

AGRICULTURAL SITUATION IN INDIA

FEBRUARY, 2013



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Agricultural Situation in India

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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, 2013, the All India Index Number of Wholesale Price (2004-05=100) of Food-grains decreased by 0.14 per cent from 212.5 in November, 216.2 in December, 2012 to 215.9 in January, 2013.

The Wholesale Price Index Number of Cereals showed an increase of 0.24 per cent from 209.0 to 209.5 whereas Pulses showed a decline of 1.56 per cent from 250.3 to 246.4.

The Wholesale Price Index Number of Wheat increased by 0.05 per cent from 205.3 to 205.4 whereas Rice showed a decline of 0.35 per cent from 202.7 to 202.0 during the same period.

Weather, Rainfall and Reservoir situation during February, 2013.

- Cumulative Winter Rainfall for the country as a whole during the period 1st January to 27th February, 2013 is 26% above LPA. Rainfall in the four broad geographical divisions of the country during the above period was 52% in North West India, 20% in Central India, 87% in South Peninsula and (-) 58% in East & North East India.
- Out of a total of 36 meteorological subdivisions, 29 subdivisions constituting 82% of the total area of the country received excess/normal rainfall, 07 subdivisions constituting 18% of the total area of the country received deficient/scanty rainfall.
- Central Water Commission monitors 84 major reservoirs in the country which have a total live capacity of 154.42 BCM at Full Reservoir Level

(FRL). Current live storage in these reservoirs as on 28th February, 2013 was 65.59 BCM as against 65.98 BCM on 28-02-2012(last year) and. 57.45 BCM of normal storage (average storage of the last 10 years). Current year's storage is 99% of the last year's and 114% of the normal storage.

- As per the second Advance Estimates of 2012-13 released on 8th February, 2013, around 101% of the normal area under Rabi crops have been sown. Area sown under all crops taken together is around 615.51 lakh ha. as compared to 605.75 lakh ha. during 2011-12(Final Estimate). Area coverage was higher by 2.0 lakh ha. under Jowar, 1.1 lakh ha. under Barley, 6.3 lakh ha. under Gram, 3.0 lakh ha. under Rapeseed & Mustard and 1.0 lakh ha. under Groundnut. Area coverage was lower by 4.3 lakh ha. under Wheat, 1.0 lakh ha. under Rice and 1.3 lakh ha. under Maize.

Agriculture

All India production of foodgrains: As per the 2nd advance estimates released by Ministry of Agriculture on 8-2-2013, production of foodgrains during 2012-13 is estimated at 250.14 million tonnes compared to 250.42 million tonnes (2nd advance estimates) in 2011-12.

Procurement: Procurement of rice as on 1st February, 2013 was 23.27 million tonnes of Rabi Marketing Season as against 21.80 million tonnes procured last year in the corresponding period respectively. This represents an increase of 6.74 per cent. 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	26.09*
Wheat	25.38	22.51	28.34	38.15**
Total	57.41	56.71	63.38	64.24

* Position as on 1-10-2012. ** Position as on 02-08-2013

Off-take: Off-take of rice during the month of January, 2013 was 26.46 lakh tonnes. This comprises 21.10 lakh tonnes under TPDS and 5.36 lakh tonnes under other schemes during January 2013. In respect of wheat, the total off take was 32.22 lakh tonnes comprising of 16.12 lakh

tonnes under TPDS and 16.10 lakh tonnes under other schemes.

Stocks: Stocks of food-grains (rice and wheat) held by FCI as on March I, 2013 were 62.87 million tonnes, which is higher by 15.5 per cent over the level of 54.44 million tonnes as on March I, 2012.

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

	Off-take			Stocks	
	2010-11	2011-12(P)	2012-13(P) (up to Jan. 2013)	Mar. 1, 2012	Mar. 1, 2013
Rice	29.93	32.12	26.67	33.18	35.77
Wheat	23.07	24.26	26.36	21.26	27.10
Total	53.00	56.38	53.03	54.44	62.87

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 4.5 per cent in the third quarter of 2012-13.

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

(at 2004-05 Prices)

Sector	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	13.7	7.9	3.6	1.8	14.5	14.1
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)

Sector	2011-12			2012-13		
	Q1	Q2	Q3	Q1	Q2	Q3
1. Agriculture, forestry & fishing	5.4	3.2	4.1	2.9	1.2	1.1
Industry	5.7	3.8	2.6	3.6	2.7	3.3
2. Mining & quarrying	-0.4	-5.3	-2.6	0.1	1.9	-1.4
3. Manufacturing	7.4	3.1	0.7	0.2	0.8	2.5
4. Electricity, gas & water supply	6.6	8.4	7.7	6.3	3.4	4.5
5. Construction	3.8	6.5	6.9	10.9	6.7	5.8
Services	8.9	8.5	8.3	7.0	7.2	6.1
6. Trade, hotels, transport & communication	9.5	7.0	6.9	4.0	5.5	5.1
7. Financing, insurance, real estate & bus. Services	11.6	12.3	11.4	10.8	9.4	7.9
8. Community, social & personal services	3.5	6.5	6.8	7.9	7.5	5.4
9. GDP at factor cost (total 1 to 8)	7.5	6.5	6.0	5.5	5.3	4.5

Source : CSO

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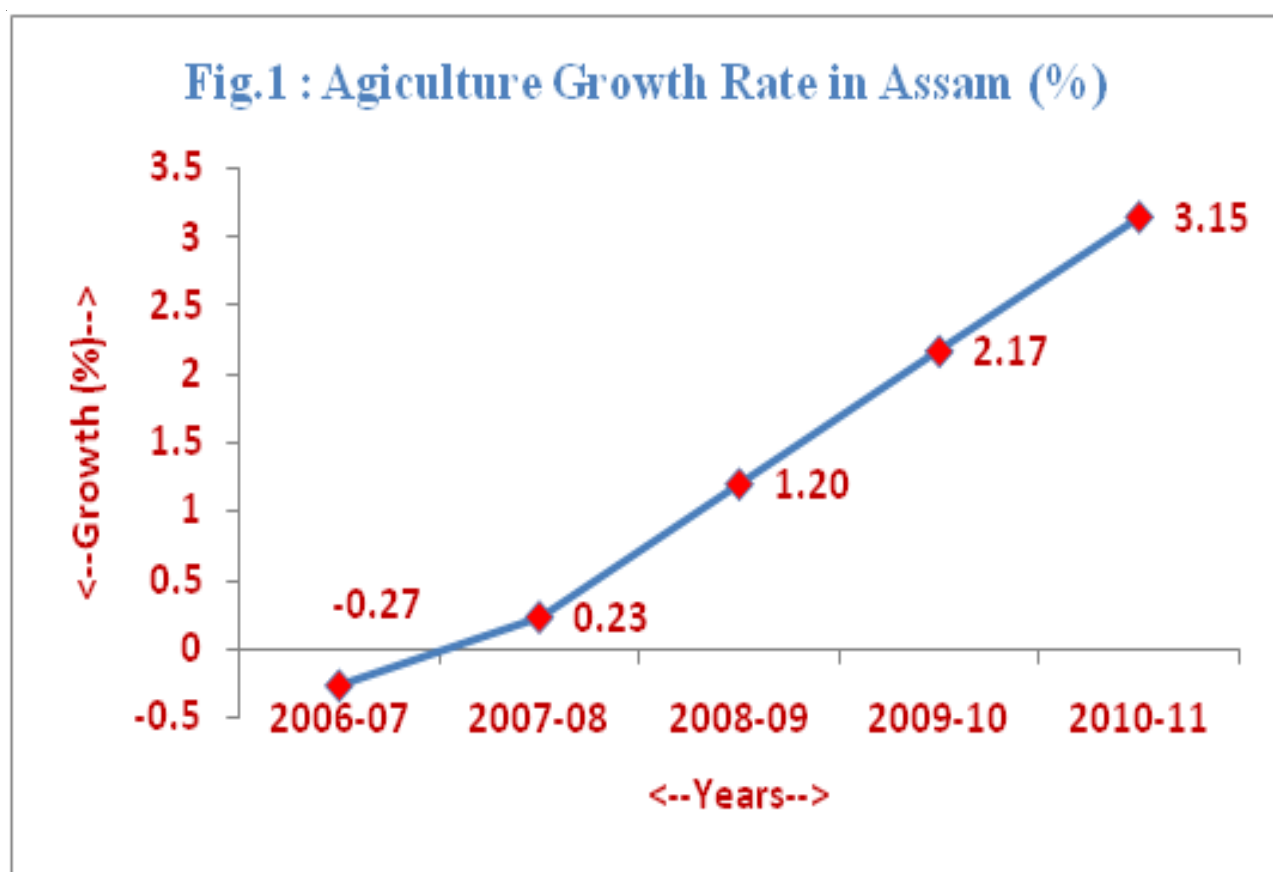
Performance of Agricultural Economy of Assam and Constraints of Economic Development

DR. MOROMI GOGOI & DR. GAUTAM KAKATY*

1.1 Backdrop

Assam, like most of the states in India is predominantly an agricultural economy especially with respect of workforce. Over 70 per cent of the state's population relies on agriculture as farmers, as agricultural labourers, or both for their livelihood. A majority of state's

population i.e. almost 86 per cent of the total population live in rural areas where the mainstay of business is production agriculture. In terms of the Gross State Domestic Product (GSDP), the agriculture sector contributed over 19.22 per cent of the state income in 2010-11(Q). The growth performance of agriculture sector



shows positive trend in the last five years period i.e. from (-) 0.27 % in 2006-07 to 3.15 % in 2010-11. (fig.1)

In Assam, farmers grow crops mainly in two seasons i.e. Kharif and Rabi season. The major kharif crops grown in the state are autumn rice, winter rice, maize, pulses, kharif oilseeds like sesamum, castor, soyabean, groundnut, kharif vegetables etc. There are some non food crops like jute, mesta, tea, cotton etc. also grown by the farmers in kharif season. On the other

hand major rabi crops cultivated are summer rice, cereals, wheat, grams, rape & mustard, various rabi oilseeds, rabi vegetables, potato etc.

1.2 Agriculture Production in Assam

Since independence, significant strides have been made in agricultural production in the state. The state is endowed with plenty of rainfall and possesses a fertile land which is extremely advantageous for cropping. The

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soil, topography, rainfall and climate of the state are quite congenial for producing variety of crops in different crop seasons. The production of foodgrains has almost doubled from 2,718.50 thousand tonnes in 1990-91 to 5,178 thousand tones in 2010-11. Similarly, production of fruits and vegetables has also increased manifold during the same period. Assam is richly endowed with natural resources, favourable soil and climatic condition and the state has become the natural abode of horticultural crops which includes cultivation of wide range of horticulture crops like fruit, vegetables, spices, plantation crops, nuts and tuber crops. The state produced 16.45 lakh MT fruits, 2.47 lakh MT of spices, 44.70 lakh MT of vegetable crops and 6.99 lakh MT of tuber crops during 2010-11.

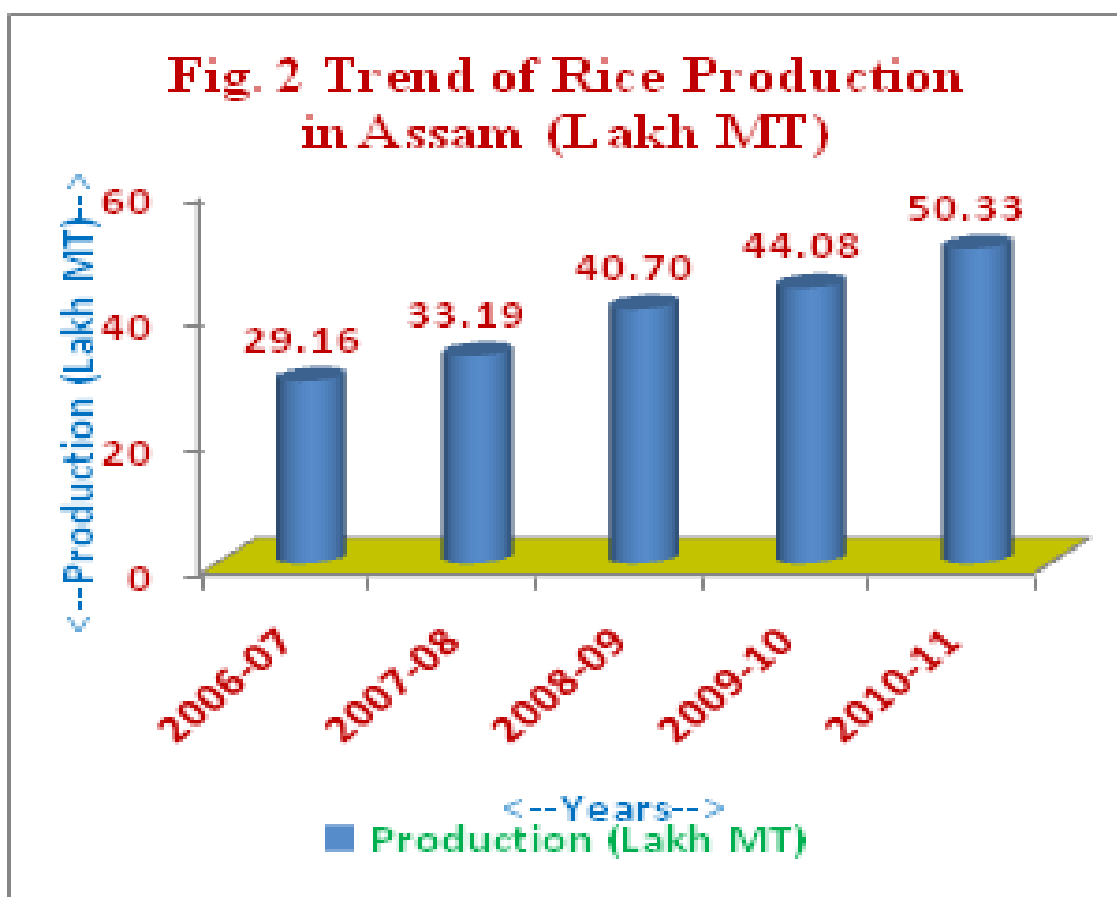
Rice is the major food crop in Assam which occupies 2,571 thousand hectare of land i.e. 62.63 % of the total cropped area. During the last five years, both production and productivity are increased to a significant level which turns the state from deficit in rice production to become a

surplus one. (Table.1 & Fig.2) Similarly, during the last five years, the state achieved highest production of foodgrains from 30.63 lakh MT in 2006-07 to 51.76 lakh MT in 2010-11 (Table:2 & Fig.3). Assam is adjudged as the “Highest Ranked State” amongst Group 2 States for

TABLE 1—PRODUCTION AND PRODUCTIVITY OF RICE FROM 2006-07 to 2010-11

Year	Production (Lakh MT)	Productivity (Kg. per ha.)
2006-07	29.16	1349
2007-08	33.19	1428
2008-09	40.7	1638
2009-10	44.08	1765
2010-11	50.33	1969

Source: Economic Survey Assam, 2011-12, Govt. of Assam



best performance in producing foodgrains, thus became entitled to award of Rs. 2.0 crore in 2011. The category 2 States include Orissa, Tamil Nadu, Gujarat, Chattisgarh, Jharkhand, Uttarakhand, Jammu & Kashmir and Himachal

Pradesh besides Assam. In 2011-12, the state again awarded with Krishi Karman Awards for surpassing national average in pulses production. Assam has also ranked 1st for performance in rice production amongst

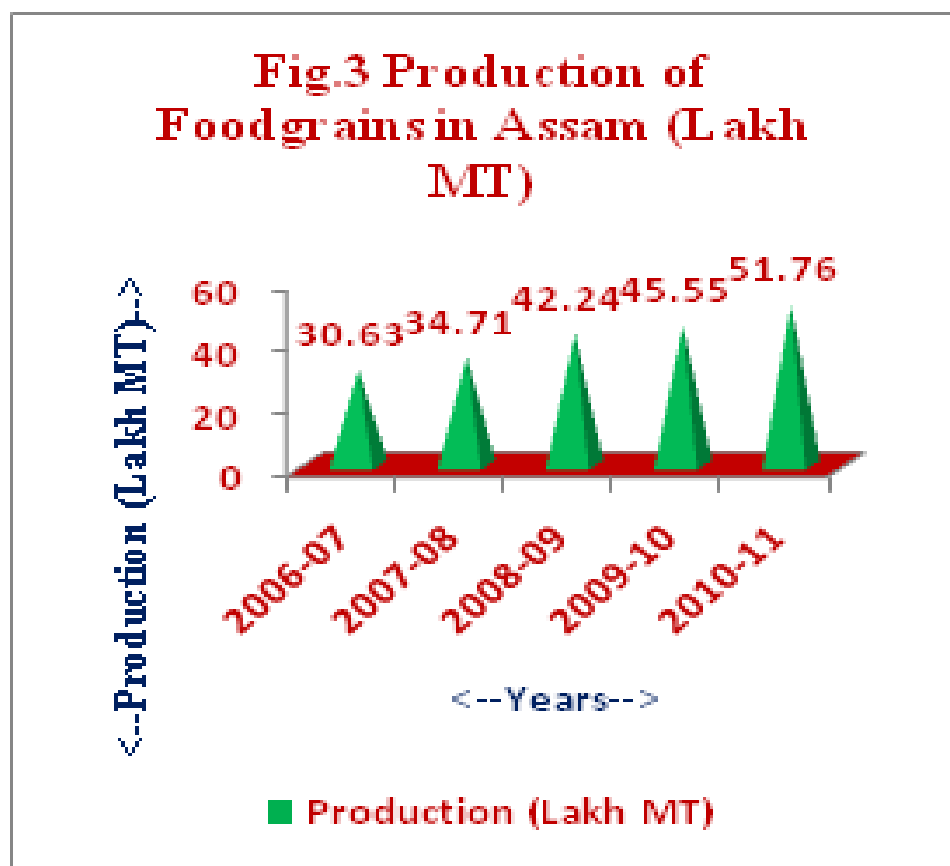
all the states in 2010-11. During the 11th plan period, production of rice and foodgrains is increased by 74 % and 71 % respectively due to the adoption of new farm technology in agriculture sector.

Assam's agriculture production growth rate has touched 6.62 per cent, which is more than the national average of 4.62 per cent in 2011-12. The state has achieved a record growth in Production of paddy, mustard and

TABLE 2—AREA, PRODUCTION AND PRODUCTIVITY OF FOODGRAINS FROM
2006-07 to 2010-11

Years	2006-07	2007-08	2008-09	2009-10	2010-11
Area (Lakh Ha.)	23.90	25.22	26.42	26.99	27.66
Production (Lakh MT)	30.63	34.71	42.24	45.55	51.76
Productivity (Kg/ha.)	1298	1393	1599	1688	1893

Source: Economic Survey Assam, 2011-12 Govt. of Assam.



pulses despite suffering three waves of floods. The high growth rate can be attributed to the new initiatives and system adopted by the state government for the development of agriculture sector.

1.3. Requirement of Foodgrains

Assam has been experiencing erratic rainfall due to unpredictable monsoon since a few years back. Insufficient irrigation support, damage caused by natural calamities,

coupled with inconsistent weather like flood also stands as impediment in attaining self sufficiency in food production by the state. Despite those difficulties, the farmers have started to increase production through technological innovations and appropriate Government policies. The state agriculture department has given more focus of attention to increase foodgrains production to provide food security for the fast growing population by increasing productivity of crops and cropping intensity.

TABLE 3—PRODUCTION, REQUIREMENT AND PER CAPITA AVAILABILITY OF FOODGRAINS IN ASSAM DURING 11TH PLAN PERIOD

Rice			
Year	Production (lakh MT)	Requirement (lakh MT)*	Per capita availability (Kg.)
2007-08	33.19	38.48	141.68
2008-09	40.70	38.92	171.53
2009-10	44.08	39.47	183.44
2010-11	50.33	40.30	206.86
2011-12 (A)	50.45	41.00	206.40
Wheat			
Year	Production (lakh MT)	Requirement (lakh MT)*	Per capita availability (Kg.)
2007-08	0.71	5.13	3.03
2008-09	0.65	5.20	2.74
2009-10	0.63	5.26	2.62
2010-11	0.56	5.37	2.30
2011-12 (A)	0.63	5.46	2.53
Pulses			
Year	Production (lakh MT)	Requirement (lakh MT)*	Per capita availability (Kg.)
2007-08	0.64	2.57	2.73
2008-09	0.73	2.60	3.08
2009-10	0.67	2.63	2.79
2010-11	0.70	2.66	2.88
2011-12 (A)	0.82	2.73	3.28
Foodgrains			
Year	Production (lakh MT)	Requirement (lakh MT)*	Per capita availability (Kg.)
2007-08	34.71	47.03	148.17
2008-09	42.24	47.63	178.02
2009-10	45.55	48.24	189.56
2010-11	51.76	48.84	212.74
2011-12 (A)	52.34	50.08	206.80

NOTE: Minimum nutritional requirement of foodgrains per capita per day on an average in Assam is calculated at 360 gram rice, 48 gram wheat, 24 gram pulses and 8 gram other foodgrains on the basis of the Indian Council of Medical Research (ICMR) recommendation.

Source: Economic Survey Assam, 2011-12 Govt. of Assam

Accordingly, the state agriculture department has prioritized optimum and efficient use of available resources to enhance the production and productivity of the crops including the horticulture crops by harnessing the best technologies. As a result of these, the gap between production and requirement of foodgrains become narrow during the 11th plan period (Table-3). The government of India duly recognized the need of extending Green

Revolution to the North-East India and Assam in particular. The main objective of Green Revolution is to provide food security by enhancing productivity of crops and to bridge the gap between requirement and production.

It is estimated that during 12th plan period total requirement of foodgrains will be 263.37 lakh MT comprising 215.45 lakh MT rice, 28.72 lakh MT wheat, 14.36 lakh MT pulses and 4.82 MT other foodgrains. (Table-4)

TABLE 4—ESTIMATED REQUIREMENT OF FOODGRAINS IN ASSAM DURING 12TH PLAN PERIOD

(Lakh MT)

Year	Projected Population (lakh)	Rice	Wheat	Pulses	Other Food-grains	Total Food-grains
2012-13	316.97	41.65	5.55	2.78	0.92	50.92
2013-14	322.33	42.35	5.65	2.82	0.98	51.80
2014-15	327.79	43.10	5.74	2.87	0.94	52.65
2015-16	333.34	43.80	5.84	2.92	0.99	53.55
2016-17	338.98	44.55	5.94	2.97	0.99	54.45
Total		215.45	28.72	14.36	4.82	263.37

NOTE: Minimum nutritional requirement of foodgrains per capita per day on an average in Assam is calculated at 360 gram rice, 48 gram wheat, 24 gram pulses and 8 gram other food grains on the basis of the Indian Council of Medical Research (ICMR) recommendation.

Source: Economic Survey Assam, 2011-12 Govt. of Assam

To achieve the requirement and to attain self sufficiency in food production, the state agriculture department has set the target to increase the area under total foodgrains in the state from 27.67 lakh hectares

at present to 34.90 lakh hectares at the end of 12th five year plan so as to increase the production of foodgrains in the state from 51.76 lakh MT in 2010-11 to 80.25 lakh.

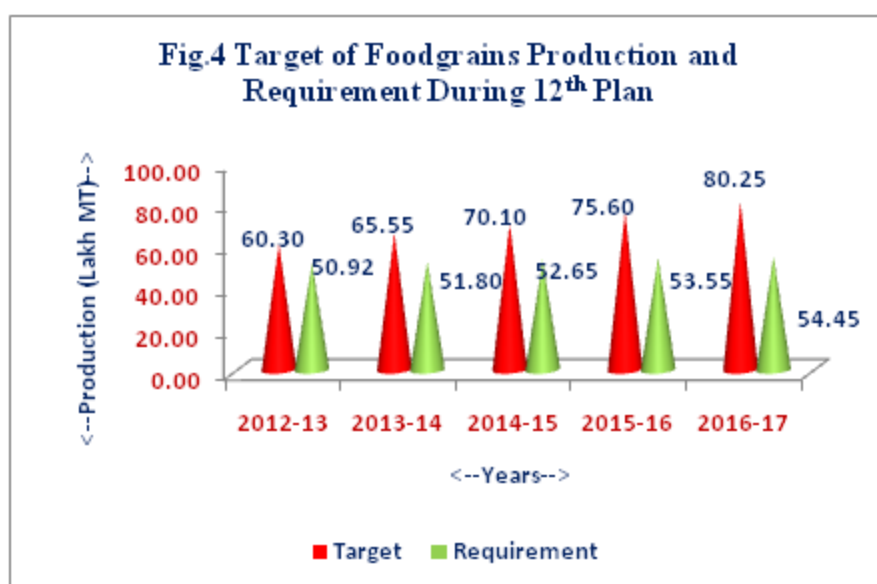


TABLE 5—TARGET OF AREA, PRODUCTION & PRODUCTIVITY OF MAJOR CROPS DURING 12TH PLAN PERIOD

(Area in lakh hectare, Production in lakh MT & Productivity in Kg. per hectare)

Crop		2012-13	2013-14	2014-15	2015-16	2016-17
Rice	Area	27.25	27.90	28.40	29.60	30.00
	Production	57.20	62.00	66.00	71.00	75.00
	Productivity	2100	2225	2325	2400	2500

TABLE 5—TARGET OF AREA, PRODUCTION & PRODUCTIVITY OF MAJOR CROPS DURING 12TH PLAN PERIOD
(Area in lakh hectare, Production in lakh MT & Productivity in Kg. per hectare)

Crop		2012-13	2013-14	2014-15	2015-16	2016-17
Wheat	Area	0.90	1.05	1.20	1.35	1.50
	Production	1.30	1.50	1.80	2.05	2.35
	Productivity	1425	1450	1480	1525	1550
Maize	Area	0.07	0.75	0.85	0.90	1.00
	Production	0.70	0.79	0.94	1.04	1.20
	Productivity	1000	1050	1100	1150	1200
Pulses	Area	1.60	1.75	1.09	2.00	2.25
	Production	1.05	1.20	1.30	1.45	1.60
	Productivity	660	675	690	705	725
Total Foodgrains	Area	30.50	31.55	32.45	34.00	34.90
	Production	60.30	65.55	70.10	75.60	80.25
	Productivity	1975	2075	2160	2225	2300

Source: Economic Survey Assam, 2011-12 Govt. of Assam

MT in 2016-17(Fig.4) Rice being the staple food of the state, the State Agriculture Department has planned to increase rice production through systematic planning so that the area under rice can be increased to 30.00 lakh hectares so as to attain self sufficiency in rice production with target of 75.00 lakh MT at the end of 2016-17(Table-5)

1.5 Productivity gap of Assam and all India

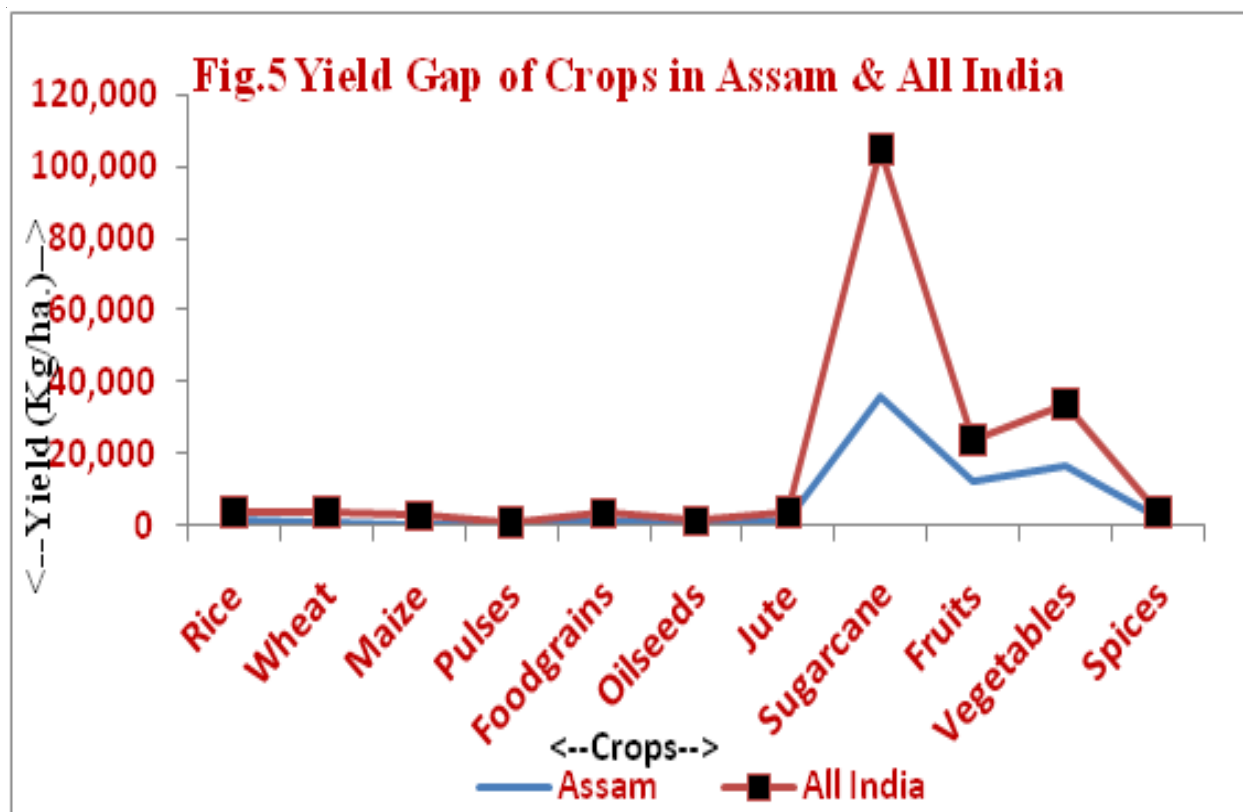
Although, the area, production and productivity of crops are showing an increasing trend in the recent years, a most relevant question in the changing scenario is that the average performance of agriculture is far

TABLE 6—PRODUCTIVITY GAPS OF CROPS IN ASSAM AND ALL INDIA

(Kg/ha.)

Sl. No.	Crop	Assam	All India
1.	Rice	1,983	2,240
2.	Wheat	1,256	2,938
3.	Maize	714	2,507
4.	Pulses	557	689
5.	Foodgrains	1,893	1,921
6.	Oilseeds	581	1,159
7.	Jute	1,808	2,344
8.	Sugarcane	36,196	68,596
9.	Fruits	12,480	11,446
10.	Vegetables	17,192	16,756
11.	Spices	2,530	1,630

Source: Economic Survey Assam, 2011-12 Govt. of Assam



behind the national average. In the year 2010-11 only except fruits and vegetables, the yield rate of all the crops were lower than that of all India average. (Table-6)

1.6 Major Issues of Concern in Assam Agriculture

Although the government of Assam is putting much emphasis on enhancing the production and productivity of crops by harnessing the best in frontier technologies there exist a host of limitations for enhanced crop production. The major constraints pertaining to Assam agriculture are :—

1. **Small and fragmented land holding:** Assam agriculture is predominated by smallholders with operational holdings of 1.10 hectares which is 1.16 hectares in all India. In Assam, about 86 % farmers belong to small and marginal category as against 81% in all India. Due to scattered and tiny plot of land, full utilization of inputs cannot be possible.
2. **Low productivity: Major foodgrains in Assam is rice.** But the productivity of rice is only 1,983 kg/ha as compared to 2,240 kg/ha. in all India. Due to the limited use of HYV seeds, lack of institutional credit and banking services, non adoption of proper cropping pattern productivity of crops still not increased up to the mark.
3. **Net Cropped Area under Irrigation:** In Assam, only 22.50 % of net cropped area is

under irrigation which is 72% in case of all India. Due to the absence of electricity connection, the farmers are compelled to use diesel running pump sets making the cost of production very high.

4. **Consumption of Fertiliser:** The amount of fertilizer consumption in Assam is very low i.e.67 kg/ha. as compared to 129 kg/ha. in all India. Only 58 % of total fertilizer requirement is available in the state.
5. **Availability of Farm Power:** Only 0.70 HP per hectare farm power is available in Assam as against 1.20 HP per hectare for all India.
6. **Low Credit Flow:** 82% of farm families are deprived of agriculture credit through KCCs. Only Rs. 2,626 per hectare agriculture credit is available in Assam as against Rs. 15,379 per hectare for all India.
7. **Weak marketing Infrastructure:** Only 35% of villages are connected with metalled road for which the producers face problems in disbursing their marketable surplus.
8. **Procurement:** High moisture content of paddy makes it unfit for procurement by FCI/ State agencies. For that reason, farmers are deprived of getting assured and reasonable price for their produce.
9. **Seed Certification:** Seed certification agency (ASSCA) is virtually defunct in the state which

compelled the farmers to use seeds without certified by certification agencies for which farmers are unable to get assured return from crop production.

10. **Negligible Usages of Micronutrients:** Micronutrient is used only 5% of the total net cropped area in the State . Due to the ignorance of the farmers or high cost, the farmers are not in a position to purchase recommended doses of micronutrients for which they could not harvest the benefits to desired level.

1.7 Measures to be adopted

- Consolidation of Holding
- Supply of Institutional Credit
- Creation of Single Window Input Delivery System
- Supply of inputs within easy reach of the farmers
- Development of rural roads and transport facilities
- Soil testing services
- Improvement of marketing system
- Strengthening of agricultural extension services
- Improvement of post harvest technology
- Multiple cropping, crop rotation, demonstration and adaptive trials at farmers level
- Balance rate of fertilizer consumption
- Agriculture Research and backup support

1.8 Concluding Overview

It can be concluded that major thrust should be given on development of irrigation, dissemination of new technology, input supply, pests and disease

control measures and marketing infrastructure for reaping the full benefit of various development programmes for increasing production and productivity of crops.

In order to achieve the desired level of productivity of crops in the state, the Government must operate in a big and effective way for creating basic infrastructural facilities and in co-ordinating with related departments. There are possibilities of bringing more land under cultivation with suitable adjustment of cropping sequences. A selective 'area approach' has been considered more effective to boost up agricultural production. In chronically flood affected areas, special programmes should be taken up for oilseeds, pulses and summer rice cultivation in rabi seasons. In view of the situation, it is necessary for the state government to make concerted effort to bring all the potential areas under cultivation to attain self sufficiency in foodgrains production. However, all efforts to increase agricultural production will have no impact unless the farmers are effectively involved in the decision making process as well as in implementation of the agricultural development programmes.

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Trends in Irrigation Development and its Impact on Agricultural Productivity in India : A Time Series Analysis

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Introduction

In India, irrigation has a crucial role in agricultural and rural development (Vaidyanathan *et al.*, 1994; Hasnip *et al.*, 2001; Barker and Molle, 2004). Due to yield augmenting impact of irrigation, it has received high priority in the successive Five Years Plans (FYP). However, ascertaining precise contribution of irrigation in food production is difficult because there are no official Indian statistical data that provide the breakdown of agricultural production under irrigated or rainfed conditions (World Bank, 1998). Nevertheless, various estimates point to a significant contribution from irrigated agriculture to overall agricultural production [60% estimated by Seckler and Sampath (1985); 55% by World Bank (1991); 58% by Planning Commission (1999)]. The present paper has examined the temporal and spatial pattern in irrigation development and has assessed its impact on agricultural productivity to provide a feedback for the holistic development of water resources in India.

Methodology

Irrigation development was examined over successive FYP and across northern (Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh and Uttarakhand), southern (Andhra Pradesh, Karnataka, Kerala, Pondicherry and Tamil Nadu), eastern (Bihar, Chattisgarh, Jharkhand, Odisha, West Bengal and Assam) and western (Gujarat, Madhya Pradesh, Maharashtra and Rajasthan) regions of India by estimating the share of gross irrigated area (GIA) in gross sown area (GSA), source-wise net irrigated area (NIA) and compound growth rate (CGR) in irrigated area. Further, the impact of irrigation on agricultural productivity was assessed by examining cropping intensity (gross cropped area/net cropped area*100) and crop diversification and by fitting time series regression models for different crops. The functional form of time series regression analysis was:

$$\ln Y_t = C_1 + C_2 * \ln X_{1t} + C_3 * \ln X_{2t} + C_4 * X_{3t}$$

where,

$$\begin{aligned} \ln Y_t &= \text{Crop yield in the } t^{\text{th}} \text{ year (kg/ha) in log form} \\ C_1 &= \text{Constant/intercept} \end{aligned}$$

$\ln X_{1t}$ = Irrigated area under crop in the t^{th} year (Mha) in log form

$\ln X_{2t}$ = Rainfall in the t^{th} year (mm) in log form

X_{3t} = Trend, and

C_2, C_3, C_4 = Coefficients to be estimated.

Yield (kg/ha) of the crops (rice, wheat, sugarcane, pulses, oilseeds) was regressed with respective area of crops under irrigation (Mha) and rainfall. Additionally, the value of agricultural commodities per net sown area (₹/ha) at 2004-05 prices was also regressed with irrigation and rainfall to see their overall impact on the agricultural sector. The stationarity conditions of data series were checked using Augmented Dicky-Fuller (ADF) test in E-views 5.1 software. Irrigation and crop yield data series for all the crops were found to be trend-stationary after transformation into the logarithmic terms. Therefore, trend variable was also included in the regression analysis. In addition to making series stationary, trend variable also captures the effect of technological improvement over the years. In the case of wheat, time-series regression suffered with auto-correlation problem. To correct the problem of autocorrelation, two-step procedure was followed. Firstly, original series of wheat yield was regressed on the area under irrigation, rainfall and trend variable. Then, variance ($\hat{\rho}$) was estimated using Durbin-Watson statistics ($\hat{\rho} = 1 - d/2$). Subsequently, in the second step, $\hat{\rho}$ was used to transform the original series ($y_t - \hat{\rho} y_{t-1}$ and $x_{it} - \hat{\rho} x_{it-1}$) and ordinary least square (OLS) technique was applied on transformed variables (Gujarati, 2005). Transformation of the variables solved the problem of autocorrelation. Additionally, Prais-Winsten transformation $\{ Y_1 \sqrt{1-P^2}$ and $X_1 \sqrt{1-P^2} \}$ was applied to avoid the loss of one observation due to differencing (Gujarati, 2005).

Results and Discussion

Ultimate Irrigation Potential (UIP)

Ultimate irrigation potential (UIP), which limits the expansion of irrigation in a region, is the GIA that theoretically could be irrigated if all available land and water resources would be used for irrigation (Ministry of

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Water Resources). UIP stands at around 139.89 Mha without inter-basin sharing and at 175 Mha with inter-basin sharing (CWC, 2010). Out of total UIP, 81.43 Mha (58.2 %) can be developed through minor irrigation (MI) projects, while the remaining 41.8 per cent can be utilized by the major and medium (M&M) irrigation sources in the country. Further, groundwater accounts for 78.7 per cent (64.09 Mha) of UIP from MI sources making it the most important source of irrigation in the country. The regional examination of UIP revealed striking variations in the potential of irrigation development across different regions due to topographical, hydrological and other constraints. Northern region constitutes the highest share (30.52 %) in the total UIP of the country, followed by western (26.08 %), eastern (24.06 %) and southern (18.19 %) regions.

Trend in irrigation development

With considerable government support, the absolute financial expenditure (planned) on irrigation development

has though increased significantly from ₹ 6,840 crore during first FYP to ₹ 55,489 crore during tenth FYP at 1993-94 prices, the share of irrigation expenditure in total planned budget has rather decreased from 23 per cent to 9 per cent (CWC, 2010) during this period, indicating increasing demand towards other sectors of the economy. However, in recent years, trend is again shifting upward. Correspondingly, irrigation potential created (IPC) has increased from 22 Mha during pre-plan period to 123 Mha up to tenth FYP. Among the regions, IPC varied from 21.83 Mha in the eastern region to 45.08 Mha in the northern region at the end of tenth FYP. But, utilization of irrigation potential (IPU) was less than the created ranging from 65.52 per cent in the eastern region to 82.38 per cent in the northern region with the national average of 73.88 per cent during tenth FYP. Further, the utilization of already created irrigation potential witnessed a declining trend over the successive FYPs, raising several efficiency issues in the execution of irrigation projects.

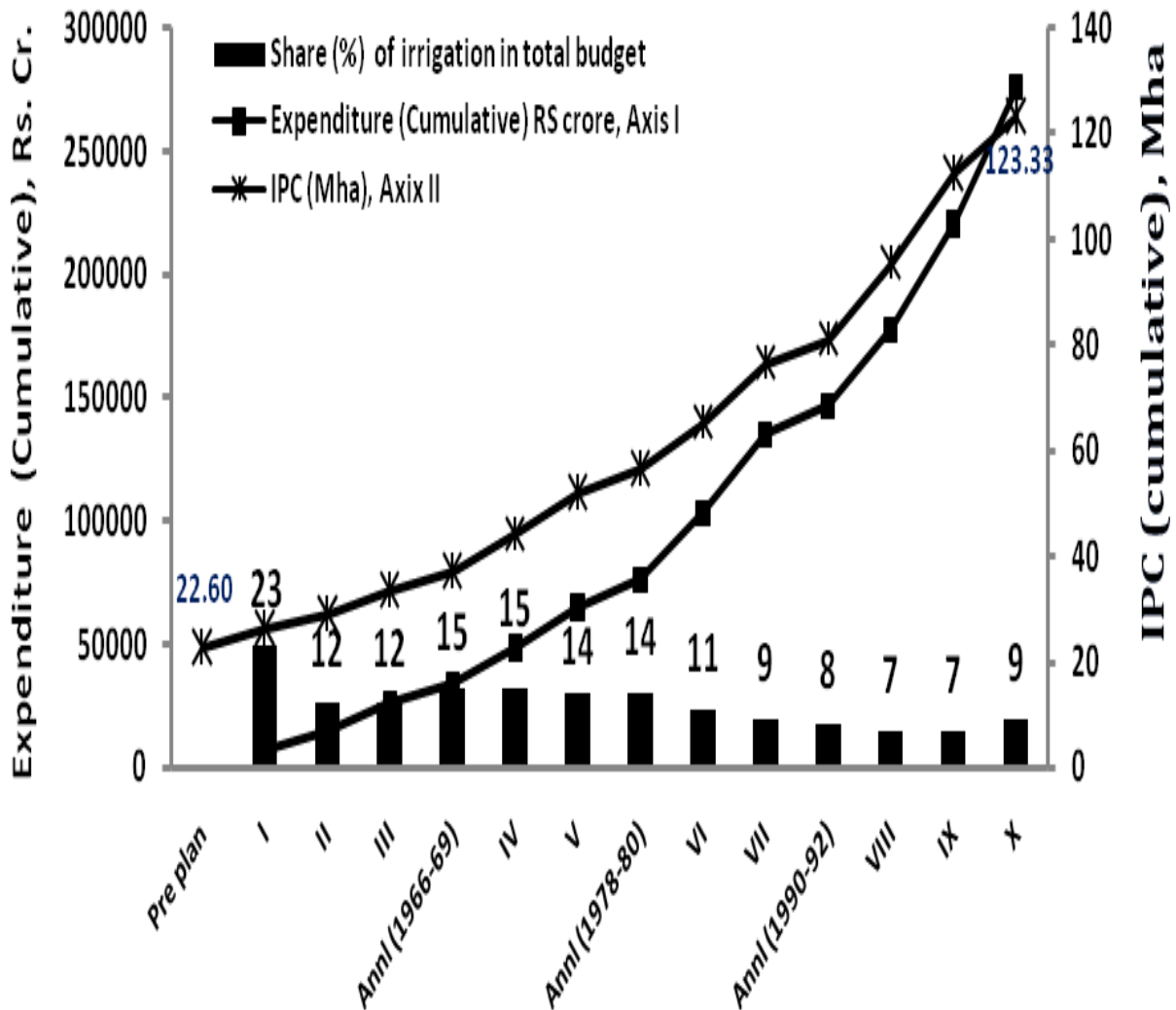


Figure 1. Five year plan wise trend in irrigation investment and its development in India

Improved irrigation infrastructure has resulted into increase in the net irrigated area (NIA) from 21.57 Mha in the first FYP to 58.81 Mha in the tenth FYP with the CGR of 2.08 per cent per annum (table 1). However, a structural shift has been observed in the relative contribution of different sources of irrigation in NIA over the years. The share of canal, which constituted 41 per cent in NIA in first FYP, declined to 26 per cent in tenth FYP, while the share of groundwater increased from less than one per cent to

about 41 per cent during the same period. It was due to significantly higher annual growth of groundwater irrigated area (8.01 %) than canal irrigated area (1.26 %) during 1950-2007. Significant growth in the groundwater irrigated area indicated the growing importance of groundwater because of its reliability and higher irrigation efficiency of 70-80 per cent compared to 25-45 per cent of the canal irrigation (Sharma, 2009). Thus, the share of GIA in GSA increased from 17.09 per cent in first FYP to 42.77 per cent in tenth FYP.

TABLE 1—PLAN-WISE LAND USE PATTERN IN INDIA

Plan	Net sown area (NSA)	Gross sown area (GSA)	Net irrigated area (NIA)	Gross irrigated area (GIA)	% of NIA to NSA	% of GIA to GSA	(Million ha)	
							Cropping intensity (%)	Irrigation intensity (%)
First	125.95	140.01	21.57	23.93	17.13	17.09	111.17	110.98
Second	131.58	150.51	23.56	26.94	17.91	17.90	114.39	114.37
Third	136.51	156.89	25.88	29.85	18.96	19.03	114.93	115.34
Annual (1966-69)	138.14	160.21	27.70	33.79	20.05	21.09	115.98	121.97
Fourth	139.66	165.05	31.45	38.58	22.52	23.37	118.18	122.69
Fifth	140.06	168.76	35.00	43.68	24.99	25.88	120.49	124.81
Annual (1978-80)	140.94	172.20	38.29	48.76	27.17	28.32	122.18	127.34
Sixth	141.18	175.60	40.80	52.28	28.90	29.77	124.39	128.12
Seventh	139.76	178.03	44.03	57.81	31.50	32.47	127.38	131.29
Annual (1990-92)	142.32	183.99	48.83	64.08	34.31	34.83	129.28	131.23
Eighth	142.61	187.48	52.62	70.05	36.90	37.36	131.47	133.13
Ninth	141.64	189.70	56.06	76.46	39.58	40.31	133.93	136.37
Tenth	139.54	189.84	58.81	81.20	42.15	42.77	136.05	138.09
CGR (1950-07)	0.18	0.58	2.08	2.52				

CGR: Compound growth rate

Cropping intensity, irrigation intensity and share of NIA and GIA in NSA and GSA, respectively witnessed increasing trend in all the regions of the country over successive FYPs reflecting overall improvement in irrigation status and consequently, agriculture. However, rate of improvement in above indicators was not found to be uniform across different regions indicating inter-regional disparity between irrigation and agriculture sector. Northern region ranked first among the regions in terms of cropping intensity, irrigation intensity and share of NIA and GIA in NSA and GSA, respectively during tenth FYP. More than double share of NIA and GIA in NSA and GSA, respectively in Northern region as compared to other regions indicated better development of irrigation in the region. Irrigation intensity and share of NIA and GIA in NSA in GSA, respectively was lowest in Western region in tenth FYP reflecting poor development of irrigation in the region.

Impact of Irrigation on Agriculture

Manifestation of irrigation development was improvement in the cropping intensity and crop diversification towards water-intensive and high-value crops like fruits, vegetables, sugarcane, etc. over the years. Cropping intensity has increased from 111 per cent in first FYP to 136 per cent in tenth FYP (table 1), though not uniformly across the regions. Cereals and pulses, though still dominating with 63 per cent share in GSA (cropping pattern), have witnessed a declining trend over the planning period (table 2). On the other hand, fruits, vegetables, sugarcane, etc. which require assured irrigation, registered an increasing share in the GSA indicating irrigation as an important factor of crop diversification along with various other economic, policy and technological factors. Among the crops, fruits and vegetables witnessed maximum growth (3.36 per cent per annum) in their area during 1950 to 2007.

TABLE 2—PLAN-WISE AREA UNDER CROPS AND CROPPING PATTERN IN INDIA

Plan	Rice		Wheat		Cereals		Pulses		Oilseeds		Sugarcane		F & V		C&S	
	TA	CP	TA	CP	TA	CP	TA	CP	TA	CP	TA	CP	TA	CP	TA	CP
First	30.78	21.77	10.87	7.67	99.61	70.85	21.94	15.50	11.62	8.22	1.75	1.24	2.17	1.54	1.29	0.91
Second	33.16	22.03	12.86	8.54	89.90	59.73	23.94	15.91	12.88	8.56	2.16	1.44	2.52	1.67	1.44	0.96
Third	35.57	22.67	13.33	8.50	93.28	59.46	24.01	15.30	14.02	8.94	2.48	1.58	2.95	1.88	1.55	0.99
Annual plans (1966-69)	35.68	22.27	14.44	9.01	96.54	60.26	22.31	13.93	14.38	8.97	2.31	1.44	3.46	2.16	1.67	1.04
Fourth	37.49	22.72	18.30	11.09	101.04	61.22	22.80	13.81	14.90	9.03	2.63	1.59	3.66	2.22	1.78	1.08
Fifth	38.98	23.10	20.11	11.91	102.06	60.48	23.72	14.05	15.25	9.04	3.09	1.83	4.19	2.48	1.91	1.13
Annual plans (1978-80)	40.03	23.25	22.32	12.96	104.28	60.56	23.15	13.44	15.43	8.96	3.10	1.80	4.70	2.73	2.14	1.24
Sixth	40.42	23.01	23.15	13.18	105.03	59.81	23.24	13.23	17.34	9.87	3.28	1.87	5.21	2.97	2.16	1.23
Seventh	41.03	23.05	23.42	13.16	103.16	57.96	23.18	13.02	20.98	11.78	3.38	1.90	6.14	3.45	2.36	1.33
Annual Plans (1990-92)	42.67	23.20	23.77	12.92	101.51	55.17	23.67	12.86	25.46	13.85	3.90	2.12	7.63	4.15	2.41	1.31
Eighth	42.73	22.79	25.29	13.49	100.75	53.74	22.94	12.24	26.58	14.18	3.97	2.12	8.68	4.63	2.36	1.26
Ninth	44.61	23.52	26.76	14.10	83.22	43.88	21.97	11.58	24.41	12.86	4.19	2.21	9.80	5.17	2.79	1.47
Tenth	42.84	22.61	26.78	14.07	98.77	52.01	22.66	11.90	25.62	13.45	4.42	2.28	11.95	6.15	3.53	1.98
CGR(1950-2007)	0.66		1.85		-0.24		-0.02		1.69		1.72		3.36		1.68	

CGR: compound growth rate in respective category during 1950-2007

TA: Total area under respective crop (Million ha)

CP: cropping pattern (share of a crop's area in gross sown area)

F & V: fruits and vegetables, C&S: condiments and spices

TABLE 3—PLAN-WISE IRRIGATED AREA UNDER DIFFERENT CROPS IN INDIA

(Per cent)

Plan	Rice		Wheat		Cereals		Pulses		Oilseeds		Sugarcane		F & V		C&S	
	IA*	Yield	IA	Yield	IA	Yield	IA	Yield	IA	Yield	IA	Yield	IA	Yield	IA	Yield
First	33.40	8.74	35.21	7.08	17.74	5.67	9.15	4.68	1.20	4.66	67.75	327.70	11.71	—	6.17	—
Second	36.15	9.14	31.77	7.58	21.60	6.15	8.27	4.82	3.18	5.03	67.00	375.25	18.21	—	22.00	—
Third	37.15	9.86	35.98	8.31	22.83	7.01	8.87	4.87	3.56	4.87	69.72	440.50	18.43	—	27.34	—
Annual plans (1966-69)	38.31	9.90	47.06	10.53	25.38	7.14	9.76	4.67	4.96	4.77	74.11	434.12	22.01	—	27.80	—
Fourth	38.25	11.06	55.12	12.68	27.99	9.11	8.58	4.91	7.48	5.28	74.32	495.70	29.56	—	33.72	—
Fifth	39.03	12.01	63.38	13.57	31.54	9.90	7.65	4.84	8.81	5.60	77.80	501.12	33.79	—	37.77	—
Annual plans (1978-80)	42.22	12.46	67.13	14.95	34.27	10.73	8.31	4.70	11.76	5.40	77.51	512.71	37.47	—	39.82	—
Sixth	42.13	13.50	72.18	16.83	35.53	11.53	8.20	4.86	16.54	6.20	81.58	523.14	36.79	—	38.93	—
Seventh	44.51	15.85	77.48	20.16	38.77	14.05	9.37	5.39	20.20	6.74	85.77	518.89	37.50	—	44.56	—
Annual Plans (1990-92)	46.45	17.45	82.18	22.66	42.18	15.59	10.63	5.54	24.73	7.62	89.99	517.76	34.33	102.13	47.36	9.48
Eighth	50.07	18.44	85.63	24.33	46.15	16.78	12.41	5.73	25.86	8.43	93.04	531.41	34.61	116.73	59.33	10.32
Ninth	54.58	19.26	87.53	26.65	61.65	18.79	13.04	5.98	25.87	8.42	99.78	541.63	46.82	130.36	59.07	11.84
Tenth	55.42	21.02	91.08	26.50	52.50	19.33	15.39	5.93	29.13	9.91	99.57	542.07	49.09	128.54	52.89	13.41
CGR (1950-2007)	1.65	2.32	4.10	2.49	2.27	2.51	0.96	0.74	8.24	1.93	2.58	1.00	6.56	1.03	5.70	2.50

CGR: compound growth rate in respective category during 1950-2007.

* share of irrigated area under respective crop.

Yield: Quintals/ha, F & V: fruits and vegetables, C&S: condiments and spices.

For rice, wheat, cereals, pulses, oilseeds and sugarcane, CGR is estimated for the period 1969-2007. For fruits & vegetables and spices, CGR is estimated for the period 1990-2007.

Further, 99.57 and 91.08 per cent area under sugarcane and wheat, respectively had access to irrigation during tenth FYP in India (table 3). Irrigated area under sugarcane has increased from 67 per cent in first FYP to 99.57 per cent in tenth FYP with the annual growth of 2.58 per cent. Similarly, irrigated area under wheat increased from 35.21 per cent in first FYP to 91.08 per cent in tenth FYP with the annual growth of 4.1 per cent. More than half of the total area under fruits and vegetables, condiments and spices, cereals and rice was under irrigation during tenth FYP. Pulses and oilseed, which are primarily grown under rainfed conditions, occupied minimum area under irrigation. However, oilseeds witnessed maximum growth in irrigated area under them during 1950 to 2007 because of technological and policy boosts provided by government to increase the oilseeds production. Similarly, yield of these crops improved in the same direction with the annual growth of 2.32 per cent, 2.49 per cent, 1.00 per cent, 0.74 per cent and 1.93 per cent, respectively indicating positive impact of irrigation in synergy with other inputs.

Results of the time series regression analysis also showed irrigation as a significant factor affecting crop yield positively, though with varying degree except for pulses (Table 4). For pulses, irrigation was not found to be a significant factor because they are primarily grown under the rainfed and residual soil moisture conditions. Rainfall was found to be a significant factor affecting yield of pulses positively. Rainfall was also significantly affecting

yield of all the crops, except sugarcane and wheat which are mainly grown in the irrigated conditions. About 94 per cent of the sugarcane and 91 per cent of the wheat are grown under irrigated conditions in India. For oilseeds, irrigated area has increased from less than one per cent during 1950s to 27 per cent in 2008 and was found significant in combination with rainfall and trend variable. Trend variable representing technological improvement was found to be significant and positive for all the crops. Overall, agricultural productivity, expressed in terms of value of agricultural commodities (₹) per net sown area at 2004-05 prices, was positively affected by irrigation, rainfall and technological improvements.

The estimated positive coefficients of the irrigated area, representing irrigation elasticities (log-linear production function), indicated scope to improve crop yield further by improving irrigation infrastructure. However, for the country as a whole, about 88 per cent of the UIP has already been developed which limits further expansion of irrigation infrastructure on a large scale. As utilization of irrigation potential is less than IPC, irrigation infrastructure can be improved by improving irrigation efficiency, institutional rearrangements in favour of water users association, sustainable groundwater development in the light of its over-exploitation and emphasizing completion of on-going irrigation projects rather starting new ones. This will lead to the improved crop productivity and thus livelihood of the Indian farming community.

TABLE 4—IMPACT OF IRRIGATION ON CROP YIELD (TIME SERIES REGRESSION)

Parameters	Rice	Wheat	Sugarcane	Pulses	Oilseeds	Agricultural productivity (₹/Ha)
Constant	1.803* (0.961)	2.482*** (0.124)	10.319*** (0.116)	2.006 (1.239)	4.918*** (0.188)	6.043*** (0.594)
Irrigated area	0.550** (0.231)	0.506*** (0.127)	0.208** (0.099)	0.024 (0.128)	0.084* (0.049)	0.332** (0.134)
Rainfall	0.494*** (0.143)	-0.027 (0.035)	0.001 (0.000)	0.564*** (0.176)	0.001*** (0.000)	0.270*** (0.086)
Trend	0.011*** (0.004)	0.005*** (0.002)	0.009*** (0.002)	0.007** (0.002)	0.014*** (0.002)	0.018*** (0.003)
R ²	0.959	0.868	0.929	0.708	0.921	0.990
D-W statistics	1.34	1.95	1.55	1.81	2.21	1.52
D _L -D _u (1%)	1.20-1.47	1.20-1.47	1.10-1.44	1.14-1.45	1.12-1.45	1.20-1.47
Time period	1965-2008	1965-2008	1965-2008	1970-2008	1971-2008	1965-2008

NOTES: Dependent variable: Yield (kg/ha) of respective crops.

Variables are expressed in logarithmic terms to make the series stationary.

Conclusions

In India, irrigation has played a catalytic role in providing food security to millions of people by positively affecting agricultural productivity. Therefore, irrigation has received massive government support in the successive FYPs and has witnessed significant growth during the past fifty years, though with inter-regional variations. The potential of irrigation development varies across geographical regions due to topographical, hydrological and other constraints. Consequently, different regions have performed differently in development of irrigation. Further, the increasing gap between irrigation potential created and its utilization over the years has raised efficiency issues in the execution of irrigation projects. As about 88 per cent of UIP has already been developed, irrigation infrastructure can be improved further by bridging this gap. Improved irrigation infrastructure has led to increased cropping intensity and crop diversification towards high-value crops. The irrigation exerts a positive and significant impact on crop yield with varying degree across different crops. The agricultural productivity can be improved further by increasing irrigation efficiency, evolving institutional rearrangements, developing sustainable groundwater supply and emphasizing on completion of the on-going irrigation projects efficiently rather starting new ones.

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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.

Diversification of Agricultural Sector in Punjab : Growth and Challenges

DR. NEERAJ SHARMA* AND HARINDER MOHAN**

Abstract

Agricultural sector in Punjab has gone through the process of mechanisation and commercialization under the impact of green revolution. However, cropping pattern in Punjab has not witnessed any drastic change and remained highly favourable towards wheat-paddy monoculture, which has produced various ecological problems in the state in the form of loss of soil fertility, water table depletion etc.. The present paper aims to study prospects and challenges of diversification in the state of Punjab. Looking at the current agrarian crises, the study suggests that there is an immediate need to diversify overall economic base of the state, instead of attempting it only in terms of crop diversification. The results of the study revealed that there is a great prospect to diversify the entire economic base of Punjab. Non-farm activities can provide ultimate solution to the rising socio-economic problems in Punjab. Along with, immediate steps need to be taken in the direction of promoting appropriate infrastructure, better institutional management, government accountability, better education, health facilities, skill and vocational training to bring the economy of Punjab out of severe agrarian crises creeping the state's economy and place it on the path of growth and prosperity.

Key Words: Diversification, Green Revolution, Human Capital Formation, Rural Non-Farm Sector.

Sector I

Punjab economy particularly its agricultural sector has witnessed a remarkable transformation since the country achieved its independence in 1947. During the pre independence period the agricultural sector of Punjab was plagued with predominance of *Zamidari* system, distress conditions of tenants, inadequate investment opportunities in rural infrastructure, poor irrigation facilities, indebtedness of farmers, exploitation of farmers from moneylenders and weak land distribution system. Expansion of the area, implementation of Land reforms in the form of Abolition of *Zamidari* System, Tenancy reforms, Ceilings on agricultural holdings, consolidation of holdings, co-operative farming, improved land records system, and huge doses of public investment works were some of the key measures introduced soon after the country achieved independence. Moreover, with the introduction

of Intensive Agricultural District Programme (IADP), mechanization of agriculture, use of chemical fertilizers and R&D activities were made an integral part of agricultural strategy of the state after independence. Further, the inception of Green Revolution resulted into the intensive cultivation in the state. Use of high yielding variety seeds programme, multiple cropping arrangements, development of new irrigation facilities, crop insurance schemes, plant protection policy, better credit facility, minimum procurement price measures, high use of modern equipment and machinery processing, storage and regulated markets etc. were the key measures introduced in the new agricultural strategy in the form of Green Revolution. All these measures were introduced to boost the growth performance of farm sector of Punjab. Green Revolution appeared as a turning point in Punjab's history (Chakravarti, 1973). Green Revolution proved the break through of Punjab agricultural sector accompanied by a sudden jump in the yield per hectare. Consequent to green revolution, state's wheat production increased from 1.9 million metric tones in 1965-66 to 5.6 million metric tones in 1971-72. Consequent to green revolution area under HYV crops has witnessed spectacular growth particularly for wheat and paddy crops. By any standard, the rise from 1.9 to 5.6 million metric tons over a five-year period is a remarkable achievement (Gill, 1983). Consequent to Green Revolution and high use of irrigation facilities, 85 per cent of the state's area became cultivable. Moreover, 97.02 per cent of the Gross Cultivated area (GCA) brought under irrigation in the state. Besides, Green revolution made agricultural sector in Punjab highly mechanized. In 1970-71 there were only 1.92 lakh Tube wells in Punjab, in 80-81 there were 6 lakh tube wells, and in 90-91 number went up to 8 lakh, 2000-01 again number rose up to 10 lakh and now there are about 14 lakh tube wells in 2010-11. Consumption of chemical fertilizers also rose from 213 thousand nutrients tonnes in 1970-71 to 1313 thousand nutrients tonnes in 2000-01 and further to 1911 thousand nutrients tones. Addition to it, green revolution has led to the emergence of various farm and non-farm linkages in different directions. Rising rural incomes accelerated the demand for industrial output and employment, resulting to the growth of both farm and non-farm employment in Punjab during the era of green revolution. Introduction of Green Revolution in Punjab brought about a significant reduction in rural poverty in terms of both the absolute number and

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percentage of poor and ultra poor population in total rural population for the early 1970s (Sukhpal Singh, 2004). However, the fruits of Green Revolution were proved only short lived. Green Revolution has led to reduced genetic diversity, increased vulnerability to pestst, soil erosion, water shortage, reduced soil fertility, micronutrient deficiencies, soil contamination, reduced availability of nutrition food crops for the local population, the displacement of vast number of small farmers from their land, rural impoverishment and increased tensions and conflicts. (Vandana Shiva, 1991). Reckless use of chemical fertilizers, pesticides and insecticides has led to the depletion of water table in Punjab. After introduction of Green Revolution water table started declining and the area having water table below 30 feet depth increased from 3 percent in 1973 to 90 percent in 2004 (Hira, 2008). It is estimated that due to over utilization of chemical fertilizers 42 per cent of the groundwater has depleted across various districts in Punjab. The Green Revolution was limited in its impact only to the farmers having larger access to big land holdings, which has led to the rising income inequalities and unemployment among the peasants of Punjab state (R.K. Mahajan, 2002). The huge parts of small and marginal farmers are leasing-out their land holdings and adopting other livelihood activities except agriculture. Half of them who left farming have totally or partially sold their land holdings and one-third of those who sold their land were worse-off after leaving farming (Sukhpal Singh, 2011).

It is now widely observed that Punjab economy particularly its conventional agriculture sector, after witnessing a high rate of growth started experiencing deceleration since mid 1980s and more particularly since the onset of the process of economic reforms in 1991. Slowing down of agricultural growth, paddy-wheat monoculture, over-exploitation of natural resources, ever increasing debt burden of the state farmers', rapidly rising labour force, declining land-man ratio, large use of pesticides and fertilizers, steep rise in land prices, inadequacy of financial facilities, poor human capital formation, infrastructural bottlenecks, increasing land degradation, increasing income inequalities, farmers suicides and declining public expenditure on agricultural growth are the major issues creeping in the state's economy.

The present paper aims to study aspects of agricultural diversification in the state of Punjab during the period 1970-71 to 2010-11. More specifically, the broad objectives of the study are as under:

- (i) To study the growth and development of agricultural sector in Punjab during the period 1960-61 to 2009-10;

- (ii) To evaluate the major indicators of diversification of Punjab agriculture;
- (ii) To provide alternative diversification strategy for the economy of Punjab.

Section II

Diversification-Meaning and Relevance

Diversification may be defined as “the production of a variety of different articles, services, etc. In simple words, Diversification refers to the participation in more than one activity at one point of time with the objective to enhance level of living and reduce risk, and uncertainty in business activity. Diversification shows a change in product (or enterprise) choice and input use decisions based on market forces and the principles of profit maximization (Pingali and Rosegrant, 1995). There are two different aspects of diversification. One is to plan under an assumption of perfect knowledge and the second is to minimize the variance of an outcome by attempting to put a floor under the income level or by preventing the occurrence of undesirable outcomes (Dorsey, 1999). The advantages of engaging in different production systems at the farm level depends upon the level of within-farm heterogeneity in soil and land resources, biological and economic factors, the extent of the sustainability effects, and the gains in fuller utilization of resources in the diversified production system. With regard to agriculture, diversification may be viewed as a process with four stages. Initially, diversification is at the cropping level where there has been a shift away from monoculture. Many developing countries are currently lying at this stage. At the second stage, the farm has more than one enterprise and may produce and sell crops at different times of year. At the subsequent stage, diversification is understood as being mixed farming. Finally, activities beyond agriculture are incorporated into the meaning of diversification. (Newby, 1988). Crop diversification intends to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk (Gurdas Singh, 2012). Crop diversification is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The advantages of diversification to the individual farmer are numerous and are such as to recommend as a policy to most farmers, however, the extent of these advantages is conditioned by the number of farmers attempting to secure themselves. In India, diversification has occurred both across and within the crop, livestock, forestry and fishery sectors. Within the agriculture, the share of output and employment in the non-crop sectors, i.e. animal husbandry, forestry and fisheries, has been gradually increasing. Despite the frequent observations that

diversification plays an important role in agriculture, there are only a few empirical studies on the factors that affect diversification.

The present paper is divided into following five sections. Section I analysis the growth of agricultural in Punjab under the impact of Green Revolution. This section also discusses the impacts of green revolution in Punjab along with the current agricultural scenario in the state. Section II deals with the conceptual aspects regarding diversification. Database and Methodological issues are discussed in Section III. Section IV presents various indicators of agricultural diversification in the state during the period 1970-71 to 2009-10. Section V provides the alternative diversification strategy for the overall economic base of Punjab. Section VI concludes the study.

Section III

Database and methodology

The results of the study are primarily based on the various secondary sources to fulfill the desired objectives of the study. Simple statistical tools like percentages, annual rates and growth rates are computed to make inferences about the data collected.

Section IV

Results and Discussion

Since the introduction of new agricultural strategy, agricultural sector in Punjab has witnessed substantial transformation of its agricultural sector. The following section is devoted to the explanation of agricultural development in Punjab during the period 1970-71 to 2010-11.

TABLE 1—AGRICULTURAL INDEX NUMBERS IN PUNJAB (BASE TRIENNIUM ENDING 1969-70=100)

Year	Net Area Sown	Cropping Intensity	Area Under Crops	Yield	Cropping Pattern	Agricultural Production	Productivity Per Hectare of the Net Area Sown
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1960-61	90.82	92.83	84.30	73.75	93.62	77.65	N.A
1970-71	101.57	103.26	104.86	107.74	101.71	109.76	N.A
1980-81	107.87	118.94	128.29	138.84	102.43	171.52	173.7
1990-91	121.57	130.46	144.60	187.01	93.96	269.55	229.24
2000-01	122.13	137.83	153.98	220.78	98.19	332.03	298.79
2007-08	123.68	138.56	156.87	230.86	101.66	377.17	325.19
2008-09 (R)	123.31	139.30	157.84	234.02	101.19	383.08	329.87
2009-10	123.47	140.04	157.82	231.08	100.81	373.47	326.23
2010-11 (P)	123.00	139.30	157.34	236.85	100.57	379.05	331.83
Overall Percentage Change	35.43	50.06	86.64	221.15	7.42	388.15	—

NOTE: (P) Provisional.

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

The details about agricultural indices in Punjab are given in Table 1. The results show that the index number of agricultural products has increased from 77.65 in

1960-61 to 379.05 in the year 2010-2011. In similar way, all the remaining indicators of agricultural indices witness continue increase during the period 1960-61 to 2010-11.

TABLE 2—GROSS CROPPED AND IRRIGATED AREA IN PUNJAB, 1970-71 TO 2010-11 (IN '000 HECTARE)

Year	Total Cropped area	Gross Irrigated area	Percentage of Gross Irrigated Area to Gross Cropped Area
(1)	(2)	(3)	(4)
1970-71	5678	4242.5	74.7
1980-81	6763	5781.3	85.9

TABLE 2—GROSS CROPPED AND IRRIGATED AREA IN PUNJAB, 1970-71 TO 2010-11 (IN'000 HECTARE)—Contd.

Year	Total Cropped area	Gross Irrigated area	Percentage of Gross Irrigated Area to Gross Cropped Area
(1)	(2)	(3)	(4)
1990-91	7502	7054.8	94.1
2000-01	7941	7663.8	96.5
2008-09	7912	7723.6	97.6
2009-10	7876	7714.2	97.9
2010-11(P)	7882	7723.8	98.0
Overall percentage change	38.82	82.06	31.2

NOTE: (P) Provisional

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Punjab agriculture witnessed spectacular transformation as a result of Green Revolution during the period 1970-71 to 2010-11. Total cropped area saw a sharp increase from 5678 thousand hectare in 1970-71 to 7882 thousand hectare in 2010-11 (Table 2). Similarly, net sown

area increased from 4053 thousand hectare in 1970-71 to 4171 in 2008-09. As a result of it, cropping intensity, which shows percentage of gross cropped area to net area sown has also increased from 1.40 thousand hectare in 1970-71 to 1.90 thousand hectare in 2008-09.

TABLE 3—AREA UNDER PRINCIPAL CROPS IN PUNJAB, 1970-71 TO 2010-11 (IN' 000 HECTARE)

Crop	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10 (R)	2010-11 (P)
Rice	1183 (17.49)	2015 (26.86)	2612 (32.89)	2609 (33.15)	2735 (34.57)	2802 (35.41)	2826 (35.85)
Bajra	69 (1.02)	12 (0.16)	6 (0.07)	5 (0.06)	5 (0.06)	3 (0.04)	3 (0.04)
Maize	382 (5.65)	188 (2.50)	165 (2.08)	154 (1.96)	151 (1.91)	139 (1.76)	133 (1.69)
Wheat	2812 (41.58)	3273 (43.63)	3408 (42.92)	3487 (44.31)	3526 (44.56)	3522 (44.72)	3510 (44.53)
Barely	65 (0.96)	37 (0.49)	32 (0.40)	16 (0.203)	16 (0.20)	14 (0.18)	12 (0.15)
Total Cereals	4513 (66.73)	5525 (73.65)	6223 (78.37)	6271 (79.68)	6433 (81.31)	6480 (82.28)	6484 (82.26)
Total Pulses	341 (5.04)	143 (1.91)	54 (0.68)	27 (0.34)	22 (0.28)	18 (0.23)	20 (0.25)
Total Foodgrains	4854 (71.77)	5668 (75.55)	6277 (79.31)	6298 (80.03)	6455 (81.58)	6498 (82.50)	6504 (82.52)
Total Oil-seeds	238 (3.51)	104 (1.39)	86 (1.08)	60 (0.76)	60 (0.76)	62 (0.79)	56 (0.71)
Cotton	649 (9.60)	701 (9.34)	474 (5.97)	605 (7.69)	527 (6.66)	511 (6.49)	483 (6.13)
Potatoes	40 (0.31)	23 (0.31)	60 (0.76)	90 (1.14)	82 (1.04)	74 (0.94)	64 (0.812)
Sugar-cane	71 (1.05)	101 (1.35)	121 (1.52)	108 (1.37)	81 (1.02)	60 (0.76)	70 (0.89)

NOTE: (i) (R) Revised

(ii) (P) Provisional

(iii) Figures in the parentheses under the relevant columns represent percentages of the total.

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Table 3 shows the pattern of area under principal crops from the year 1960-61 to 2008-09. Compared to pre-green revolution period, post green revolution period experienced sharp increase in the total area under principal crops. Wheat and paddy accounted for the most of the increase in the area under these crops. Both these crops,

together accounted for the 81.31 per cent of the total area in the year 2009-10. On the other side area under other crops such as oil-seeds, cotton, potatoes, bajra experienced relatively very small increase in the respective area. It can be concluded that the monoculture of wheat and paddy had dominated most of the increase in the area under these crops.

TABLE 4—AREA UNDER FOOD AND NON-FOOD CROPS IN PUNJAB, 1970-71 TO 2010-11 (IN '000 HECTARE)

Year	Kharif Crops			Rabi Crops			Total Crops (Kharif Crops+Rabi Crops)		
	Food	Non-Food	Total	Food	Non-Food	Total	Food	Non-Food	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1970-71	1356 (53.90)	1160 (46.10)	2516 (100.00)	2773 (87.70)	389 (12.30)	3162 (100.00)	4129 (72.72)	1549 (27.28)	5678 (100.00)
1980-81	1827 (57.98)	1324 (42.02)	3151 (100.00)	3204 (88.70)	408 (11.30)	3612 (100.00)	5031 (74.39)	1732 (25.61)	6763 (100.00)
1990-91	2444 (72.05)	948 (27.95)	3392 (100.00)	3434 (83.55)	676 (16.45)	4110 (100.00)	5878 (78.35)	1624 (21.65)	7502 (100.00)
2000-01	3072 (74.90)	1030 (25.10)	4102 (100.00)	3491 (90.94)	348 (9.06)	3839 (100.00)	6563 (82.65)	1378 (17.35)	7941 (100.00)
2007-08	2943 (75.89)	935 (24.11)	3878 (100.00)	3674 (92.03)	318 (7.97)	3992 (100.00)	6617 (84.08)	1253 (15.92)	7870 (100.00)
2008-09	3162 (78.13)	885 (21.87)	4047 (100.00)	3553 (91.93)	312 (8.07)	3865 (100.00)	6715 (84.87)	1197 (15.13)	7912 (100.00)
2009-10	3061 (78.75)	826 (21.25)	3887 (100.00)	3665 (91.88)	324 (8.12)	3989 (100.00)	6726 (85.40)	1150 (14.60)	7876 (100.00)
2010-11 (P)	3148 (79.52)	811 (20.48)	3959 (100.00)	3602 (91.82)	321 (8.18)	3923 (100.00)	6750 (85.64)	1132 (14.36)	7882 (100.00)
Overall Percentage change	132.15	-30.09	57.35	29.90	-21.18	24.07	63.48	-26.92	38.82

Note: (i) (P) Provisional

(ii) Figures in the parentheses under the relevant columns represent percentages of the total.

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Table 4 discloses that the distribution of area under Kharif and Rabbi crops has remained in favour of the food crops than in that of the number of the non-food crops during the period under study. The results of the table also reveals that while area under food crops witnessed 62.63 percentage overall increase while that of total crops

saw negative growth of -22.72 per cent during the same period. It can be concluded from the above analysis that the present agriculture crop pattern in the state is dominated by the wheat-paddy rotation causing degradation in soil fertility and fall in the underground water table in the state.

TABLE 5—PRODUCTION PATTERN OF PRINCIPAL CROPS IN PUNJAB, 1970-71 TO 2010-11 (IN KGS/HA)

Crop	1970-71	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10(R)	2010-11(P)	Overall Percentage Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Rice	688	3233	6506	9157	10486	11000	11236	10819	1472.53
Bajra	243	86	13	5	5	5	4	3	-98.76
Maize	861	612	333	461	525	514	475	491	-42.97
Wheat	5145	7677	12159	15551	15716	15733	15169	16472	220.15
Barely	57	108	101	109	57	55	47	44	-22.81
Total Cereals	6997	11717	19113	25283	26789	27307	26931	27829	297.72
Total Pulses	308	204	105	39	20	19	16	17	-94.48
Total Foodgrains	7305	11921	19218	25322	26809	27326	26947	27846	281.19
Total Oil seeds	233	187	93	88	78	73	84	73	-68.67
Cotton	818	1178	1909	1199	2359	2285	2006	1822	122.74
Potatoes	216	767	543	1166	1714	2014	1918	1609	644.91
Sugar-cane	261	392	601	777	657	467	370	417	59.77

NOTE: (i) (R) Revised

(ii) (P) Provisional

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Table 5 reflects the production of Kharif and Rabi crops in Punjab from the period 1960-61 to 2008-09. The analysis of the table reveals that the production of rice, wheat, total cereals, total food grains, cotton, and potatoes witnessed manifold increase during the period under study. For instance, the production of wheat in Punjab increased by 3 to 4 fold from 5,145 thousand metric tonnes in 1970-71 to nearly 16,472 thousand metric tonnes during 1970-71 to 2010-11. On the other part, the production of rice recorded 16 fold increase from 688 thousand metric

tonnes to 10,819 thousand metric tonnes during the same period. However, the production of other crops remained relatively poor during the same period. The production of wheat and paddy crops have replaced that of Bajra, Maize, Barely, total pulses, total oilseeds etc. Actually, these crops have recorded sharp deceleration during the last five decades. The overall foodgrains production also experienced between 3 to 4 fold rise from about 73.5 thousand metric tonnes in 1970-71 to nearly 27,846 thousand metric tonnes in 2010-11.

TABLE 6—PATTERN OF AVERAGE YIELD OF PRINCIPAL CROPS IN PUNJAB, 1960-61 TO 2009-10 (IN KGS/HA)

Crop	1967-68	1970-71	1980-81	1990-91	2000-01	2006-07	2009-10(P)	Overall Percentage Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wheat	1244	2238	2730	3715	4563	4210	4307	246.22
Rice	1009	1765	2733	3229	3506	3868	4010	297.42
Maize	1135	1555	1602	1786	2793	3123	3414	200.79
Bajra	472	1176	1244	1107	893	977	1495	216.74
Barley	768	1022	1640	2754	3393	3394	3337	334.50
Gram	813	797	582	744	953	1010	1129	38.87

TABLE 6—PATTERN OF AVERAGE YIELD OF PRINCIPAL CROPS IN PUNJAB, 1960-61 TO 2009-10 (IN KGS/HA)—Contd.

Crop	1967-68	1970-71	1980-81	1990-91	2000-01	2006-07	2009-10(P)	Overall Percentage Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rapeseed & Mustard	509	555	567	1003	1218	1119	1284	152.26
Sugarcane	3954	4117	5526	5941	6425	6083	6172	68.91
Cotton (A)	269	399	329	481	437	763	673	150.18
Cotton (D)	270	338	241	285	408	531	465	72.22
Groundnut	925	970	1249	816	879	865	1240	34.05

Note: (P) Provisional

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Table 6 indicated that yield per hectare has increased tremendously particularly in case of rice and wheat. Yield per hectare in case of rice increased from 1009 kgs in 1970-71 to 4010 kgs in 2009-10. While in case of wheat, it rose from 1244 to 4307 during the same period. As a result of increase in yield per hectare, Punjab has been able to

produce food grains not only to feed its own people but contribute a major portion to Central pool. The respective contribution of wheat to the central pool increase from 5.3 lakh tones in 1970-71 to 92.8 lakh tones in 2009-10 nearly 28 times increase, and for wheat the corresponding share increase from 3.8 lakh tones to 107.3 lakh tones during the same period.

TABLE 7—CONSUMPTION OF CHEMICAL FERTILIZERS IN PUNJAB, 1970-71 TO 2010-11 (IN '000 NUTRIENTS TONNES)

Year	Nitrogeous (N)	Phosphatic (P ₂ Q ₅)	Potassic (K ₂ O)	Total (NPK)
(1)	(2)	(3)	(4)	(5)
1970-71	175 (82.16)	31 (14.55)	7 (3.29)	213 (100.00)
1980-81	526 (69.02)	207 (5.17)	29 (3.81)	762 (100.00)
1990-91	877 (71.88)	328 (26.89)	15 (1.23)	1220 (100.00)
2000-01	1008 (76.77)	282 (21.48)	23 (1.75)	1313 (100.00)
2008-09	1332 (75.34)	379 (21.44)	57 (3.22)	1768 (100.00)
2009-10	1358 (72.78)	434 (23.26)	74 (3.97)	1866 (100.00)
2010-11(P)	1403 (73.42)	435 (22.76)	73 (3.82)	1911 (100.00)
Overall Percentage Change	661.14	1122.58	714.28	730.05

NOTE: (i) (P) Provisional

(ii)) Figures in the parentheses under the relevant columns represent percentages of the total

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Such a significant increase of yield per hectare can be attributed to the intensive use of chemical fertilizers coupled with irrigation facilities, adoption of new agricultural practice and use of high yielding variety seeds. Table 7 shows that the consumption

of total chemical fertilizer (NPK) has jumped from 213 thousand nutrients tones to 1911 thousand nutrients tones between the period 1970-71 to 2010-11, or nearly 9 fold increase during the period under study.

TABLE 8—GROWTH PATTERN OF AGRICULTURAL IMPLEMENTS AND MACHINERY IN PUNJAB, 1980-2005 (000'NUMBER)

Year	Tractors/ Trailers	Tiller/ Culti- vators	Disc Harrow (T.Driven)	Seed- Cum- Fertilizers Drill	Spray Pump	Tractor Drawn Combine	Self Proppled Combine	Threshers	Tube- well	Cane Crushres
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1980	110	10	71	19	NA	NA	NA	25	NA	NA
1990	265	195	215	100	NA	NA	NA	297	NA	NA
2001	405	245	245	175	565	5.2	5.2	205	1073	25
2005	407	348	191	158	650	6.4	6.4	92	1200	5
Overall Percentage change	270	3380	169.01	731.58	NA	NA	NA	268.00	NA	NA

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

On the other hand, Punjab agriculture witnessed high scale of mechanization thanks to Green Revolution. Number of tractors, tiller, seed-cum-fertilizers Drill spray

pumps, tubewells have witnessed significant growth during the period under study. (Table 8)

TABLE 9—GROWTH PATTERN OF TUBEWELLS IN PUNJAB, 1970-71 TO 2009-10 (IN LAKHS)

Year	Number of Tubewells		
	Diesel Operated	Electric Operated	Total
(1)	(2)	(3)	(4)
1970-71	1.01 (52.60)	0.91 (47.40)	1.92 (100.0)
1980-81	3.20 (53.33)	2.80 (46.67)	6.00 (100.0)
1990-91	2.00 (25.0)	6.00 (75.0)	8.00 (100.0)
2000-01	2.85 (26.56)	7.88 (73.44)	10.73 (100.0)
2007-08	2.75	9.71	12.46
2008-09 (R)	2.71 (21.94)	10.05 (78.06)	12.76 (100.0)
2009-10 (R)	2.70 (19.01)	10.65 (80.99)	13.15 (100.0)
2010-11 (P)	2.40 (17.37)	11.42 (82.63)	13.82 (100.0)
Overall Percentage Change	137.62	1154.94	619.80

NOTE: (i) (R) Revised.

(ii) (P) Provisional.

(iii) Figures in the parentheses under the relevant columns represent percentages of the total.

Source: Statistical Abstract of Punjab for Various Years, Government of Punjab.

Government of Punjab made significant attempt to expanding are under various sources of irrigation. As a consequent structure of irrigation also witnessed considerable shift in the form of tubewells. The percentage of net area irrigated by tubewells and wells increased from 55.10 per cent in 1970-71 to about 57.33 per cent in 1980-81 and further to 72.59 per cent in 2008-09. In spite of rapid expansion of tubewells irrigation in the state, agriculture in Punjab continues to depend importantly on canal irrigation as well.

Section V

DIVERSIFICATION STRATEGY FOR PUNJAB ECONOMY

The following section highlights some of the key policy measures in the direction of diversifying the overall economic base of Punjab and help bring the economy of Punjab out of severe economic crisis.

In the first attempt, the policy makers and state planners need to adopt such diversification mechanism, which ensure overall economic welfare of peasant economy of Punjab. It is now universally evident that in rural economies like India, typically characterized by continuing population pressure, an ever-declining land-man ratio, small and fragmented agricultural holdings, highly wicked land distribution structures and increasing labour saving farm production technologies, agriculture alone cannot provide the ultimate solution for emerging rural economic problems. Therefore, it is a high time to look beyond the conventional practices of farm activities. The role and importance of non-farm activities is immense in this regard. Rural non-farm sector, along with the better development of agricultural sector and additional employment opportunities can lead to the overall rural development in Punjab.

Second, to enjoy the fruits of globalization, promotion of various agro related activities at various levels are need to be promoted. It is seen that the cultivation of vegetables and fruits in place of wheat and paddy in Punjab has ample scope. It has been estimated that India exports flowers worth more than 120 crore annually to several European countries such as Holland, Germany and USA. Alongside there has been tremendous increase in the demand of floriculture products both globally as well as domestically. Thus, state government must make serious efforts to promote floriculture activities in the state. To this end, a large number of input testing laboratories need to be opened at a wider scale to ensure quality checks of inputs such as seeds, pesticides and fertilizers.

Third, Special policy emphasis must be made for such crops like oilseeds, pulses, coarse cereals, fodder, alongside other field crops such as sugarcane and cotton. Establishment of agro-based industries of small and medium size in rural areas away from urban places can be

of great help in creating employment for rural youths and to encourage diversification. Research and Development (R&D) activities also need to be promoted to improve the new varieties of high yielding variety seeds (HYVs).

Fourth, the role and emergence of dairy farming has shown great promises to enhance the levels of income of peasant economy of Punjab. Dairying is the best choice for agricultural diversification in the state, on ecological as well as economic grounds. It has vast potential for growth in employment and income and for restoring soil health. Efficient and modern system of marketing and processing is required to give boost to dairy industry in the state.

Fifth, looking at the rising unemployment problem particularly among the small and marginal farmers in the state, efforts are required to promote agro related activities more particularly at the village level. However, Government must recognize options and constraints in the way of effective implementation of these activities at the village level.

Sixth, to ensure the overall development of economic base of the state, farm-non-farm linkages need to be strengthened in the desired directions. Government should plan to enhance public investment on R&D infrastructure for the agro-processing industry, improvement of seeds quality, biotechnology and product-quality development.

Eighth, for providing safety nets for farmers during the period of agrarian distress. Government of Punjab should create pension fund and enhance the crop insurance scheme. It has been found that government insurance policy was mainly focused on insurance of two crops wheat and paddy, which has worked against the healthy performance of other crops. Therefore, such policy measures are required, which ensure the full coverage of different crops of farmers in Punjab.

Ninth, Due to the limited scope of further addition to the area sown in the state, diversification of state agriculture through allied activities comprising animal husbandry, commercial dairying and fisheries have acquired significance in the reduction of economic disparities between rural and urban population.

Tenth, Under the WTO framework, Punjab agriculture should undergo a paradigm shift in strategy. From a 'production-driven' agriculture, we have to move to a 'demand driven' one. For this, government needs to spend liberal amounts on R & D, infrastructure for the agro-processing industry, seed, biotechnology and product-quality development.

Eleventh, Heavy doses of chemical fertilizers, pesticides, insecticides have put the water resources of the state under tremendous pressure. Instead of pushing

more farm equipments efforts must be directed to promote System of Rice Intensification (SRI), which neither require much standing water nor heavy labour at the time of transplanting. In addition, direct rice planting should also be promoted as it saves a lot of water. It should be made mandatory for fertilizer companies to ensure green manuring, composting and use of panchkavya and jeev amrit in farming.

Twelfth, considering the water crisis that looms large, Punjab must shift to farming systems that require less water. As a matter of principle, hybrid and GM crops (which require much more water) should be discouraged. In addition, water harvesting and revival of village ponds should be given incentives. Artificial regeneration of groundwater along borewells and wells too need adequate allocation.

Thirteenth, Punjab Agricultural University (PAU), once the seat of Green Revolution, needs to undergo transformation in its research approach. From inorganic crop breeding, research focus should now shift to organic breeding where varieties are developed in response to the availability of nutrients in organic form. These varieties have also to respond to climate change that stares ahead. Multiple cropping systems, incorporating dairy cattle, need adequate emphasis.

Fourteenth, Care should be taken to ensure that the small and marginal farmers are brought within the gambit of new agricultural strategy. Along with efforts must be made to cover more and more crops, lay more emphasis on small farming, adopt integrated approach, enlarge irrigation facilities, use of labour intensive techniques and finally achieve social justice.

Fifteenth, Cooperative societies have made significant impact on the living conditions of small and farmers in the state. However, the progress made so far is satisfactory but cannot be termed as ideal. Hence, efforts are required to make these societies closely intertwined with other societies dealing with farming, and financial activities. There is an urgent need to establish multipurpose societies, which could look after all the aspects of farm sector. These societies should construct their own storage capacity, own transport, and arrange for gradation and promotion of exports.

Sixteenth, Animal husbandry has emerged as one of the most important sub-sector of agricultural economy and plays a significant role in the rural economy of the state by providing gainful employment particularly to the small and marginal farmers, women and agricultural landless labourers.

Seventeenth, the problem of indebtedness of farmers is rising by each passing years. Credit Cooperative societies failed to check the malpractices involve in granting loans to small and marginal farmers.

A large portion of these farmers is still under the hands of moneylenders. Thus government must promote credit facilities and regulated the malpractices by the part of moneylenders.

In net terms, the thorough diversification suggested above coupled with a well-synchronized system of technological-cum-infrastructural-cum-institutional mechanisms for the entire economic base of Punjab can prove to be an ultimate solution to deal with the various socio-economic challenges that state's economy is currently facing.

Section VI

Concluding Remarks

Punjab economy particularly its agricultural sector has gone through the process of commercialization and mechanization, consequent to which production and productivity of agriculture has registered robust increase in the state. However, green Revolution was only limited to it impact on large farmers or on farmers having larger access to big land holdings. In overall sense, it can be said that Punjab economy more particularly its agricultural sector is passing through a severe economic crises. Slowing down of agricultural growth, paddy-wheat monoculture, over-exploitation of natural resources, ever increasing debt burden of the state farmers', rapidly rising labour force, declining land-man ratio, large use of pesticides and fertilizers, steep rise in land prices, inadequacy of financial facilities, poor human capital formation, infrastructural bottlenecks,, increasing land degradation, increasing income inequalities, farmers suicides and declining public expenditure on agricultural growth are the major issues creeping in the state's economy. Looking at the deep crises, there is an immediate need to diversify overall economic base of the state, instead of attempting it only in terms of crop diversification. The thorough diversification coupled with a well-synchronized system of technological-cum-infrastructural-cum- institutional mechanisms for the entire economic base of Punjab can prove to be an ultimate solution to deal with the various socio-economic challenges that state's economy is currently facing.

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“कृषि समस्याओं का
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कृषि मंत्रालय, भारत सरकार, नई दिल्ली

C. Agro-Economic Research

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

The NREGA is an Indian job guarantee scheme for rural household. The scheme provides a legal guarantee for one hundred days of employment in every financial year to adult members (above the age of 18 years) of any rural household willing to do public work-related unskilled manual work at the statutory minimum wage of Rs 100 per day. It has been renamed as Mahatma Gandhi National Rural Employment Guarantee Act on 2nd October 2009.

The Act was notified in 200 districts in the first phase with effect from February 2, 2006 and then extended second

phase to 130 districts in the financial year 2007-2008 (113 districts were notified with effect from April 1, 2007 and 17 districts in UP were notified with effect from May 15, 2007). The remaining districts have been notified in phase three under the NREGA with effect from April 1, 2008. Thus, NREGA covers all the 593 districts in India.

The outlay had been raised from Rs 11,000 to Rs. 39,100 crores during the year 2006-2007 to 2009-2010. About 4,49,40,870 rural households were provided jobs under NREGA during 2008-09 with a national average of 48 working days per household.

Box 1.1 Goals of the NREGA

- (1) *Strong social safety net for the vulnerable groups by providing a fall-back employment-source. when other employment alternatives are scarce or inadequate*
- (2) *Growth engine for sustainable development of an agricultural economy. Through the process of providing employments on works that address causes of chronic poverty such as drought, deforestation and soil erosion. the act seeks to strengthen the natural resource base of rural livelihood and create durable assets in rural areas. Effectively implemented. NREGA has the potential to transform the geography of poverty.*
- (3) *Empowerment of rural poor through the processes of a rights-based law.*
- (4) *New ways of doing business, as a model of a governance reform anchored the principles of transparency and grass root democracy .*

7.1 Salient features of the Act

The Salient features of the Act are as follows:

- (1) Adult members of a rural household, willing to do unskilled manual work, may apply for registration in writing or orally to the local Gram Panchayat.
- (2) The Gram Panchayat after due verification issue a job card. The job card will bear the photograph of all adult members of the household willing to work under NREGA and is free of cost.
- (3) The job card should be issued within 15 days of application.
- (4) A job card holder may submit a written application for employment to the Gram Panchayat, stating the time and duration for which work is sought. The minimum days of employment have to be at least fourteen.
- (5) The Gram Panchayat will issue a dated receipt of the written application for employment, against which the guarantee of providing employment within 15 days operator.
- (6) Employment will be given 15 days of application for work, if it is not then daily unemployment allowance as per the act, has to be paid liability of payment of unemployment allowance is of the States.
- (7) Work should ordinarily be provided within 5 Km radius of the village. In case work is provided beyond 5 Km, extra wages of 10% are payable to meet additional transportation and living expenses.
- (8) Wages are to be paid according to the minimum wages act 1948 for agricultural laborers in the State, unless the centre notifies a wage rate which will not be less than Rs 60 per day. Equal wages

will be provided to both men and women.

- (9) Wages are to be paid according to piece rate or daily rate. Disbursement of wages has to be done a weekly basis and not beyond a fortnight in any case.
- (10) At least one-third beneficiaries shall be women who have registered and requested work under the scheme.
- (11) Work site facilities such as creche, drinking water, shade have to be provided.
- (12) The shelf of projects for a village will be recommended by the Gram Sabha and approved by Zila Panchayat.
- (13) At least 50% of work will be allotted to Gram Panchayats for execution.
- (14) Permissible works predominantly include water and soil conservation, forestation and land development works.
- (15) A 60:40 wage and material ratio has to be maintained. No contractors and machinery is allowed.
- (16) The Central Government bears the 100 per cent wage cost of unskilled manual labour and 75 per cent of material cost including the wages of skilled

and semiskilled workers.

- (17) Social Audit has to be done by Gram Sabha.
- (18) Grievance redressal mechanisms have to be put in place for ensuring a responsive implementation process.
- (19) All accounts and records relating to the scheme should be available for public scrutiny.

7.2 Historical Background

India is a country of villages and about 50 per cent of the villages have very poor socio-economic conditions. Since the dawn of independence, concerted efforts have been made to ameliorate the living standard of rural masses. The Ministry of Rural Development runs a number of schemes and programmes with the principal objective of enabling rural people to improve the quality of lives. It was realized that a sustainable strategy of poverty alleviation has to be based on increasing the productive employment opportunities in the process of growth itself and the NREGA a land mark legislation in the history of social security legislation in India after independence had taken place. Coupled with the right to information out, this legislation is looked upon as one bringing about a silent revolution in rural areas of the country. The figure given below gives a glimpse of how NREGA, which could be seen to render rural transformation for the welfare of the country as a whole.

Photo

7.3 Main Objectives of the Study

The study covers the following objectives:

- (1) To measure the extent of manpower employment generated under NREGA, their various socio-economic characteristics and gender variability in all the districts implementing NREGA since its inception.
- (2) To compare wage differentials between NREGA activities and other wage employment activities.
- (3) To evaluate the effect of NREGA on pattern of migration from rural to urban areas.
- (4) To find out the nature of assets created under NREGA and their durability.
- (5) To identify the factors determining the participation of people in NREGA and find out its impact in ensuring better food security to the beneficiaries.
- (6) To assess the implementation of NREGA, it's

functioning and to suggest, suitable policy measures to further strengthen the programme.

7.4 Data Base and Methodology

The study was based on both primary and secondary data. The primary data was collected from five districts, one each from the North, South, East, West and central location of the State. From each district two villages were selected keeping into account their distance from the location of the district or the main city/town. One village was selected from the nearby periphery of around 5 kilometers of the district/city head-quarters and the second village was selected from the farthest location of 20 kilometers and more than that. From each selected village, primary survey was carried out on 20 participants in NREGA and 5 non-participants working as wage employed. Thus, from Chhattisgarh State 250 numbers of households (HHs) were surveyed from 10 selected villages (Table 1.1). From Chhattisgarh State 200 participants and 50 non participants were surveyed in detail to construct baseline for comparison.

TABLE 7.1—SAMPLING SCHEME FOR THE STUDY

S. No.	Location	District	Near/ Far	NREGA HHs	Non-NREGA HHs
1.	North	Korba	Near	20	5
2.			Far	20	5
3.	South	Kanker	Near	20	5
4.			Far	20	5
5.	East	Mahasamund	Near	20	5
6.			Far	20	5
7.	West	Kabeerdham	Near	20	5
8.			Far	20	5
9.	Central	Durg	Near	20	5
10.			Far	20	5
Total				200	50

A Stratified Random Sampling method was adopted for selection of the participant households giving proportionate representation to the caste, i.e. (1) Scheduled Caste (2) Scheduled Tribe (3) Other Backward Caste (4) Forward Castes (others). A due representation was given to the gender factor. Phase and district wise implementation of NREGA has given utmost care for the proper representation across the State.

7.5 Major Findings

An increasing trend were observed to other castes i.e. 42.28, 46.48 and 54.28 per cent in the year 2008-09,

2009-10 and 2010-11 respectively whereas a decreasing trend was noticed in case of scheduled tribes & scheduled castes i.e. 57.73, 53.52 and 45.72 per cent in the year 2008-09, 2009-10 and 2010-11 respectively out of total man days generated employment.

Out of total person days generated employment for women during the last three years i.e. from 2008-09 to 2010-11 were found to be 47.43, 49.21 and 45.10 respectively. Women got higher opportunities of employment in districts like Rajnandgaon (53.41 per cent), Durg (52.12 per cent) and Raipur (49.69 per cent).

A decreasing trend was noticed in case of house hold completed 100 days employment and recorded as 7.50, 4.50, 3.57 per cent in the years 2008-09; 2009-10 and 2010-11 respectively. This might be due to the fact that the difficulty faced by bottom level planners in generating employment opportunities at gross root level. Hence there is need to involve agricultural scientist, thinkers, planners in the policy implication from top to bottom for effective implementation of the programme. This programme should be tuned up with Comprehensive District Agricultural Plan (C-DAP). Rural households should be encouraged for cottage industry & value added products.

Irrigation facilities are developing in a very fast rate which is most important factor for the development of agricultural sector in particular and industry as a whole in Chattisgarh State. The amount spent on the works under taken shown increasing trend in provision of irrigation facility and renovation of traditional water bodies while decreasing trend were found in rural connectivity & water conservation and water harvesting during different financial year from 2008-09 to 2010-11.

The number of muster roll used in Chattisgarh were 1378278, 1404654 and 1395639 and out of which 73.28, 80.96 and 87.28 per cent were verified in the year 2008-09, 2009-10 and 2010-11 respectively.

Out of total number of Gram Panchayats i.e. 9772, 9754 and 8108, the social audit were held in 90.66, 99.54 and 99.04 per cent Gram Panchayats in the year 2008-09, 2009-10 and 2010-11 respectively. In the financial year 2010-11 the total accounts opened as individual and joint accounts were found to be 99.04 and 0.96 per cent respectively.

The NREGA not only provided employment to the weaker section of the society but also strengthening the health of post office and commercial banks in the rural area. Although the total amount disbursed by the commercial banks and post office is found to be Rs. 1824.14, Rs. 1452.14 and Rs. 307.71 per account in the year 2010-11, 2009-10 and 2008-09 respectively.

Regarding work projection for the financial year 2011-12, it was observed that the attention will be given on provision of irrigation facility to owned land (31.76 per cent) followed by land development (23.42 per cent), Rural connectivity (16.15 per cent), water conservation and water harvesting (12.38 per cent) and renovation of traditional water bodies (9.08 per cent). The highest employment man days to be generated in rural connectivity (34.31 per cent), water conservation and water harvesting (17.94 per cent), renovation of traditional water bodies (15.93 per cent), provision of irrigation facility to owned land (10.20 per cent) and land development (9.77 per cent). The estimated cost will be used on unskilled wages (68.82 per cent) and material cost (31.18 per cent) for the said activities.

There were no remarkable difference was found in the characteristics of the household of beneficiaries and non beneficiaries respondents. Among total household the majority of them were male decision maker, head of the family. illiterate, age group 16-60, belonged to OBC caste groups, BPL category. Their main occupation was related to farming and wage earning and out of the total only 12.8 per cent were migrated from the village.

The maximum respondents were engaged as casual labour (35.05%) and 33.31 per cent were self employed while remaining were engaged in NREGA and regular jobs. The sources of income were NREGA, agriculture, public work programme, non farming of livestock, salary/pension etc. A household received an average total income of Rs.49376.79/year with fluctuation of 62.52 per cent in the study area. Although the average income of beneficiaries Rs.48,236.28/year (66.26%) showed more fluctuation as compared to non beneficiaries Rs.55,452.90 (48.15%) household. Wages earned from public work programme i.e. 292.56 per cent and minimum was found in wages from agriculture i.e. 27.65 per cent.

Beneficiary household consumes more quantity of liquid milk and milk products as compared to non beneficiaries household, while non beneficiaries consumes more quantity of total cereals, fruits and vegetables than the beneficiaries.

The monthly expenditure of households in food items varies from 234.02 (pulses) to 1074.48 (confectionery), 155.74 (pulses) to 2067.08 (fruits) and 220.3 (pulses) to 1469.20 (fruits) per cent and in non food items from 563.66 (others) to 873.68 (fuel), 400.64 (footwear) to 546.89 (clothing) and 531.92 (others) to 800.16 (fuel) per cent in case of beneficiary, non beneficiary and at aggregate level, respectively.

The variability in income is higher as compared to the consumption expenditure for both the categories and it was also noticed that the variability in case of beneficiaries is greater than that in case of non beneficiaries.

The employment other than NREGA and HH income other than NREGA was found to be negative and highly significant, which shows that with the increase in above variables the possibility of the participation of the HH in NREGA will decrease. The variables on social characteristics like HH belonging to SC, ST and OBC were also found positive and highly significant showing that with the increase in number of SC, ST and OBC population the possibility of participation in the NREGA will be high. The other factors such as AA Y, BPL, ration card holding, were found positive and non-significant response over participation in NREGA while land ownership was found negative and non significant.

The HH income other than NREGA turned out to be negative and highly significant in HH participation which indicated that those HH who had HH income other

than NREGA did not preferred to work in NREGA. Other variables such as employment other than NREGA, wage rate in NREGA were found negative, while HH size, value of owned land, HH related to AAY, BPL, SC, ST, OBC were found positive but non-significant response over association in participation in NREGA.

The wage rates were fixed Rs. 75 per day from (1st January 2009 to 31 May 2009) and from (1st June 2009) wage rate were revised Rs. 82.23 from (1st June to 1st October 2009) and from 2nd October 2009 onward Rs. 100 per day wage rate were also revised. The wage rate was found to be similar for man and women in NREGA. The average distance of work place where NREGA works is going on was found to 1.37 KM from their residence.

On an average 49 numbers of days per household member were employed during Jan.-Dec.2009 in Chhattisgarh. The scheduled castes employed higher number of days per household were (62 days) followed by other backward castes, (54 days) scheduled tribes (42 days) and general castes (36 days). As regard women, 67 number of days per household member employed in NREGA.

The majority beneficiaries reported that the quality of assets created through NREGA activities in their villages were good (54.5%), while 45.5 per cent reported that the assets were very good. None of the beneficiaries reported. that they have not received unemployment as allowance for not getting works under NREGA after registration.

The programme is very useful for single family because norms of the programme are 100 days employment will be given to per household family in a financial year either single family or joint family. Some of the joint families were broken-up to single family in the study area after the implementation of NREGA.

The total value of assets of non beneficiaries was found to be 1.5 times higher than that of beneficiaries. Value of agricultural implements of non beneficiaries was found 2.58 times higher than the beneficiaries, while in other items it ranged from 1.39 to 1.70.

The 78.5 of NREGA and 82.5 per cent non NREGA HHs reported the availability of the cooperative credit society in the village and none of the NREGA and 6 per cent non NREGA HHs were found to be member of such society. The availability of informal credit society/SHG in the village were found to be 69 and 76 per cent with 5.5 and 12 per cent family members being member of such society in case of NREGA and non NREGA HHs respectively. Tendency of opening an account in a bank/post office/ other institution was found noticeably higher in NREGA HHs (86.5%) as compared to non NREGA HHs (52%).

HHs revealed that in 16 per cent cases job cards had no entries regarding their employment even though they had worked on NREGA, 6.5 per cent expressed that

some entries were incomplete or missing or fake information was entered, 3.5 per cent reported that some entries had been over written. 94.5 cases the job cards were kept with the job card holders only. Cent per cent beneficiaries revealed that they did not get work within 15 days of application and were not paid unemployment allowance too.

The 84.5 per cent of the NREGA workers got their wages within a month while 15.5 per cent were paid even more than a month which is a serious issue. Majority of the beneficiaries (84%) stated that they were paid in front of labourers. About 91.5 per cent of the beneficiaries complained in delay in wage payments while 55.3 per cent faced problems in accessing post office/bank accounts and 11 per cent did not know that on what basis wages were calculated. Only 5.4 per cent reported that the task was too much compared to the wages paid. None of the HHs reported that the work was useless for the villagers.

Most of the beneficiaries told that it is worth creating the structure (99) and were adequate (92%).

The 9.5 per cent beneficiaries HHs reported that their family members migrated out for job after implementation of NREGA and 7.5 & 2 per cent told that more than one and only one member of the family migrated respectively.

Almost all the beneficiaries were aware about the implementation of NREGA and the right to minimum wages. Most of the beneficiaries were aware about the minimum work site facilities (89%), the list of permissible works under NREGA (71 %) and only 27 per cent knew the wage calculation method. Nearly 89.5 per cent beneficiaries could get full two meals throughout the year 2009 because of NREGA and remaining 10.5 per cent had some degree of food insecurity, 23.5 and 19 per cent did not get sufficient food for a month and two month respectively.

All the villages have road connectivity, landline and mobile connectivity, primary school and Gram Panchayat offices and half or more than half of the villages have Self Help Group Centre and secondary school. About 40,30 and 20 per cent villages have cooperative credit society, primary health centre, post office and 10 per cent have Regional Rural Banks, Higher Secondary School and fair price shop. The average distance of railway connectivity was found to be 58.7 kms away from the village. Regional Rural bank and Agricultural Produce Market were found to be about 6.8 and 6.1 kms away from the village while other infrastructures like Commercial Bank, hospital/dispensary and fair price shop were found to be within the average distance ranges from 1.3 to 4.6 kms.

The occupation structure of the sample villages shows a slight change over a period of nine years. The share of cultivators and agricultural labourers had declined marginally leading to a slight increase in the share of workers in non- farm occupations. Compared to 2001, workers are

seen to be working in greater proportion in sectors like household mall industry, construction, trade, commerce and business and other sectors.

The wages of both male and female workers have increased over the concerned period and it ranges from 25 to 35 per cent. Non-farm wages are seen to be increased with higher rate than the farm wages.

The labour charges almost became double during 2001-2009. During the two periods i.e. 2001-2005 and 2005-2009, the labour charges found to be increased in the range of 25-50 per cent. Little difficulty regarding availability of labour was noticed everywhere during peak period of agricultural operations.

No change in labour migration by NREGA activities were felt by the 80 per cent respondents while 70 per cent felt that there has been a shortage of agriculture labour after implementation of NREGA. Increase in household consumption in village, trend of people living in village and going to work outside daily and for longer period has increased, labour is migrating from the village as wage rate in the town is higher than wage rate under NREGA or other activities in the village and cost of production increased by 20 to 50 per cent were reported by 20 per cent respondents.

7.6 Policy Suggestions

The analysis of the functioning of various aspects of NREGA in Chhattisgarh has implemented in 2006 (Phase I) in 13 districts, while in 2007 (Phase II) and 2008 (Phase III) in 4 and 1 district. The scheme seems to have broad benefits in all the districts for SC, ST, backward and weaker section of the society. However, since 2009 there has been absolute decline in number of days employment and employment generated. This might be due to the fact that bottom level planners do not have clear cut vision of how to generate employment. This means there is need to involve agricultural scientists, thinkers and planners in the policy implementation. This programme should be tuned up with comprehensive District Agricultural Plan for effective and efficient implementation of the programme. In the light of this following implication emerge :

1. As it is clear from the study that irrigation facilities along with supportive infrastructure have been developed at a very fast rate. Hence, there is needed to form water use association bodies for maintenance of these precious structures to keep them in ever lasting. It is imperative that the implementing agencies upscale such successful models .
2. The nature of assets created at various places in the different locations of the study was not found at satisfactory level, this was due to lack of proper

planning. However, some NREGA officials in the study area reported that no proper and timely proposal are coming from Gram Sabha. Time and staff shortage also affected the quality of the assets created. Thus, it is suggested to execute work after proper planning and consultation with Gram Sabha or the potential beneficiaries of the infrastructure created. The quality and maintenance of assets need more attention in the coming years so that the investment made would not go futile.

3. It is pointed out that the planning for new works on continuous basis in each and every village so as to provide guaranteed 100 days work to the HH may not be technically feasible, this might happen if the implementing agency do not have enough land for carrying out work or if the demand of work is very high. Thus, there is a need for locating newer type of works and new type of undertaking works along with capacity building of the beneficiaries. Possibilities of working on private land need to be explored. The experience of learned policy makers, scientist, extension worker should also be included in the policy decision at Gram Sabha level.
4. Timely and adequate technical help should be made available to all the Gram Panchayat to ensure timely starting of the NREGA activities. The vacant post of technicians should be filled, it would be possible to tap potential demand on NREGA work. This also ensures good quality of work done.
5. It is clear from the study that women got more employment as compare to men in the NREGA. Thus, scheme serves as a source of employment for them without which they would be deprived of the opportunity to participate in the work force. There is need to form health centers near the villages particularly for the women as they found to tackle tremendous work pressure due to performance of different duties viz; job in NREGA, different household activities, child care, preparing food for the family, bringing water etc. They should also be provided to pay some incentives for that.
6. It is revealed by the sample respondents that NREGA works were undertaken during agricultural seasons also as per the convenience of the NREGA officials. However, such arrangements have yielded negative effect on the employment of the workers at agricultural works so also on their gross income levels. Thus, it is suggested that work should not be given when the agricultural works is at its peak. The NREGA employment calendar should be evolved so as to

tap the supply of labourers during the agriculture slack season.

7. NREGA has a provision of providing same 100 days of employment to all registered HHs irrespective of their family size. This uniform provision has been argued by many beneficiaries. They have suggested to provide more employment to families with larger family size.
8. The major problem related to the employment generation as the man days generated a number of HHs provided 100 days employment are quite low in almost all the districts of Chhattisgarh. With the sole application of providing employment opportunities to the weaker section of the society, the act has not able to succeed in any of its other provisions. Thus the number of days should be increased to 150 days from present 100 days of employment.
9. As per the NREGA guidelines, the payment of wages should be made within 15 days of work. However, about 60 per cent cases were found in which, the payment was made after one month. Thus, some respondents have suggested for making payment of NREGA wages in time. Some

of them suggested to revise the schedule of rates and to pay higher wages keeping in view the inflationary increase in price level.

10. The rural labours marked have been influenced by the massive employment in NREGA in Chhattisgarh and had a decisive impact on agriculture which needs to be studied in depth to bring out the labour availability and implication on cost of cultivation.
11. The people's participation and awareness is the key to the better performance of the NREGS. Thus, there is a need to take enough steps to increase the awareness level in the rural area.
12. Looking to the durability of pucca works, more focus should be given on *pucca* works than the *kuccha*.
13. The steps should be taken to increase the involvement of line departments at the desires level to check the delays and discrepancies in the measurement of the work. A majority of respondents have suggested that better monitoring and measurement of NREGA works can help in making NREGA more effective.

D. Commodity Reviews

(i) Foodgrains

During the month of January, 2013 the Wholesale Prices of food grains displayed a declining trend. Wholesale Price Index (Base 2004-05=100) of cereals and foodgrains

rose by 0.24 per cent while that of pulses and foodgrains fell by 1.56 per cent and 0.14 per cent over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALe PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of January, 2013	WPI for the Month of December, 2013	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	202.0	202.7	170.6	-0.35	18.41
Wheat	1.116	205.4	205.3	175.2	0.05	17.24
Jowar	0.096	231.9	229.9	200.9	0.87	15.43
Bajra	0.115	256.0	246.4	177.2	3.90	44.47
Maize	0.217	248.1	241.1	174.7	2.90	42.01
Barley	0.017	213.7	212.7	179.3	0.47	19.19
Ragi	0.019	317.1	320.7	172.9	-1.12	83.40
Cereals	3.373	209.5	209.0	177.4	0.24	18.09
Pulses	0.717	246.4	250.3	189.9	-1.56	29.75
Foodgrains	4.09	215.9	216.2	183.3	-0.14	17.79

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 January, 2013.

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

Procurement of Rice

6839 thousand tonnes of Rice (including paddy converted into rice) was procured during January, 2013, as against 5967 thousand tonnes of Rice (including paddy converted into rice) procured during January 2012. The total

procurement of Rice in the current marketing season i.e 2012-2013, upto 31-01-2013 stood at 23004 thousand tonnes, as against 21529 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 31-01-2013)		Corresponding Period of last Year 2011-12		Marketing Year (October-September)			
	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	2752	11.96	2945	13.68	7542	21.52	9609	28.10
Chhatisgarh	3992	17.35	3377	15.69	4115	11.74	3746	10.95
Haryana	2590	11.26	1994	9.26	2007	5.73	1687	4.93
Maharashtra	131	0.57	99	0.46	178	0.51	308	0.90
Punjab	8557	37.20	7731	35.91	7731	22.06	8635	25.25
Tamil Nadu	9	0.04	455	2.11	1596	4.55	1543	4.51
Uttar Pradesh	1315	5.72	2085	9.68	3357	9.58	2554	7.47
Uttarakhand	254	1.10	204	0.95	378	1.08	422	1.23
Others	3404	14.80	2639	12.26	8187	23.22	5694	16.65
Total	23004	100.00	21529	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)			
	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.

Commercial Crops

OILSEEDS AND EDIBLE OILS :

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 204.9 in January, 2013 showing increase of 0.4 per cent and 25.4 per cent over the previous month and previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Gingelly seed (9.9 per cent), Copra (2.8 per cent), Cottonseed (1.5 per cent) and Groundnut seed (0.6 per cent) increased over the previous month. However, the WPI of, Sunflower (2.9 per cent), Soyabean (1.6 per cent) and Rape & Mustard (1.6 per cent) decreased over the previous month. The WPI of Nigerseed and Safflower seed remained unchanged over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 149.3 in January, 2013 showing a fall of 0.2 per cent over the previous month. However, it increased by 7.3 per cent over the previous year. The WPI of Groundnut Oil (0.7 per cent), Sunflower Oil (0.0 per cent), Gingelly Oil (1.9 per cent) and Copra oil (0.1 per cent) and Soyabean Oil (0.2 per cent) increased over the previous month. However, the WPI of Cottonseed Oil (1.0 per cent) and Mustard Oil (0.3 per cent) decreased over the previous month. The WPI of Sunflower oil remained unchanged over the previous month.

FRUITS AND VEGETABLE:

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 187.6 in January, 2013 showing increase of 3.6 per cent and 16.7 per cent over the previous month and previous year.

Potato:

The Wholesale Price Index (WPI) of Potato stood at 177.1 in January, 2013 showing increase of 1.1 per cent and 79.1 per cent over the previous month and previous year.

ONION:

The Wholesale Price Index (WPI) of Onion stood 319.4 in January, 2013 showing an increase of 2.6 per cent and 111.5 per cent over the previous month and over the previous year.

CONDIMENTS AND SPICES:

The Wholesale Price Index (WPI) of Condiments and Spices (Group) stood at 217.3 in January, 2013 showing an increase of 3.5 per cent over the previous month. However, it decreased by 3.9 per cent over the previous year. The WPI of Black Pepper, Chillies (Dry) and Turmeric increased by 1.0 per cent, 3.1 per cent and 26 per cent, over the previous month.

RAW COTTON:

The Wholesale Price Index (WPI) of Raw Cotton stood at 199.7 in January, 2013 showing a fall of 0.5 per cent and 1.5 per cent over the previous month and over the previous year.

RAW JUTE:

The Wholesale Price Index (WPI) of Raw Jute stood at 242.6 in January, 2013 showing an increase of 1.5 per cent and 17.8 per cent over the previous month and over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF JANUARY, 2013

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over	
	Jan., 2013	Dec., 2012	Jan., 2012	Month	Year
<i>Oil Seeds</i>	204.9	204.0	163.4	0.4	25.4
Groundnut Seed	255.1	253.7	208.4	0.6	22.4
Rape & Mustard Seed	219.1	222.6	164.6	-1.6	33.1
Cotton Seed	167.7	165.3	140.2	1.5	19.6
Copra (Coconut)	98.1	95.4	105.1	2.8	-6.7
Gingelly Seed (Sesamum)	370.8	337.4	220.2	9.9	68.4
Niger Seed	182.4	182.4	177.1	0.0	3.0
Safflower (Kardi Seed)	150.4	150.4	130.9	0.0	14.9
Sunflower	192.5	198.2	160.4	-2.9	20.0
Soyabean	199.7	203.0	148.8	-1.6	34.2
<i>Edible Oils</i>	149.3	149.6	139.2	-0.2	7.3
Groundnut Oil	198.9	197.6	169.6	0.7	17.3
Cotton Seed Oil	182.9	184.7	150.6	-1.0	21.4
Mustard & Rapeseed Oil	155.4	155.8	145.5	-0.3	6.8
Soyabean Oil	162.3	161.9	150.3	0.2	8.0
Copra Oil	114.9	114.8	120.6	0.1	-4.7
Sunflower Oil	139.4	139.4	134.9	0.0	3.3
Gingelly Oil	188.8	185.3	151.9	1.9	24.3
<i>Fruits and Vegetables</i>	187.6	181.0	160.8	3.6	16.7
Potato	177.1	175.1	98.9	1.1	79.1
Onion	319.4	311.2	151.0	2.6	111.5
<i>Condiments and Spices</i>	217.3	209.9	226.1	3.5	-3.9
Black Pepper	528.0	522.9	425.0	1.0	24.2
Chillies(Dry)	242.2	234.9	266.2	3.1	-9.0
Turmeric	176.3	171.8	161.7	2.6	9.0
Raw Cotton	199.7	200.7	202.8	-0.5	-1.5
Raw Jute	242.6	239.0	205.9	1.5	17.8

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	Wo-man	Non Adult	Man	Wo-man	Non Adult	Man	Wo-man	Non Adult	Car-penter	Black-smith	Cob-ler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
<i>Andhra Pradesh</i>															
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
<i>Karnataka</i>															
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
<i>Maharashtra</i>															
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
<i>Jharkhand</i>															
Ranchi	Gaintalood	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		
											Car-penter	Black-smith	Cob-ler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<i>Assam</i>													
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
<i>Bihar</i>													
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
<i>Chhattisgarh</i>													
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
<i>Gujarat</i>													
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
<i>Haryana</i>													
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		
											Car-penter	Blacksmith	Cob-ler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<i>Himachal Pradesh</i>													
Mandi	Mandi	Nov., to Dec. 2010	M W	8 8	300.00 NA	110.00 110.00	110.00 110.00	110.00 110.00	110.00 110.00	110.00 110.00	200.00 NA	200.00 NA	NA NA
<i>Kerala</i>													
Kozhikode	Koduvally	Sep., 2012	M W	4 to 8 4 to 8	820.00 NA	450.00 NA	NA 350.00	450.00 350.00	635.00 400.00	NA NA	550.00 NA	NA NA	NA NA
Palakkad	Elappally	Sep., 2012	M W	4 to 8 4 to 8	400.00 NA	300.00 NA	NA 200.00	350.00 250.00	375.00 200.00	NA NA	450.00 NA	NA NA	NA NA
<i>Madhya Pradesh</i>													
Hoshangabad	Sangarkhera	Sep., 2012	M W	8 8	150.00 NA	100.00 100.00	100.00 100.00	160.00 160.00	100.00 100.00	100.00 100.00	300.00 NA	300.00 NA	250.00 NA
Satna	Kotar	Sep., 2012	M W	8 8	150.00 NA	150.00 150.00	150.00 150.00	NA NA	150.00 150.00	150.00 150.00	250.00 NA	250.00 NA	250.00 NA
Shyampur Kala	Vijaypur	Sep., 2012	M W	8 8	150.00 NA	150.00 150.00	NA NA	NA NA	200.00 200.00	50.00 50.00	200.00 NA	200.00 NA	200.00 NA
<i>Orissa</i>													
Bhadrak	Chandbali	Sep., 2012	M W	8 8	180.00 NA	NA NA	200.00 150.00	150.00 120.00	200.00 150.00	50.00 40.00	250.00 NA	200.00 NA	130.00 NA
Ganjam	Aska	Sep., 2012	M W	8 8	200.00 NA	200.00 NA	200.00 100.00	NA NA	200.00 120.00	200.00 100.00	350.00 NA	300.00 NA	200.00 NA
<i>Punjab</i>													
Ludhiana	Pakhowal	June, 2008	M W	8 8	NA NA	NA NA	90.00 NA	95.00 NA	NA NA	99.44 NA	NA NA	NA NA	NA NA
<i>Rajasthan</i>													
Barmer	Vishala	July, 2012	M W	8 8					—NA— —NA—				
Jalore	Panwa	July, 2012	M W	8 8	NA NA	NA NA	NA NA	NA NA	NA NA	50.00 NA	100.00 NA	50.00 NA	NA NA
<i>Tamil Nadu</i>													
Thanjavur	Pulvannatham	Oct., 2012	M M	6 5					—NA—				
Tirunelveli	Malayakulam (Kurvikulam)	Oct., 2012	M W	8 8					—NA—				
<i>Tripura</i>													
Agartala	Govt. Agri. Farm		M W	8 8					—NA—				
<i>Uttar Pradesh*</i>													
Meerut	Ganeshpur	Aug., 2012	M W	8 8	200.00 NA	200.00 172.00	200.00 172.00	200.00 173.00	200.00 172.00	NA NA	309.00 NA	NA NA	NA NA
Auraiya#	Auraiya	Aug., 2012	M W	8 8	120.00 NA	120.00 NA	120.00 120.00	132.9 132.9	120.00 120.00	NA NA	257.1 NA	NA NA	NA NA
Chandauli	Chandauli	July, 2012	M W	8 8	NA NA	NA NA	NA NA	125.00 125.00	125.00 125.00	NA NA	236.00 NA	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, Agricultural Wages Division.

C. CROP PRODUCTION

2. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING MARCH, 2013

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

(K)—Kharif

(R)—Rabi

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