including parboiling drying, storage techniques, polishing methods, bran stabilization, energy conservation and Pollution control.

Objectives

The specific objectives of the study are:

(i) To analyse the trends and pattern in the growth of modem rice mills.

(ii) To estimate conversion ratios of paddy to rice with varietal differences with or without parboiling in various paddy processing units.

(iii) To estimate the relative shares of different milling techniques ~ paddy processed with various type of processing technologies.

(iv) To examine the problems and prospects in paddy processing industry

Methodology

The study is based on both primary and secondary data. Primary data were collected from the two districts of Punjab, namely Sangrur and Patiala, which were selected based on the highest density of rice mills in the state. From each selected district, a total number of 20 modern and 25 traditional rice mills (hullers) were selected for detailed information. In Punjab, there are either modern rice mills or the hullers operating in the villages for custom-milling of paddy, therefore the analysis were restricted to these only. From each selected mill or unit, primary survey was carried out with pre-tested questionnaire. A questionnaire was prepared specifically indicating the quantity of paddy processed, hulled or milled in the mills. The primary data had a reference year of 2009-10 (financial year) and information was collected for the last three years in order to avoid yearly fluctuations. The secondary information was collected from the Ministry of Food Processing Industries and State Government Department of Civil Supplies related to their work plan on modernization of rice milling in the state. Secondary information was also collected on applied aspects of production, rice processing and by-product utilization like drying, storage, parboiling, milling, bran stabilization, etc. from concerned Government Departments.

Status of Rice milling industry in Punjab

Rice milling units are mostly concentrated in the paddy producing states like Uttar Pradesh, Punjab, Haryana, Uttrakhand, West Bengal, Bihar, Orissa, Assam, Andhra Pradesh, Karnataka and Kerala. The Basmati varieties of rice are mainly produced in Punjab, Haryana, Uttrakhand and Uttar Pradesh while the non Basmati varieties are produced in other states. Depending on the regional food habits, the rice mills consist of raw rice and parboiled rice, viz., the mills in Eastern India process mainly the parboiled variety.

Almost the entire production of over 90 million tonnes of paddy is being converted into rice every year by many units, small and big, spread all over the country. In Punjab state, there were 4416 hullers, 442 shellers and 1965 modern rice mills in 1993. Till nineties, the major portion of the paddy was milled through hullers. Most of the tiny hullers of less than 500 kg/hr capacities were employed for custom-milling of paddy. The hullers are usually low capacity mills. In these hullers, both shelling

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TABLE 1—DISTRICT WISE NUMBER OF PADDY PROCESSING UNITS (MODERN), 2009-10, PUNJAB

District	Number	%age	Capacity (tonnes)	%age
Gurdaspur	77	2.40	206.90	2.8
Amritsar	33	1.00	61.00	0.8
Tarntarn	33	1.00	83.00	1.1
Kapurthala	74	2.30	263.00	3.5
Jalandhar	63	2.00	376.00	5.0
SBS Nagar	37	1.20	133.50	1.8
Hoshiarpur	40	1.30	101.25	1.4
Ropar	32	1.00	112.00	1.5
SAS Nagar	21	0.70	44.50	0.6
Ludhiana	306	9.70	1025.69	13.7
Ferozpur	140	4.40	391.00	5.2
Faridkot	100	3.20	411.00	5.5
Mukatsar	136	4.30	217.00	2.9
Moga	166	5.30	628.50	8.4
Bathinda	231	7.30	411.00	5.5
Mansa	192	6.10	274.50	3.7
Sangrur	563	17.80	1161.25	15.5
Barnala	268	8.50	546.00	7.3
Patiala	526	16.60	801.25	10.7
Fatehgarh	123	3.90	232.00	3.1
Punjab	3161	100.00	7308.84	100.0

Source: Department of Food and Civil Supplies, Punjab, Chandigarh

and polishing operations are carried out simultaneously. Hence, there is no control on the polishing of rice, bran and a higher breakage of rice occurs. To overcome all these, rice mills have been established and became more popular to meet the needs of the villagers and a substitute for a huller mill, to get polished rice, rice bran and paddy husk. As government agencies have stopped providing the lieences to hullers in the state, therefore the data regarding the number of hullers in the state was not available for the recent times. Presently, most of the hullers in the villages are double hulling units numbers which carry out both the functions of shelling as well as polishing of the processed rice. Further, over the years there has been a steady growth of improved/modern rice mills in the state as their number has been increasing continuously from 1965 in the year 1993 to 3163, in 2009-10 and the figure has reached to 3778 in the year 2011-12 (Table 1). Most of these have capacities ranging from 0.5 tonnes /hr to 10 tonnes/hr.

Sangrur and Patiala district of the state are leading districts in terms of the number of modern rice mills in the state and occupying about 18 and 17 per cent of the total number of mills in the state in the year 2009-10 (Table 2). Ludhiana, Barnala and Bathinda are the other important districts in terms of the number of modern rice mills in the state and occupying about 10, 9 and 7 per cent of the total number of mills in the state, respectively. Presently, the milling capacity of paddy processing by the modern rice mills in the state was 7308MT. Sangrur district of the state has the highest milling capacity of paddy in the state which was about 16 per cent of the total capacity in the state in the year 2009-10. Ludhiana, Patiala and Moga are the other important districts in terms of milling capacity of paddy processing by the modern rice mills in the state which was about 14, 11 and 8 per cent, respectively.

TABLE 2—TRENDS IN TYPE OF PADDY PROCESSING UNITS (MODERN RICE MILLS AND TRADITIONAL) IN PUNJAB

Years	Hullers	Shellers	Hullers cum Shellers	Modern/ Modernised Rice Mills	Others	Total
1992-93	4416	442	–	1965	–	6823
2009-10	–	–	–	3161	–	3161
2010-11	–	–	–	3505	–	3505
2011-12				3778		3778

Source: F:\Hulling & Milling Rice/Internet website/Ministry of Food Processing Industries.robt and Department of Food and Civil Supplies. Punjab. Chandigarh.

Basic characteristics of the selected sample units

In Punjab, there are either modern rice mills or the hullers operating in the villages for custom-milling of paddy, therefore the analysis were restricted to these only. Most of the modern rice mills in the study area had the production capacity of 1 Ton/Hr. rice processing capacity followed by 2 tonnes/hr. capacity (Table 3). The average modern rice mills in the study area had the production capacity of 1.6 tonnes/hr. rice processing capacity. The traditional rice mills/hullers were also prevalent in the study area with the average processing capacity of 150 Kg/hr. The average modern rice mills had the investment of about Rs. 13 lakh on the processing plant while the traditional rice miller/huller had to invest Rs. 32 thousand per processing plant. The average modern rice mills had employed 9 employees/labourers as compared to only one daily wage labourer for the traditional rice mills/ hullers.

TABLE 3—CHARACTERISTICS OF STUDY SAMPLE UNITS OF PADDY PROCESSING, NON-PARBOILED, PUNJAB

Particulars	Avg. Investment (Rs. in lakhs)	A vg. Size of Units (Tonnes per hr.)	Avg. No. of Employees	Avg. No. of Daily Wage Labourers
Modern Rice Mills	13.10	1.60	5	4
Traditional Rice Mills (hullers)	0.32	0.15	—	1

Differences in rice milling ratio among modern rice mills (owner-cum-trader) and hullers (custom hiring)

Tables 4 and 5 depict the comparison of milling ratio from paddy processing in modern rice mills and hullers. The milling ratio in modern rice mills is around 69.5% while the ratio for traditional rice mill using steel hullers for dehusking is slightly lesser (68.8%). In hullers, there is excessive loss in the form of coarse and fine brokens. Further, loss of large portion of endosperm layers during the dehusking operation further accentuates the problem. The average modern rice mills were found to process about 362 tonnes of paddy per annum, while the traditional rice miller/huller processed only meager quantity (about 6 tonnes) of paddy per annum. The improved rice mills have a better husk and rice bran aspiration system. The same prevents mixing of fine brokens with rice bran. Therefore, the quality of rice bran obtained is better and is more preferred as compared to the traditional hullers.

TABLE 4—HULLING AND MILLING RATIO IN MODERN RICE MILLS (OWNER CUM TRADER), NON-PARBOILED, PUNJAB

Particulars/Year		2007-08	2008-09	2009-10	Average
Total Quantity of Paddy Processed in the Year (Qtl/unit)	Grade. A	3644	3695	3523	3621
	Common	—	—	—	—
	Others	—	—	—	—
Total Rice Produced (Qtl/unit)	Grade. A	2541	2530	2479	2517
	Common				
	Others	—	—	—	—
Paddy to Rice Conversion Ratio (Per cent)	Grade. A	69.70	68.50	70.40	69.50
	Common	—	—	—	—
	Others	—	—	—	—

TABLE 5—HULLING AND MILLING RATIO IN HULLERS ON CUSTOM HIRING BASIS, NON-PARBOILED, PUNJAB

Particulars/Year		2007-08	2008-09	2009-10	Average
Total Quantity of Paddy Processed in the Year (Qtl/unit)	Grade. A	58.90	62.0	53.60	58.20
	Common	—	—	—	—
	Others	—	—	—	—
Total Rice Produced (Qtl/unit)	Grade. A	40.40	42.70	37.60	40.0
	Common	—	—	—	—
	Others	—	—	—	
Paddy to Rice Conversion Ratio (per cent)	Grade. A	68.60	68.70	68.80	68.80
	Common	—	—	—	—
	Others	—	—	—	—

Processing cost among modem and traditional rice mills

The costs incurred on various components in processing of one quintal of paddy into rice among modern and traditional rice mills are presented in Tables 6 and 7 respectively. Among modern rice mills, there are three major components of processing costs comprising of power, administrative and labour expenses. In rice milling process through modern rice mills, the total cost was found to continuously increase from about Rs. 64/q in the year 2007-08 to about Rs 75/q in the year 2009-10 with an average of about Rs 69/q over this period. The variable costs contributed about 69 per cent of the total cost of processing. Amongst variable cost components, the share of power and labour expenses was about 73 per cent. Expenses on storage, maintenance and repair and packing material were the other important components of the variable cost. Amongst fixed cost items, administrative expenses alone contributed about 82 per cent to the total fixed cost. Depreciation cost occupied the second largest place among the fixed costs in the case of rice milling by modern units.

TABLE 6—COST OF PADDY PROCESSING BY MODERN RICE MILLS (OWNER CUM TRADER), NON-PARBOILED, PUNJAB

(Rs/qtl)

Particulars/Year	2007-08	2008-09	2009-10	Average
Variable Cost				
Labor Cost	13.50 (21.27)	14.50 (21.2)	15.60 (20.9)	14.50 (21.1)
Electricity charges	23.0 (36.1)	24.40 (35.7)	26.60 (35.7)	24.60 (35.8)
Packing Material Cost	0.90 (1.4)	1.10 (1.6)	1.30 (1.7)	1.10 (1.6)
Maintenance/Repair Cost	2.40 (3.8)	2.80 (4.1)	3.40 (4.6)	2.80 (4.1)
Storage Cost Specify	3.70 (5.8)	4.10 (6.0)	4.70 (6.3)	4.20 (6.1)
Miscellaneous	0.20 (0.3)	0.10 (0.1)	0.20 (0.3)	0.20 (0.3)
Sub-total	43.70 (68.6)	47.0 (68.7)	51.80 (69.5)	47.40 (68.9)
Fixed Cost				
Insurance	0.20 (0.3)	0.20 (0.3)	0.10 (0.1)	0.10 (0.3)

TABLE 6—COST OF PADDY PROCESSING BY MODERN RICE MILLS (OWNER CUM TRADER), NON-PARBOILED, PUNJAB—*Contd.*

(Rs/qtl)

Particulars/Year	2007-08	2008-09	2009-10	Average
Depreciation	3.90 (6.1)	3.30 (4.8)	3.10 (4.2)	3.50 (5.10)
Administrative Expenses	15.70 (24.6)	17.70 (25.9)	19.20 (25.8)	17.50 (225.4)
Miscellaneous	0.20 (0.3)	0.20 (0.3)	0.30 (0.4)	0.20 (0.3)
Sub-total	20.0 (31.4)	21.40 (31.3)	22.70 (30.5)	21.40 (31.1)
Total Cost	63.70 (100.0)	68.40 (100.0)	74.50 (100.0)	68.80 (100.0)

NOTE: Figures in brackets are percent to total cost.

TABLE 7—COST OF PADDY PROCESSING BY TRADITIONAL RICE MILLS (HULLERS), NON-PARBOILED, PUNJAB

(Rs/qtl)

Particulars/Year	2007-08	2008-09	2009-10	Average
Variable Cost				
Labor Cost	12.20 (15.2)	13.60 (16.0)	15.60 (16.2)	13.80 (15.9)
Electricity charges	15.10 (18.8)	16.70 (19.6)	26.60 (27.7)	17.40 (20.0)
Sub-total	27.30 (34.0)	30.30 (35.6)	36.20 (43.9)	31.20 (35.9)
Fixed Cost				
Depreciation	53.10 (66.0)	54.70 (64.4)	59.90 (56.1)	55.70 (64.1)
Sub-total	53.10 (66.0)	54.70 (64.4)	59.90 (56.1)	55.70 (64.1)
Total Cost	80.40 (100.0)	85.00 (100.0)	96.10 (100.0)	86.90 (100.0)

NOTE: Figures in brackets are percent to total cost.

Among traditional rice mills/hullers, there are three components of processing costs comprising of depreciation, power and labour expenses. The total cost of processing was found to continuously increase from about Rs. 80/q in the year 2007-08 to about Rs 96/q in the year 2009-10 with an average of about Rs 87/q over this period. The depreciation alone contributed about 64 per cent of the total cost of processing while the share of power and labour expenses was about 16 and 20 per cent respectively.

Comparative economics of paddy processing through modern and traditional rice mills

In Punjab, most of the produce of Grade A in Punjab is procured by the government agencies and most of the purchase/procurement of PUSA 1121 and Sharbati varieties of paddy is done by the rice millers. Therefore, the rice millers have to incur marketing/processing cost before finally selling the produce. The hullers are operating on the custom hiring basis only, have not to incur marketing/processing cost. The total cost of paddy purchase including marketing by modern rice mills was found to vary between Rs. 1686/q in 2009-10 to Rs. 2315/q in 2008-09, with an average of Rs. 1909/q over the period of 3 years (Table 8). On the other hand, the hullers had to incur the average cost of merely about Rs. 87 as these were operating on the custom hiring basis only, have not to incur marketing/processing cost. The net profit for modern rice mills was found to be the highest during

2008-09 due to higher price of paddy purchased/sold during the year. The average net profit fetched was found to be about Rs. 313/q for modern rice mills and the same was about Rs. 87/q for hullers.

TABLE 8—COMPARATIVE ECONOMICS OF PADDY PROCESSING THROUGH MODERN RICE MILLS AND HULLERS

(Rs/qtl)

Particulars	Modern Rice Mills				Hullers (on Custom hiring basis)			
	2007-08	2008-09	2009-10	Average	2007-08	2008-09	2009-10	Average
Cost	1713.30	2315.80	1686.40	1909.40	80.40	85.0	96.10	86.90
Gross Return	1950.40	2687.60	2018.40	2222.10	118.40	125.90	134.80	129.90
Net Profit	237.10	371.80	332.00	312.70	38.0	40.90	38.70	40.0

Marketing of processed rice by modern millers

Table 3.6 presents the disposal pattern of rice by modern units. The rice was marketed through two different agencies, viz. sale of rice at mill gate directly to the wholesaler and sale of rice in open markets directly to the retailer/consumer. It can be seen from the Table 9 that more than 75 per cent of the rice processed by the millers was directly sold to the wholesalers over the different years. Tables 10 and 11 depict the average quantity of paddy processed and its by-products by the modern rice mills and traditional rice Mills (hullers), respectively. The tables show the quantities of fine rice, broken rice, bran, husk and other cattle feed produced by processing one quintal of paddy into rice. Over the last 3 years, one quintal of paddy yielded 66.7 kgs of fine rice in modern units and 65.3 kgs in case of hullers. This difference in head rice naturally resulted in the output of larger quantity of broken rice (3.4 kgs) per quintal of paddy processed in respect of conventional unit and only 2.8 kgs in modern units. The yield of bran and husk are marginally different over different years in rice making process and it was found to be about 6 and 20 per cent in modern units and 7 and 20 per cent in case of hullers, respectively. Further, the modern units could also realize higher price per kg of fine rice than the conventional units on account of difference in the rice quality. The prices of brokens, bran and husk did not differ between the two types of mills.

TABLE 9—MARKETING OF RICE BY OWNER CUM TRADER, NON-PARBOILED, PUNJAB

Year	Unit	Wholesaler	Retailer/Directly to Consumer	Levy to Government	Others	Total
2007-08	Qty (Qtls/unit)	1916	625	—	—	2541
	Per cent of total	75.40	24.60	—	—	100.0
2008-09	Qty (Qtls/unit)	2044	486	—	—	2530
	Per cent of total	80.80	19.20	—	—	100.0
2009-10	Qty (Qtls/unit)	1872	607	—	.	2479
	Per cent of total	75.50	24.50	—	—	100.0
Average	Qty (Qtls/unit)	1944	573	—	—	2517
	Per cent of total	77.20	22.80	—	—	100.0

TABLE 10—AVERAGE QUANTITY OF PADDY PROCESSED AND ITS BY-PRODUCTS BY MODERN RICE MILLS, NON-PARBOILED PUNJAB

Type	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value (000' Rs,)	Qty (Qtls)	Value (000' Rs.)	Qty (Qtls)	Value (000' Rs.)	Qty (Qtls)	Value (000' Rs.)
Paddy	3644	5552	3695	7816	3523	5204	3621	6191
Fine Rice	2437 (66.9)	6626	2426 (65.7)	9240	2382 (67.6)	6513	2415 (66.7)	7460
Broken Rice	104 (2.9)	147	104 (2.8)	236	97 (2.8)	139	102 (2.8)	174
Paddy Husk	700 (19.2)	165	757 (20.5)	273	705 (20.0)	283	715 (19.7)	233
Rice Bran	179 (4.9)	131	185 (5.0)	143	162 (4.6)	134	176 (4.9)	137
Other Cattle Feed	222 (6.1)	35	222 (6.0)	37	176 (5.0)	40	214 (5.9)	39

NOTE: Figures in brackets are percent to paddy.

TABLE 11—AVERAGE QUANTITY OF PADDY PROCESSED AND ITS BY-PRODUCTS BY TRADITIONAL RICE MILLS (HULLERS), NON-PARBOILED PUNJAB

Type	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value (Rs.)	Qty (Qtls)	Value (Rs.)	Qty (Qtls)	Value (Rs.)	Qty (Qtls)	Value (Rs.)
Paddy	58.90		62.0		54.6		58.2	
Fine Rice	38.30 (65.0)		40.6 (65.5)		35.7 (65.4)		38.0 (65.3)	
Broken Rice	2.10 (3.6)		2.10 (3.4)		1.9 (3.5)		2 (3.4)	
Paddy Husk	11.40 (19.4)	1968	12.4 (20.0)	2232	10.8 (19.8)	2149	11.6 (19.9)	2132
Rice Bran	1.90 (3.2)	651	2.0 (3.3)	724	1.6 (3.0)	631	1.8 (3.1)	659
Other Cattle Feed	4.2 (7.1)	488	4.7 (7.6)	597	4.4 (8.1)	621	4.4 (7.6)	571

NOTE: Figures in brackets are percent to paddy.

Relative shares of different milling techniques

The relative shares of different milling techniques in total paddy processed during 2009-10 are presented in Table 12. Under the custom milling policy, the State procuring agencies get the paddy milled from rice milling units at the determined price, specification and terms and deposit to the central pool, which is not considered for the present analysis. The average modern rice mills were found to process about 352 tonnes of paddy per annum (98.5 per cent of total paddy processed during 2009-10), while the traditional rice miller/huller processed only meagre quantity (about 5 tonnes) of paddy per annum. The improved rice mills have a better husk and rice bran aspiration system. The same prevents mixing of fine brokens with rice bran. Therefore the quality of rice bran obtained is better and is more preferred as compared to the traditional hullers.

TABLE 12—RELATIVE SHARES OF DIFFERENT MILLING TECHNIQUES IN TOTAL PADDY PROCESSED IN THE SAMPLE UNITS DURING 2009-10

(qtls/unit)

Type of Unit	Non-parboiled	Per cent
Modern Rice Mills with 3 Phase	3523.00	98.50
Traditional Rice Mills (Hullers)	53.60	1.50
All	3576.60	100.00

Capacity utilization of modern versus traditional rice mills

The capacity utilization aspects of modern rice mills and traditional (hullers) were depicted in the Tables 13 and 14. Under the custom milling policy, the State procuring agencies get the paddy milled from rice milling units at the determined price, specification and terms and deposit to the central pool, which is also considered for the present analysis. Over the last 3 years, the annual installed capacity was about 0.44 tonnes/hour in the case of conventional units as compared to about 1.60 tonnes/hour in modern units. But as compared to the capacity utilization of about 77 per cent in modern units, it was less than 2 per cent in conventional (hullers) units. The mills have to mill the allocated paddy in the state by the government agencies by March 31. The milling of paddy purchased by the private agencies is carried out throughout the year. The exporting units mostly work for 11 months in a year leaving one month for plant maintenance and other units mainly work for six months season with effect from October to March. Thus, it clearly indicates that the capacity utilization was higher in the case of modern units in comparison with conventional units. The lower capacity utilization of conventional mills compared to modern mills could be attributed to the use of conventional technology i.e. manual method of processing like cleaning, parboiling, drying, grading, packing etc, coupled with lesser preference of the people for processing of paddy through hullers due to lower quality of rice and byproducts produced.

TABLE 13—CAPACITY UTILIZATION OF MODERN RICE MILLS, PUNJAB

Particulars	2007-08	2008-09	2009-1 0	Average
Actual Capacity (Tonnes/hr)	1.60	1.60	1.60	1.60
Capacity used (Tonnes/hr)	1.20	1.26	1.24	1.23
Capacity utilization (%)	75.0	79.0	78	77.0
Time period for which plant remained closed in the off-season (Days)	65	70	74	70

TABLE 14—CAPACITY UTILIZATION OF TRADITIONAL (HULLERS) RICE MILLS, PUNJAB

Particulars	2007-08	2008-09	2009-1 0	Average
Actual Capacity (Tonnes/hr)	0.450	0.340	0.570	0.440
Capacity used (Tonnes/hr)	0.008	0.006	0.009	0.007
Capacity utilization (%)	1.77	1.76	1.58	1.59
Time period for which plant remained closed in the off-season (Days)	270	240	290	267

Constraints in rice milling industry

- It has been expressed by about 55 per cent of the modern rice millers that the un standardised and faulty designed combine harvesting machines and milling plants along with the premature cutting of high moistured paddy increases the broken percentage of rice during milling as well as inferior rice quality and other rejections.
- The State is facing the shortage of power supply and about 30 per cent of the modern and 62 per

cent of traditional rice millers felt that irregular power supply was affecting the efficiency of their units (Tables 15 and 16).

- More than 90 per cent of the huller owners felt that conventional mills were less preferred as compared to modern mills due to the use of conventional technology i.e. manual method of processing like cleaning, parboiling, drying, grading, packing etc, coupled with lower quality of rice and byproducts produced.

TABLE 15—CONSTRAINTS IN THE PROCESSING OF PADDY (MODERN RICE MILLS), PUNJAB

Reasons	No. of Respondents	Per cent
Lack of availability of quality raw material nearby areas	22	55.0
Lack of good quality roads for transportation	3	8.0
Bad Quality electricity, irregular cuts voltage fluctuation	12	30.0
Lack of international standard machinery and technical know- how	10	25.0
Lack of adequate finances	12	30.0
Mandi fee, toll tax and delays in clearance of loaded trucks with the raw materials at the state boundaries	4	10.0
Lack of government long term planning for promoting food processing industry	32	80.0
Space problem	20	50.0
Shortage of labour	10	25.0

TABLE 16—CONSTRAINTS IN THE PROCESSING OF PADDY (TRADITIONAL RICE MILLS/HULLERS), PUNJAB

Reasons	No. of Respondents	Per cent
Bad Quality electricity, irregular cuts voltage fluctuation	31	62
Lack of adequate finances	24	48
Lack of government long term planning for promoting food processing industry	14	28
Shortage of labour	6	12
Lesser preference of the people	46	92

- Lack of adequate and liberal finance requirement has been expressed by many units particularly for paddy plant modernization and up gradation. Even though they believed that modernization was economical, they had not been able to procure and use all the modern equipments due to financial constraint.
- About 80 per cent of the modern and 28 per cent of traditional rice millers complained about the lack of government long term planning for promoting food processing industry in the state. The units were facing the problems due to high level of market fee in state markets, toll tax and delays in clearance of loaded trucks with the raw materials at the state boundaries. Most of the non exporting units have expressed their dissatisfaction over the policy of incentives given by Government to the exporters especially in case of tax exemptions, reduced rate of interest and subsidised rate of the supplied to them by the procuring agencies/central pool for the purpose of exporting.
- About half of the modern rice millers were facing the problem of space for storage of the produce due to delay in uplifting of the produce by the Government agencies. About 25 per cent of modern and 12 per cent of traditional rice millers also complained about shortage of skilled labour at the plant due to NREGA programme which has reduced the migration of labour force from the neighboring states.

Policy recommendations

- To overcome problems faced by modern and traditional rice millers, about 53 per cent of the modern and 28 per cent of traditional rice millers emphasized for better designing of the combine harvester machines by their manufacturers/ Research & Development and other institutions. This may improve the rice yield and rejection/ broken percentage (Tables 17 and 18).
- There is a scope of improvement in various processes like parboiling, storage, paddy drying, polishing and grading etc. The methods adopted by most of the units are traditional and unscientific/non professional. They give rise to the broken per cent age and affect product quality and productivity.
- About 60 per cent of modern and 48 per cent of traditional rice millers desired to reduce the existing rate of interest of finance at par with the international rate of interest to the tune of 3-4%. Some of the non exporting units have desired to become exporters but non exporting units demand concession at par with exporters to effectively compete in the market.
- With the mega units getting a plethora of concessions from the state government, the existing units, especially the smaller units are facing hard times. Some of the non exporting units have desired to become exporters but these demand concession at par with exporters to effectively compete in the market. They have expressed that they are facing problems due to their 20 to 25% higher cost of production than the exporting units as well as market fee/taxes. The associations/industry has emphasized the tax structure to be uniform in the country and only Government of India should have the authority to regulate and collect the tax.
- In order to manage the industry in a professional manner to get optimum outputs there is an utter need to upgrade the competency of personal at various levels i.e. for technical, managerial and at top level as per the needs of changed environment.
- About 48 per cent of the modern and traditional rice millers opined that uninterrupted power supply, avail duty free diesel for generators as per EXIM Policy and concessional power supply will also help in boosting paddy processing industry in the state.

TABLE 17—SUGGESTIONS TO IMPROVE THE PADDY PROCESSING INDUSTRY AS EXPRESSED BY MODERN RICE MILLERS, PUNJAB

Suggestions	No. of Respondents	Per cent
Better designing of combine harvester machines	21	53.5
Adoption of modern and scientific methods of processing	27	67.5
Credit availability at cheaper rates	24	60.0
Reduction in market fee and taxes	15	37.5
Improvement in technical know how	11	27.5
Supply of reliable electricity	19	47.5

TABLE 18—SUGGESTIONS TO IMPROVE THE PADDY PROCESSING INDUSTRY AS EXPRESSED BY TRADITIONAL RICE MILLERS/ HULLERS, PUNJAB

Suggestions	No. of Respondents	Per cent
Better designing of combine harvester machines	14	28
Credit availability at cheaper rates	24	48
Improvement in technical know how	7	14
Supply of reliable electricity	24	48

D. Commodity Reviews

(i) Foodgrains

During the month of November, 2012 the Wholesale Prices of food grains displayed a rising trend. Wholesale Price Index (Base 2004-05=100) of Food grains and cereals rose by 1.74 per cent and 2.85 per cent while that of pulses fell by 2.34 per cent over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of December 2012	WPI for the Month of November 2012	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	202.7	196.1	173.1	3.37	17.10
Wheat	1.116	205.3	202.4	166.6	1.43	23.23
Jowar	0.096	229.9	226.0	247.9	1.73	-7.26
Bajra	0.115	246.4	228.9	187.2	7.65	31.62
Maize	0.217	241.1	233.1	200.4	3.43	20.31
Barley	0.017	212.7	203.4	174.0	4.57	22.24
Ragi	0.019	320.7	312.1	214.8	2.76	49.30
Cereals	3.373	209.0	203.2	175.6	2.85	19.02
Pulses	0.717	250.3	256.3	212.9	-2.34	17.57
Foodgrains	4.09	216.2	212.5	182.1	1.74	18.73

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 December, 2012.

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

Procurement of Rice

3924 thousand tonnes of Rice (including paddy converted into rice) was procured during December, 2012, as against 4427 thousand tonnes of Rice (including paddy converted into rice) procured during December 2011. The total procurement of Rice in the current marketing season i.e 2012-2013, upto 31.12.2012 stood at 16165 thousand tonnes, as against 15562 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 2012-13 (up to 31-12-12)		Corresponding Period of last Year (2011-12)		Marketing Year (October-September) 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)
Andhra Pradesh	1395	8.63	1464	9.41	7542	21.52	9609	28.10
Chhatisgarh	1741	10.77	1827	11.74	4115	11.74	3746	10.95
Haryana	2583	15.98	1966	12.63	2007	5.73	1687	4.93
Maharashtra	14	0.09	5	0.03	178	0.51	308	0.90
Punjab	8544	52.85	7661	49.23	7731	22.06	8635	25.25
Tamil Nadu	1	0.01	288	1.85	1596	4.55	1543	4.51
Uttar Pradesh	524	3.24	1358	8.73	3357	9.58	2554	7.47
Uttarakhand	138	0.85	129	0.83	378	1.08	422	1.23
Others	1225	7.58	864	5.55	8137	23.22	5694	16.65
Total	**16165**	**100.00**	**15562**	**100.00**	**35041**	**100.00**	**34198**	**100.00**

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2012-2013 upto August, 2012 is 38148 thousand tonnes against a total of 28148 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 2-08-2012)		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	22.71	6882	24.45	6928	24.45	6347	28.19
Madhya Pradesh	8493	22.26	4905	17.43	4965	17.52	3539	15.72
Punjab	12834	33.64	10957	38.93	10958	38.67	10209	45.35
Rajasthan	1964	5.15	1303	4.63	1303	4.60	476	2.11
Uttar Pradesh	5063	13.27	3461	12.30	3461	12.21	1645	7.31
Others	1129	2.96	640	2.27	720	2.54	298	1.32
Total	**38148**	**100.00**	**28148**	**100.00**	**28335**	**100.00**	**22514**	**100.00**

Source: Department of Food & Public Distribution.

(ii) Commercial Crops

OILSEEDS AND EDIBLE OILS :

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 202.3 in December, 2012 showing fall of 0.4 per cent over the previous month. However, it increased by 28.9 per cent over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Gingelly seed (7.7 per cent), Copra (3.0 per cent) and Sunflower (3.5 per cent) increased over the previous month. However, the WPI of Groundnut seed (-2.5 per cent), Soyabean (-0.2 per cent), Rape & Mustard (-1.2 per cent), Niger Seed (-3.8 per cent), Gingelly seed (7.7 per cent) and Cottonseed (-1.3 per cent) decreased over the previous month. The WPI of Safflower seed remained unchanged over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 150.0 in December, 2012 showing an increase of 0.9 per cent and 9.5 per cent over the previous month and over the previous year. The WPI of Groundnut Oil (5.5 per cent), Sunflower Oil (0.6 per cent), Gingelly Oil (8.1 per cent), and Copra oil (1.5 per cent) and Soyabean Oil (0.9 per cent) increased over the previous month. However, the WPI of Cottonseed Oil (0.4 per cent), decreased over the previous month. The WPI of Mustard Oil remained unchanged over the previous month.

FRUITS AND VEGETABLE:

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 188.2 in December, 2012 showing a fall of 3.8 per cent over the previous month. However, it increased by 13.2 per cent over the previous year.

POTATO :

The Wholesale Price Index (WPI) of Potato stood at 209.5 in December, 2012 showing a fall of 13.3 per cent over the previous month. However, it increased by 89.1 per cent over the previous year.

ONION :

The Wholesale Price Index (WPI) of Onion stood 304.8 in December, 2012 showing an increase of 16.9 per cent and 69.2 per cent over the previous month and over the previous year.

CONDIMENTS AND SPICES :

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 209.2 in December, 2012 showing a fall of 0.5 per cent over the previous month. However, it increased by 12.0 per cent over the previous year.

The WPI of Black Pepper increased by 1.4 per cent over the previous month. However, the WPI of Chillies (Dry) and Turmeric decreased by 1.4 per cent and 0.9 per cent, over the previous month.

RAW COTTON :

The Wholesale Price Index (WPI) of Raw Cotton stood at 202.2 in December, 2012 showing a fall of 0.2 per cent and 3.7 per cent over the previous month and over the previous year.

RAW JUTE :

The Wholesale Price Index (WPI) of Raw Jute stood at 230.8 in December, 2012 showing a fall of 1.7 per cent over the previous month. However, it increased by 18.7 per cent over the previous year.

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

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over a	
	Dec., 2012	Nov., 2012	Dec., 2011	Month	Year
Oil Seeds	202.3	203.1	156.9	–0.4	28.9
Groundnut Seed	250.0	256.5	192.4	–2.5	29.9
Rape & Mustard Seed	224.3	227.1	157.9	–1.2	42.1
Cotton Seed	172.1	174.3	140.0	–1.3	22.9
Copra (Coconut)	93.2	90.5	109.4	3.0	–14.8
Gingelly Seed (Sesamum)	318.8	295.9	214.9	7.7	48.3
Niger Seed	171.7	178.4	171.7	–3.8	0.0
Safflower (Kardi Seed)	150.4	150.4	129.1	0.0	16.5
Sunflower	193.1	186.6	161.6	3.5	19.5
Soyabean	200.1	200.5	137.2	–0.2	45.8
Edible Oils	150.0	148.7	137.0	0.9	9.5
Groundnut Oil	198.2	187.9	162.6	5.5	21.9
Cotton Seed Oil	186.2	186.9	149.3	–0.4	24.7
Mustard & Rapeseed Oil	155.7	155.7	141.7	0.0	9.9
Soyabean Oil	163.1	161.7	147.1	0.9	10.9
Copra Oil	114.4	112.7	120.5	1.5	–5.1
Sunflower Oil	139.4	138.6	134.9	0.6	3.3
Gingelly Oil	179.6	166.2	150.4	8.1	19.4
Fruits and Vegetables	188.2	195.7	166.2	–3.8	13.2
Potato	209.5	241.6	110.8	–13.3	89.1
Onion	304.8	260.8	180.1	16.9	69.2
Condiments and Spices	209.2	208.1	237.6	0.5	–12.0
Black Pepper	523.1	530.4	441.6	–1.4	18.5
Chillies(Dry)	233.0	229.7	282.4	1.4	–17.5
Turmeric	168.8	167.3	167.4	0.9	0.8
Raw Cotton	202.2	202.7	210.0	–0.2	–3.7
Raw Jute	230.8	234.8	194.5	–1.7	18.7

Source : Dte. of Eco. and Statistics, Commercial Crops Division.

PART II—Statistical Tables

A. Wages

1. Daily Agricultural Wages in Some States (Category-wise)

(in Rupees)

State/Distt.	Village	Month and Year	Normal Daily Working Hours	Field Labour			Other Agri. Labour			Herdsman			Skilled Labour		
				Man	Woman	Non Adult	Man	Woman	Non Adult	Man	Woman	Non Adult	Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Andhra Pradesh															
Krishna	Ghantasala	Dec., 2011	8	250.00	100.00	NA	250.00	130.00	NA	NA	NA	NA	NA	NA	NA
Guntur	Tadikonda	Dec., 2011	8	200.00	175.00	110.00	200.00	160.00	110.00	160.00	NA	NA	NA	NA	NA
Rangareddy	Arutla	Dec., 2011	8	200.00	120.00	NA	150.00	120.00	NA	150.00	120.00	NA	220.00	200.00	NA
Karnataka															
Bangalore	Harisandra	May to June, 2012	8	200.00	150.00	NA	200.00	150.00	NA	250.00	180.00	NA	300.00	300.00	NA
Tumkur	Gedlahali	May to June, 2012	8	160.00	160.00	NA	180.00	160.00	NA	180.00	160.00	NA	180.00	180.00	NA
Maharashtra															
Nagpur	Mauda	Dec., 2009	8	100.00	80.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ahmednagar	Akole	June, 2009	8	80.00	70.00	NA	NA	NA	NA	NA	NA	NA	83.5	85.00	85.00
Jharkhand															
Ranchi	Gaintalsood	April, 2012	8	100.00	100.00	NA	90.00	90.00	NA	58.00	58.00	NA	170.00	150.00	NA

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

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working 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	March, 12	M	8	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
			W	8	NA	NA	160.00	160.00	160.00	NA	NA	NA	NA
Bihar													
Muzaffarpur	Bhalui Rasul	April to June, 2012	M	8	130.00	120.00	80.00	130.00	150.00	120.00	200.00	180.00	250.00
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shekhpura	Kutaut	May and June 2012	M	8	NA	NA	185.00	NA	185.00	NA	245.00	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh													
Dhamtari	Sihaba	Oct., 2012	M	8				80.00	80.00	100.00	200.00	100.00	100.00
			W	8				80.00	80.00	80.00	200.00	100.00	NA
Gujarat													
Rajkot	Rajkot	March, 2012	M	8	247.00	270.00	164.00	197.00	168.00	140.00	408.00	358.00	240.00
			W	8	NA	182.00	142.00	167.00	167.00	100.00	NA	NA	NA
Dahod	Dahod	March, 2012	M	8	71.00	71.00	71.00	71.00	71.00	NA	143.00	150.00	150.00
			W	8	NA	71.00	71.00	71.00	71.00	NA	NA	NA	NA
Haryana													
Panipat	Ugarakheri	July and Aug, 2012	M	8	180.00	180.00	180.00	200.00	180.00	NA	NA	NA	NA
			W	8	NA	150.00	150.00	180.00	150.00	NA	NA	NA	NA

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

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working 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	NA
			W	8	NA	110.00	110.00	110.00	110.00	110.00	NA	NA	NA
Kerala													
Kozhikode	Koduvally	Feb., and March, 2012	M	4 to 8	720.00	450.00	NA	450.00	572.05	NA	500.00	NA	NA
			W	4 to 8	NA	NA	350.00	350.00	350.00	NA	NA	NA	NA
Palakkad	Elappally	Feb., and March, 2012	M	4 to 8	400.00	300.00	NA	275.00	368.75	NA	400.00	NA	NA
			W	4 to 8	NA	NA	150.00	200.00	160.00	NA	NA	NA	NA
Madhya Pradesh													
Hoshangabad	Sangarkhera	Aug., 2012	M	8	150.00	130.00	150.00	150.00	125.00	100.00	350.00	350.00	NA
			W	8	NA	130.00	150.00	150.00	125.00	100.00	NA	NA	NA
Satna	Kotar	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shyopur Kala	Vijaypur	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Orissa													
Bhadrak	Chandbali	Sep., 2012	M	8	180.00	NA	200.00	150.00	200.00	50.00	250.00	200.00	130.00
			W	8	NA	NA	150.00	120.00	150.00	40.00	NA	NA	NA
Ganjam	Aska	Sep., 2012	M	8	200.00	200.00	200.00	NA	200.00	200.00	350.00	300.00	200.00
			W	8	NA	NA	100.00	NA	120.00	100.00	NA	NA	NA
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	NA	NA	90.00	95.00	NA	99.44	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan													
Barmer	Vishala	July, 2012	M	8					—NA—				
			W	8					—NA—				
Jalore	Panwa	July, 2012	M	8	NA	NA	NA	NA	NA	50.00	100.00	50.00	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu													
Thanjavur	Pulvarnatham	Oct.., 2012	M	6					—NA—				
			M	5									
Tirunelveli	Malayakulam (Kurvikulam)	Oct., 2012	M	8					—NA—				
			W	8									
Tripura													
Agartala	Govt. Agri. Farm		M						—NA—				
			W										
*Uttar Pradesh**													
Meerut	Ganeshpur	Aug., 2012	M	8	200.00	200.00	200.00	200.00	200.00	NA	309.00	NA	NA
			W	8	NA	172.00	172.00	173.00	172.00	NA	NA	NA	NA
Aurraiya#	Aurraiya	Aug., 2012	M	8	120.00	120.00	120.00	132.9	120.00	NA	257.1	NA	NA
			W	8	NA	NA	120.00	132.9	120.00	NA	NA	NA	NA
Chandauli	Chandauli	July, 2012	M	8	NA	NA	NA	125.00	125.00	NA	236.00	NA	NA
			W	8	NA	NA	NA	125.00	125.00	NA	NA	NA	NA

M-Man W-Woman

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

*- Uttar Pradesh reports its district-wise average rural wage data rather than from selected centre/village.

New district is opted to replace Chandbali.

Source : Dte. of Eco and Statistics, Wages Division.

B. PRICES

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Dec.-12	Nov.-12	Dec.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1450	1450	1110
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1500	1450	1065
Wheat	—	Quintal	Madhya Pradesh	Sagar	2000	2000	1500
Jowar	—	Quintal	Maharashtra	Mumbai	1950	1900	2100
Gram	—	Quintal	Punjab	Abohar	NA	NA	NA
Maize	Yellow	Quintal	Uttar Pradesh	Bahraich	1250	1200	1030
Gram Split	—	Quintal	Maharashtra	Mumbai	6800	6150	4450
Gram Split	—	Quintal	Bihar	Patna	5410	5300	4700
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6350	6200	5750
Arhar Split	—	Quintal	Maharashtra	Mumbai	6500	6400	5200
Arhar Split	Sort-II	Quintal	Tamil Nadu	Chennai	5600	6000	5500
Arhar Split	—	Quintal	Bihar	Patna	5750	5800	5800
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2575	2370	2300
Gur	Sort-II	Quintal	Tamil Nadu	Chennai	NA	NA	2700
Gur	—	Quintal	Maharashtra	Mumbai	3450	3450	2900
Mustard Seed	Rai UP	Quintal	West Bengal	Kolkata	4600	4500	3500
Mustard Seed	Raira	Quintal	West Bengal	Kolkata	NA	NA	NA
Mustard Seed	Black(S)	Quintal	Uttar Pradesh	Kanpur	4110	4090	2820
Linseed	—	Quintal	Maharashtra	Nagpur	4600	4400	3350
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4380	4350	3360
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	NA	NA	4500
Cotton Seed	—	Quintal	Maharashtra	Mumbai	NA	NA	NA
Copra	FAQ	Quintal	Kerala	Alleppey	4575	4150	5275
Groundnut	—	Quintal	Maharashtra	Mumbai	8450	8400	6000
Groundnut	TMV-7	Quintal	Tamil Nadu	Chennai	NA	NA	4280
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1440	1425	1300
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1355	1335	1080
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1875	1800	1350
Groundnut Oil	—	15 Kg.	Tamil Nadu	Chennai	1875	1875	1500
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1328	NA	1155
Castor Oil	—	15 Kg.	Uttar Pradesh	Kanpur	NA	NA	NA
Sesamum Oil	Agmark	15 Kg.	Tamil Nadu	Chennai	NA	NA	1995
Sesamum Oil	—	15 Kg.	Maharashtra	Mumbai	NA	NA	NA
Coconut Oil	—	15 Kg.	Kerala	Cochin	998	915	1163
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	2180	2170	1150
Groundnut Cake	—	Quintal	Uttar Pradesh	Kanpur	NA	NA	NA
Cotton/Kapas	F-414	Quintal	Punjab	Abohar	NA	NA	NA
Cotton/Kapas	LR-A	Quintal	Tamil Nadu	Thiruppur	NA	NA	NA
Wool	Fine	Quintal	Madhya Pradesh	Dabra	NA	NA	NA
Jute Raw	TD-5	Quintal	West Bengal	Kolkata	2425	2340	2030

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Dec.-12	Nov.-12	Dec.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jute Raw	W-5	Quintal	West Bengal	Kolkata	2425	2340	2030
Oranges	—	100 No.	Maharashtra	Mumbai	NA	NA	NA
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	430	430	340
Oranges	Big	100 No.	Tamil Nadu	Chennai	480	560	530
Banana	Basarai	100 No.	Maharashtra	Jalgaon	275	400	425
Banana	Singapore	100 No.	West Bengal	Kolkata	350	350	NA
Cashewnuts	—	Quintal	Maharashtra	Mumbai	50000	50000	60000
Almonds	—	Quintal	Maharashtra	Mumbai	45000	44800	44000
Walnuts	—	Quintal	Maharashtra	Mumbai	60000	52500	70000
Kishmish	—	Quintal	Maharashtra	Mumbai	11000	11500	15250
Peas Green	—	Quintal	Tamil Nadu	Chennai	NA	NA	2000
Tomatoes	—	Quintal	Tamil Nadu	Chennai	1600	2000	900
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	1900	3000	2500
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1400	1700	800
Potatoes	Red	Quintal	Bihar	Patna	800	1200	560
Potatoes	Deshi	Quintal	West Bengal	Kolkata	940	1240	300
Potatoes	Sort-I	Quintal	Tamil Nadu	Mettuppalayam	2267	2191	1200
Onions	Bombay	Quintal	West Bengal	Kolkata	NA	NA	NA
Turmeric	Erode	Quintal	West Bengal	Kolkata	8200	8200	NA
Turmeric	Nadan	Quintal	Kerala	Cochin	8000	8000	6700
Chillies	—	Quintal	Bihar	Patna	7800	7200	8700
Black Pepper	Palai	Quintal	Kerala	Alleppey	NT	NT	NT
Ginger	Dry	Quintal	Kerala	Cochin	14700	15000	8500
Cardamom	Big	Quintal	West Bengal	Kolkata	85000	85000	110000
Cardamom	Small	Quintal	West Bengal	Kolkata	100000	100000	78000
Milk	Cow	100	NCT of Delhi	Delhi	3600	3600	3400
Milk	Buffalo	100	West Bengal	Kolkata	3200	3200	3200
Ghee Deshi	Agmark	Quintal	West Bengal	Kolkata	34000	34000	27000
Ghee Deshi	—	Quintal	Uttar Pradesh	Khurja	24150	24000	NA
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	NA	NA	26500
Fish	Rohu	Quintal	West Bengal	Kolkata	15000	15000	NA
Fish	Sea Prawns	Quintal	Tamil Nadu	Chennai	NA	NA	22000
Eggs	Madras	1000 No.	West Bengal	Kolkata	3800	3800	3350
Tea	Medium	Quintal	Assam	Guwahati	16000	15000	NT
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	9000	9000	13000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26000	26000	30000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	14000	14000	12000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2750	2700	2315
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2625	2550	2210
Tobacco	Bidi /Tobacco	Quintal	West Bengal	Kolkata	4000	4000	3500
Rubber	—	Quintal	Kerala	Kottayam	15100	15900	18700
Arecanut	Rashi	Quintal	Tamil Nadu	Chennai	NA	NA	30000

NA :—Not Available NT :—Not Transaction

Source : Dte. of Eco. and Statistics, Prices and Market Division.

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2012

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Barley		Canada	Winni-peg	Can Dollar/M.T..	213.00 1072.88	214.00 1048.81	216.00 1100.30	220.00 1175.68	220.00 1183.38	220.00 1203.40	220.00 1211.54	— —	— —	— —	— —	— —
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T. Rs./Qtl.	15000.00 77295.00	11000.00 53889.00	12500.00 63600.00	12500.00 65562.50	12500.00 69212.50	12500.00 69550.00	12500.00 69062.50	12500.00 69400.00	12500 66075.00	12500 67212.50	16500.00 89545.50	16500.00 90502.50
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/1bs Rs./Qtl.	4.12 46791. 71	4.03 43513.51	4.00 44855.81	4.06 46933.52	4.03 49180.30	3.80 46599.61	3.65 44446.42	3.55 43439.96	3.53 41125.71	3.44 40767.12	3.54 42342.32	3.55 42915.74
Castor Oil	Any Origin ex tank Rotterdam	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1880.00 9687.64	1875.00 9185.63	1700.00 8649.60	1600.00 8392.00	1500.00 8305.50	1500.00 8346.00	1680.00 9282.00	1760.00 9771.52	1680.00 8880.48	1650.00 8872.05	1540.00 8357.58	1600.00 8776.00
Celery Seed	ASTA cif	India	—	Dollar/M.T. Rs./Qtl.	1500.00 7729.50	1500.00 7348.50	1500.00 7632.00	1500.00 7867.50	1500.00 8305.50	1500.00 8346.00	1500.00 8287.50	1500.00 8328.00	1500.00 7929.00	1500.00 8065.50	1500.00 8140.50	1500.00 8227.50
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T. Rs./Qtl.	5500.00 28341.50	6500.00 31843.50	5900.00 30019.20	5900.00 30945.50	5650.00 31284.05	5650.00 31436.60	5650.00 31216.25	5650.00 31368.80	5650.00 29865.90	5650.00 30380.05	5000.00 27135.00	5000.00 27425.00
Cinnamon Bark		Mada-gascar	—	Dollar/M.T. Rs./Qtl.	1100.00 5668.30	1100.00 5388.90	1100.00 5596.80	1100.00 5769.50	1100.00 6090.70	1100.00 6120.40	1100.00 6077.50	1100.00 6107.20	1100.00 5814.60	1100.00 5914.70	1100.00 5969.70	1100.00 6033.50
Cloves	Singapore	Mada-gascar	—	Dollar/M.T. Rs./Qtl.	10875.00 56038.88	12000.00 58788.00	12000.00 61056.00	12000.00 62940.00	12000.00 66444.00	10300.00 57309.20	10500.00 58012.50	9500.00 52744.00	9500.00 50217.00	9500.00 51081.50	9500.00 51556.50	9500.00 52107.50
Coconut Oil	Crude Phillipine/ Indonesia	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1430.00 7368.79	1430.00 7005.57	1315.00 6690.72	1325.00 6949.63	1030.00 5703.11	1095.00 6092.58	1000.00 5525.00	995.00 5524.24	920.00 4863.12	900.00 4839.30	830.00 4504.41	780.00 4278.30
Copra	Phillipines cif Rotterdam	Philli pine	—	Dollar/M.T. Rs./Qtl.	901.50 4645.43	905.00 4433.60	835.00 4248.48	825.50 4329.75	648.00 3587.98	692.00 3850.29	616.00 3403.40	648.00 3597.70	600.50 3171.60	552.50 2970.79	501.50 2721.64	489.00 2682.17
Corriander		India	—	Dollar/M.T. Rs./Qtl.	1150.00 5925.95	1150.00 5633.85	1150.00 5851.20	1150.00 6031.75	1150.00 6367.55	1150.00 6398.60	1150.00 6353.75	1150.00 6384.80	1150.00 6078.90	1150.00 6183.55	1150.00 6241.05	1150.00 6307.75
Cummin Seed		India	—	Dollar.M.T. Rs./Qtl.	3800.00 19581.40	3800.00 18616.20	3800.00 19334.40	3800.00 19931.00	3800.00 21040.60	2800.00 15579.20	2800.00 15470.00	2800.00 15545.60	2800.00 14800.80	2800.00 15055.60	2889.00 15678.60	2889.00 15846.17
Fennel seed		India	—	Dollar/M.T. Rs./Qtl.	2600.00 13397.80	2600.00 12737.40	2600.00 13228.80	2600.00 13637.00	2600.00 14396.20	2600.00 14466.40	2600.00 14365.00	2600.00 14435.20	2600.00 13743.60	2600.00 13980.20	2600.00 14110.20	2600.00 14261.00

3. MONTH-END WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2012—*Contd.*

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Ginger	Split	Nigeria	—	Dollar/M.T.	3800.00	3400.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2400.00
				Rs./Qtl.	19581.40	16656.60	12974.40	13374.75	14119.35	14188.20	14088.75	14157.60	13479.30	13711.35	13838.85	13164.00
Groundnut kernels	US 2005, 40/50	European Ports	—	Dollar/M.T	—	—	—	2400.00	1725.00	1650.00	1595.00	1555.00	1400.00	1400.00	1350.00	1320.00
				Rs./Qtl.	—	—	—	12588.00	9551.33	9180.60	8812.38	6412.56	7400.40	7527.80	7326.45	7240.20
Groundnut Oil	Crude Any Origin cif Rotterdam	U.K.	—	Dollar/M.T	—	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	—	2200.00	2200.00	2200.00	2200.00
				Rs./Qtl.	—	10777.80	11193.60	11539.00	12181.40	12240.80	12155.00	—	11629.20	11829.40	11939.40	12067.00
Lentils	Turkish Red Split Crop 1+1 water	U.K.	—	Pound/M.T	587.57	567.02	562.08	553.32	574.59	572.94	571.55	519.93	510.50	—	—	506.96
				Rs./Qtl.	4637.69	4409.15	4578.70	4720.93	4983.42	5007.50	4971.91	4580.58	4360.69	—	—	4525.12
Maize		U.S.A	Chicago	C/56 lbs.	658.00	630.00	630.50	607.00	601.25	645.50	790.00	789.75	724.75	754.50	760.25	703.00
				Rs./Qtl	1332.53	1212.94	1260.74	1251.20	1308.34	1411.48	1715.35	1723.18	1505.59	1594.38	1621.47	1515.39
Oats		Canada	Winnipeg	Dollar/M.T.	209.31	211.40	211.23	207.59	217.72	215.14	212.19	370.30	371.28	—	—	376.73
				Rs./Qtl.	1054.29	1036.07	1076.01	1109.36	1171.12	1176.82	1168.53	2084.79	1995.63	—	—	2092.36
Palm Kernal Oil	Crude Malaysia/ Indonesia	Netherlands	— —	Dollar/M.T.	1355.00	1410.00	1370.00	1375.00	1180.00	1070.00	1000.00	1040.00	925.00	870.00	780.00	725.00
				Rs./Qtl.	6982.32	6907.59	6970.56	7211.88	6533.66	5953.48	5525.00	5774.08	4889.55	4677.99	4233.06	3976.63
Palm Oil	Crude Malaysian/ Sumatra	Netherlands	— —	Dollar/M.T.	1063.00	1125.00	1163.00	1178.00	1015.00	1013.00	990.00	998.00	885.00	860.00	790.00	763.00
				Rs./Qtl.	5477.64	5511.38	5917.34	6178.61	5620.06	5636.33	5469.75	5540.90	4678.11	4624.22	4287.33	4185.06
Rapeseed	Canola	Canada	Winnipeg	Can	524.80	559.50	606.90	620.50	610.80	632.10	605.00	621.40	595.10	622.60	592.90	578.80
	U.K. delivered			Dollar/M.T	2643.42	2742.11	3091.55	3315.95	3285.49	3457.59	3331.74	3498.48	3198.66	3351.46	3239.01	3214.66
	rapeseed, delivered	U.K.	—	Pound/M.T.	365.00	372.00	394.00	397.00	364.00	378.00	390.00	393.00	380.00	382.00	368.00	358.00
				Rs./Qtl.	2880.95	2892.67	3209.52	3387.20	3156.97	3303.72	3392.61	3462.33	3245.96	3305.83	3200.13	3195.51
Rapeseed Meal	UK produced HP 37% DO, Resell Erith	U.K.	—	Pound/M.T.	171.00	176.00	166.00	178.00	197.00	199.00	221.00	—	—	—	—	—
				Rs/Qtl.	1349.70	1368.58	1352.24	1518.70	1708.58	1739.26	1922.48	—	—	—	—	—
Rapeseed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	911.00	914.00	909.00	913.00	851.00	870.00	870.00	873.00	864.00	857.00	840.00	816.00
				Rs/Qtl.	7190.52	7107.26	7404.71	7789.72	7380.72	7603.80	7568.13	7691.13	7380.29	7416.48	7304.64	7283.62
Soyabean Meal	U.K. produced 49% oil & protein	U.K.	—	Pound/M.T.	264.00	269.00	302.00	292.00	354.00	365.00	459.00	498.00	477.00	484.00	480.00	495.00
				Rs./Qtl.	2083.75	2091.74	2460.09	2491.34	3070.24	3190.10	3992.84	4387.38	4074.53	4188.54	4174.08	4418.37
Soyabean Oil		U.S.A.	—	C/lbs Rs./Qtl.	52.15	54.00	55.02	55.72	50.40	50.87	51.73	55.87	51.65	51.84	50.11	48.41
					5922.79	5830.59	6169.92	6441.22	6150.59	6238.22	6299.21	6824.36	6017.40	6143.51	5993.71	5852.26

3. MONTH-END WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2012—*Contd.*

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
	Refined bleached and deodorised	U.K.	—	Pound/M.T.	843.00	874.00	875.00	871.00	823.00	834.00	864.00	865.00	844.00	818.00	797.00	838.00
				Rs/Qtl.	6653.80	6796.22	7127.75	7431.37	7137.88	72.89.16	7515.94	7620.65	7209.45	7078.97	6930.71	7479.99
Soyabeans		U.S.A.	—	C/60 lbs	1208.50	1267.75	1370.75	1465.00	1382.50	1471.50	1645.50	1736.00	1573.00	1570.50	1446.25	1437.00
				Rs./Qtl	2285.46	2279.33	2559.60	2820.00	2809.35	3004.79	3336.54	3537.25	3051.56	3099.16	2880.51	2892.67
	US No. 2 yellow	Nether-lands	Chi-cago	Dollar/M.T.	503.90	527.50	558.20	591.70	556.40	606.30	676.10	707.50	641.60	636.60	583.50	580.20
				Rs./Qtl	2596.60	2584.22	2840.12	3103.47	3080.79	3373.45	3735.45	3928.04	3391.50	3423.00	3166.65	3182.40
Sunflower Seed	US hulled ex-store	U.K.	—	Pound/M.T.	979.28	945.03	936.80	922.20	957.64	—	—	—	—	—	—	—
				Rs./Qtl	7729.46	7348.55	7631.17	7868.21	8305.61	—	—	—	—	—	—	—
Sunflower Seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	964.00	985.00	981.00	1004.00	1038.00	1026.00	981.00	988.00	976.00	958.00	959.00	955.00
				Rs./Qtl	7608.85	7659.36	7991.23	8566.13	9002.57	8967.24	8533.72	8704.28	8336.99	8290.53	8339.46	8524.33
Tallow	High grade delivered	U.K.	Lon-don	Pound/M.T.	550.00	550.00	550.00	550.00	570.00	570.00	570.00	570.00	600.00	570.00	550.00	550.00
				Rs./Qtl	4341.15	4276.80	4480.30	4692.60	4943.61	4981.80	4958.43	5021.70	5125.20	4932.78	4782.80	4909.30
Turmeric	Madras finger spot/cif	India	—	Dollar/M.T.	4100.00	4100.00	4100.00	4100.00	4100.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00
				Rs./Qtl	21127.30	20085.90	20860.80	21504.50	22701.70	4729.40	4696.25	4719.20	4493.10	4570.45	4612.95	4662.25
Walnuts	Indian light halves	U.K.	—	Pound/M.T.	6750.0	6300.00	6350.00	6350.00	6350.00	6775.00	5900.00	5900.00	5900.00	6400.00	7250.00	7500.00
				Rs./Qtl	53277.75	48988.80	51727.10	54178.20	55073.55	59213.50	51324.10	51979.00	50397.80	55385.60	63046.00	66945.00
Wheat		U.S.A.	Chic-ago	C/60 lbs	646.50	633.00	639.50	624.50	683.00	727.50	880.25	854.75	869.25	884.00	876.00	805.75
				Rs../Qtl	1222.63	1138.09	1194.14	1202.11	1387.91	1485.55	1784.86	1741.62	1686.31	1744.45	1744.74	1621.97

Source : Public Ledger.

Exchange Rate

	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug.	Sep.	Oct.	Nov.	Dec.
US Dollar	51.53	48.99	50.88	52.45	55.37	55.64	55.25	55.52	52.86	53.77	54.27	54.85
CAN Dollar	50.37	49.01	50.94	53.44	53.79	54.70	55.07	56.30	53.75	53.83	54.63	55.54
UK Pound	78.93	77.76	81.46	85.32	86.73	87.40	86.99	84.10	85.42	86.54	89.96	89.26

C. CROP PRODUCTION

4. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING FEBRUARY, 2013

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Summer Rice, Ragi (R), Sugarcane	Winter Rice, Jowar (K), Maize (R), Ragi (K), Wheat, Gram, Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Linseed, Cotton, Turmeric, Onion (2nd Crop) Coriander.
Assam	Autumn Rice, Summer Potato (Hills), Jute.	Gram Urad (R), Winter Potato, Tobacco, Rapeseed & Mustard, Linseed, Cotton.
Bihar	Summer Rice, Winter Potato (Plains), Sugarcane.	Wheat, Barley, Gram, Winter Potato (Plain), Rapeseed & Mustard, Sugarcane, Linseed.
Gujarat	Sugarcane.	Jowar (R), Wheat, Gram Tur (K), Other Rabi Pulses, Winter Potato, Sugarcane, Ginger, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Cotton, Turmeric, Onion.
Himachal Pradesh	Winter Potato (Hills),	—
Jammu & Kashmir	Sugarcane, Onion.	Winter Potato.
Karnataka	Summer Rice, Mung (R), Sugarcane.	Winter Rice, Jowar (R), Maize (R), Wheat, Barley, Gram, Tur (K), Other Kharif Pulses, Potato, Sugarcane, Black Pepper, Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Turmeric Cardiseed.
Kerala	Summer Rice, Tur (K), other Rabi Pulses (Kulthi), Sugarcane, Sesamum.	Winter Rice, Urad (R), Sugarcane, Cotton, Sweet Potato.
Madhya Pradesh	Sugarcane, Onion.	Jowar (R), Wheat, Barley, Small Millets (R), Gram, Tur, Urad (R), Mung(R), Other Rabi Pulses, Winter Potato (Hills) Sugarcane, Ginger, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Sweet Potato, Turmeric, Sannhemp, Cardiseed, Onion.
Maharashtra	Sugarcane.	Jowar (R), Wheat, Barley, Gram, Tur (K), Urad (R), Mung (R), Other Rabi Pulses, Witner Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Cardiseed.
Manipur	Jute.	Wheat, Castorseed, Rapeseed & Mustard, Turmeric.
Orissa	Sugarcane, Chillies (Dry).	Bajra (R), Winter Potato (Plains), Chillies (Dry), Rapeseed & Mustard.
Punjab and Haryana	Sugarcane, Tobacco, Onion, Potato.	Potato, Sugarcane, Rapeseed & Mustard, Turmeric.
Rajasthan	Sugarcane.	Gram, Tur (K), Winter Potato (Plains), Sugarcane, Castorseed, Rapeseed & Mustard, Linseed.
Tamil Nadu	Summer Rice, Jowar (R), Sugarcane, Groundnut, Cotton, Onion, Sesamum (Late).	Winter Rice, Jowar (R), Bajra, Ragi, Small Millets (K), Gram, Tur, Urad (K) Mung (K), Other Rabi Pulses (Kulthi), Winter Potato, Sugarcane, Black Pepper, Tobacco, Castorseed, Sesamum, Cotton, Turmeric, Onion.
Tripura	Sugarcane.	Gram, Urad (R), Mung (R), Other Rabi Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Rapeseed & Mustard, Sweet Potato.
Uttar Pradesh	Summer Rice, Small Millets (R), Sugarcane, Tobacco, Jute, Tapioca (1st Crop).	Winter Potato (Plains), Sugarcane, Ginger, Tobacco, Castorseed, Rapeseed & Mustard, Sweet Potato.
West Bengal	Summer Rice, Sugarcane, Sesamum (2nd Crop).	Tur (K), Urad (R), Mung (R), Other Rabi Pulses, Winter Potato Sugarcane, Ginger, Chillies (Dry), Tobacco Sesamum, (1st Crop), Rapeseed & Mustard.
Delhi	—	Sugarcane, Chillies (Dry), Tobacco.

(K)—Kharif (R)—Rabi

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