AGRICULTURAL SITUATION IN INDIA

MARCH, 2014

PUBLICATION DIVISION
DIRECTORATE OF ECONOMICS AND STATISTICS
DEPARTMENT OF AGRICULTURE AND CO-OPERATION
MINISTRY OF AGRICULTURE
GOVERNMENT OF INDIA

Publication Division

DIRECTORATE OF ECONOMICS AND STATISTICS
DEPARTMENT OF AGRICULTURE AND CO-OPERATION
MINISTRY OF AGRICULTURE
Government of India
C-1, Hutments, Dalhousie Road,
New Delhi-110001
Phone : 23012669

Subscription

	Inland	Foreign
Single Copy	**: ₹ 40.00**	**£ 2.9 or $ 4.5**
Annual	**: ₹ 400.00**	**£ 29 or $ 45**

Available from :

The Controller of Publication,
Ministry of Urban Development,
Deptt. of Publications,
Publications Complex (Behind Old Secretariat),
Civil Lines, Delhi-110 054.
Phone : 23817823, 23817640, 23819689

Agricultural Situation in India

VOL. LXX **MARCH, 2014** **No. 12**

Contents

Officials of the Publication Division, Directorate of Economics and Statistics, Department of Agriculture and Co-operation, New Delhi associated in preparation of this publication :

D. K. Gaur—*Technical Asstt.*

S. K. Kaushal—*Technical Asstt. (Priting)*

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

NOTE TO CONTRIBUTORS

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

Although authors are solely responsible for the factual accuracy and the opinion expressed in their articles, the Editorial Board of the Journal, reserves the right to edit, amend and delete any portion of the article with a view to making it more presentable or to reject any article, if not found suitable. Articles which are not found suitable will not be returned unless accompanied by a self-addressed and stamped envelope. No correspondence will be entertained on the articles rejected by the Editorial Board.

An honorarium of ₹ 2000 per article of atleast 2000 words for the regular issue and ₹ 2500 per article of atleast 2500 words for the Special/ Annual issue is paid by the Directorate of Economics & Statistics to the authors of the articles accepted for the Journal.

STATISTICAL TABLES

Abbreviations used

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

ISSN 0002—167
Regn. No. : 840

P. Agri. 21-3-2014
600

LIST OF PUBLICATIONS

Journal

Agricultural Situation in India (Monthly)

Periodicals

Agricultural Prices in India

Agricultural Wages in India

Cost of Cultivation of Principal Crops

District-wise Area and Production of Principal Crops in India

Year Book of Agro-Economic Research Studies

Land Use Statistics at a Glance

Farm Harvest Prices of Principal Crops in India

Copies are available from : The Controller of Publications, Civil Lines, Delhi-110054. (Phone 23817640)

PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, RING ROAD, MAYAPURI, NEW DELHI-110064
AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110054—2014.

GENERAL SURVEY

Agriculture

Rainfall

With respect to rainfall situation in India, the year is categorized into four seasons : winter season (January-February), pre monsoon (March-May), south west monsoon (June- September) and post monsoon (October-December). South west monsoon accounts for more than 75 per cent of annual rainfall. The actual rainfall received during the period 01.03.2014 - 16.04.2014 has been 46.9 mm as against the normal at 49.0 mm. As per the Indian Meteorological Department's stand on El Nino, as of 17.04.2014, there is no immediate acknowledgement of EI Nino phenomenon.

All India Production of Foodgrains

As per the 2nd advance estimates released by Ministry of Agriculture on 14.02.2014, production of foodgrains during 2013-14 is estimated at 263.20 million tonnes compared to 257.13 million tonnes in 2012-13.

TABLE 1 : PRODUCTION OF MAJOR AGRICULTURAL CROPS (in Million Tonnes)

Crop	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14 (2nd advance estimates)
Rice	99.18	89.09	95.98	105.30	105.24	106.19
Wheat	80.68	80.80	86.87	94.88	93.51	95.60
Total Pulses	14.57	14.66	18.24	17.09	18.34	19.77
Total Foodgrains	234.47	218.11	244.49	259.29	257.13	263.20
Total Oilseeds	27.72	24.88	32.48	29.79	30.94	32.98
Sugarcane	285.03	292.30	342.38	361.04	341.20	345.92

Procurement

Procurement of rice as on 17.04.2014 was 26.95 million tonnes during 2013-14 and procurement of wheat as on 17.04.2014 was 3.99 million tonnes during 2014-15.

TABLE 2 : PROCUREMENT (in Million Tonnes)

	2010-11	2011-12	2012-13	2013-14	2014-15
Rice	34.20	35.04	34.04	26.95#	
Wheat	22.51	28.34	38.15	25.09	3.99*
Total	**56.71**	**63.38**	**72.19**	**51.46**	

Position as on 17.4.2014

* Position as on 17.4.2014.

Off-take

Off-take of rice during the month of March, 2014 was 21.32 lakh tonnes and off-take of wheat was17.18 1akh tonnes under TPDS (including NFSA).

Stocks

Stocks of food-grains (rice and wheat) held by FCI as on April 1,2014 were 48.39 million tonnes, which is lower by 18.9 per cent compared to the level of 59.68.million tonnes as on April 1,2013.

TABLE 3: Off-take and stocks of food grains (Million Tonnes)

	Off-take			Stocks	
	2011-12	2012-13	2013-14 (Up to Jan 1, 2014)	April 1, 2013	April 1, 2014#
Rice	32.12	32.64	24.21	35.47	20.28
Unmilled Paddy in terms of Rice					10.28
Wheat	24.26	33.21	23.79	24.21	17.83
Total	**56.38**	**65.85**	**48.00**	**59.68**	**48.39**

Note: Buffer Norms for Rice and Wheat are 14.20 Million Tonnes and 7.00 Million Tonnes respectively as on 01.04.2014. # Since September, 2013, FCI gives separate figures for rice and unmilled paddy lying with FCI & state agencies in terms of rice.

Economic Growth

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 4.9 per cent in 2013-14 with agriculture, industry and services registering growth rates of 4.6 per cent, 0.7 per cent and 6.9 per cent respectively. The GDP growth rate is placed at 4.4 per cent, 4.8 per cent and 4.7 per cent respectively in the first, second and third quarters of 2013-14.

TABLE 4— GROWTH OF GDP AT FACTOR COST BY ECONOMIC ACTIVITY

(at 2004-05 Prices)

Sector	Growth			Percentage Share in GDP		
	2011-12	2012-13 (1R)	2013-14 (AE)	2011-12	2012-13 (1R)	2013-14 (AE)
1. Agriculture, forestry & fishing	**5.0**	**1.4**	**4.6**	**14.6**	**14.4**	**13.9**
2. Industry	**7.8**	**1.0**	**0.7**	**27.9**	**28.2**	**27.3**
a Mining & quarrying	0.1	-2.2	-1.9	2.2	2.1	2.0
b Manufacturing	7.4	1.1	-0.2	16.2	16.3	15.8
c Electricity, gas & water supply	8.4	2.3	6.0	1.9	1.9	1.9
d Construction	10.8	1.1	1.7	7.6	7.9	7.7
3. Services	**6.6**	**7.0**	**6.9**	**57.5**	**57.4**	**58.8**
a Trade, hotels, transport & communication	4.3	5.1	3.5	27.3	26.7	26.9
b Financing, insurance, real estate & business services	11.3	10.9	11.2	17.3	18.0	19.1
c Community, social & personal services	4.9	5.3	7.4	12.9	12.7	12.8
4. GDP at factor cost	**6.7**	**4.5**	**4.9**	**100**	**100**	**100**

1R: 1st Revised Estimates; AE: Advance Estimates. Saurce: CSO.

TABLE 5— QUARTERLY GROWTH ESTIMATE OF GDP (YEAR-ON YEAR IN PERCENT)

Sector	2011-12				2012-13				2013-14		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1. Agriculture, forestry & fishing	**6.5**	**4.0**	**5.9**	**3.4**	**1.8**	**1.8**	**0.8**	**1.6**	**2.7**	**4.6**	**3.6**
2. Industry	**10.1**	**8.2**	**6.9**	**6.3**	**0.3**	**-0.4**	**1.7**	**2.1**	**0.2**	**2.3**	**-0.7**
a Mining & Quarrying	0.3	-4.6	-1.9	5.8	-1.1	-0.1	-2.0	-4.8	-2.8	-0.4	-1.6
b Manufacturing	12.4	7.8	5.3	4.7	-1.1	0.0	2.5	3.0	-1.2	1.0	-1.9
c Electricity, gas & water supply	8.5	10.3	9.6	5.4	4.2	1.3	2.6	0.9	3.7	7.7	5.0
d Construction	8.9	11.9	12.2	10.2	2.8	-1.9	1.0	2.4	2.8	4.3	0.6
3 Services	**6.7**	**7.0**	**6.5**	**6.1**	**7.2**	**7.6**	**6.9**	**6.3**	**6.7**	**6.0**	**7.6**
a Trade, hotels, transport & communication	5.5	4.7	4.0	3.3	4.0	5.6	5.9	4.8	3.9	4.0	4.3
b Financing, insurance, real estate & business services	11.3	12.0	11.1	11.8	11.7	10.6	10.2	11.2	8.9	10.0	12.5
c Community, social & personal services	2.4	5.4	5.7	5.7	7.6	7.4	4.0	2.8	9.4	4.2	7.0
4 GDP at factor cost	**7.6**	**7.0**	**6.5**	**5.8**	**4.5**	**4.6**	**4.4**	**4.4**	**4.4**	**4.8**	**4.7**

Source: CSO.

NOTE TO CONTRIBUTORS

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

Although authors are solely responsible for the factual accuracy and the opinion expressed in their articles, the Editorial Board of the Journal, reserves the right to edit, amend and delete any portion of the article with a view to making it more presentable or to reject any article, if not found suitable. Articles which are not found suitable will not be returned unless accompanied by a self-addressed and stamped envelope. No correspondence will be entertained on the articles rejected by the Editorial Board.

An honorarium of Rs. 2000 per article of atleast 2000 words for the regular issue and Rs. 2500 per article of atleast 2500 words for the Special/Annual issue is paid by the Directorate of Economics & Statistics to the authors of the articles accepted for the Journal.

ARTICLES

Agricultural Development in Bihar : Some Empirical Evidences

Dr. R. K. P. Singh*, Dr. K. M. Singh** and Dr. Abhay Kumar*

Introduction :

Bihar is the third largest state with respect to population and seventh in terms of area in India. Agriculture is still an important sector in Bihar since it contributes about 20 per cent to State Gross Domestic Product and provides employment to about 70 per cent of working force in rural area. The state is characterized by small land holders in the country. More than 90 per cent of farm households belong to Marginal farm category (less than 1 ha land) but own about 44 per cent of cultivated land in Bihar. Agriculture sector experienced a drastic change with respect to public investment, use of inputs, extension activities and crop-milk-fish production. State Government assigned priority to the sector through providing fund to this sector by increasing annual average budget allocation from less than Rs 200 crore during 2001-05 to more than Rs. 2,000 crore during 2007-13. In Bihar, the State Agricultural GDP was almost stagnant at Rs. 32.5 billion during 1981-94 and its growth was negative in Ninth Five Year Plan (-1.4%) which turned positive in Tenth Five Year Plan (0.91%). During Eleventh Five year Plan, State AgGDP grew at the annual growth rate of 5.9 per cent. However, State Gross Domestic Product recorded growth of 12 per cent during the period which was higher than corresponding growth achieved at national level. State agriculture sector also achieved spectacular growth of 31 per cent in the year 2006-07. But the state failed to maintain higher agriculture growth due to flood in 2007 and 2008, and drought in 2009 and 2010. Despite severe drought in 2010, the state recorded the food grain production of 125 lakh tonnes and milk production of 63 lakh tonnes, indicating sustainability in agricultural production in Bihar.

Per hectare Net State Agril. Domestic Product (at current rice) increased from Rs. 32672 in 2001-05 to Rs. 72942 in 2007-12, which worked out to be an annual increase 9.0 per cent during the period, indicating a substantial increase in productivity of crops and animals in the state. It has been made possible due to an increase in area under modern varieties of crops and high value crops and increase in high yielding dairy animals during the period. State Government prepared the first Road Map in 2008 and the second Road Map in 2012 for development of agriculture and allied sectors and tried to implement several projects/programmes for faster development of these sectors in the state. It is a coincidence that the Union Government has also launched several Mega projects namely; National Horticulture Mission, Rastriya Krishi Vikas Yojna and National Food Security Mission for agricultural development during last five years.

Climate of Bihar is favourable for production of various field crops and agriculture of the state is still dependent on behaviour of monsoon and distribution of rainfall. During the last 10 years, food grain production was the highest (178 lakh tonnes) in 2011 12 when state received almost normal rainfall (1133 mm). The state has achieved almost sustainability in agricultural production because the food grains of about 108 lakh tonnes was produced in drought year of 2010-11 when annual rainfall declined to 678 mm. Whereas the state had severe drought in 1966 when 866 mm of monsoon rainfall was received and food grain production was declined by 50 per cent of the normal production level. An increase in food grain production in the state in drought year 2010- 11 was made possible due to increase in number of private tube wells installed by farmers. However, the State Government also made some cosmetic efforts for maintaining agricultural production.

* Former Adviser, State Farmers Commission, Bihar, 101, Shivam Heritage, Ashiava Road Jagriti Nagar, PO - BVC, Patna - 800014

** Principal Scientist & Head and † - Principal Scientist, Division of Socio-economics and Extension ICAR Research Complex for Eastern Region, ICAR Parisar, PO-BVC, Patna-800014 (Bihar)

Changes in Land Use

Agricultural land is becoming a scarce commodity and shrinking land is a challenge for agricultural development in Bihar. Data pertaining to the land use pattern in Bihar revealed that the net sown area is declining and areas under current fallow and land under non- agricultural uses have increased over the last 10 years. An annual decline of about 15 thousand hectares in net area sown has been observed during last 10 years (Table 1).

TABLE 1: AGRICULTURAL LAND USE IN BIHAR DURING LAST 10 YEARS

(Area in Lakh hectares)

Particulars	TE 2001-02	TE 2006-07	TE 2011- 12
Geographical Area	93.60	93.60	93.60
Land put to non-agril. use	16.40	16.53	16.89
Net sown area	56.63	56.18	55.16
Current fallow	5.76	6.03	6.94

Source : Economic Survey (various issues) Finance Department, Government of Bihar .

Decline in net area sown is mainly due to unabated massive conversion of agricultural land for building houses and construction of infrastructure. Current fallow increased might be due to erratic rainfall, peak time scarcity of labour, unreliable and costly irrigation and tiny unviable farm holdings in Bihar. Policy makers are not realizing the challenge posed to agriculture due to decline in net area sown and increasing fallow land in the state which warrants their immediate attention.

Bihar Agriculture is characterized by small and fragmented land holdings. There ace about 162 lakh operational holdings possessing about 62 lakh hectares land with average farm size of only 0.39 hectare, down from 0.58 hectare in 2001-02. The reduction in farm-size has. been larger in the case of medium and large farmers than in the case of marginal farmers whereas average size of land holdings of small farmers increased from l.21 hectares 2001-02 to 1.25 hectares in 2010- 11 (Table 2).Around 91 per cent of the farmers have land holdings less than 1 ha and they cultivate nearly 57per cent of the operational land. On the other hand, only 0.02 of the farmers have operational land holdings above 4 hectares and account for 0.7 per cent of the operated land. Marginal farm holdings constitute more than 90 per cent of total farm households and their average size of land holdings declined from 0.30 hectare in 2001-02 to 0.25 hectare in 20 10- 11. It is one of the main hindrance in faster adoption of new farm technology due to their small and fragmented holdings, low level of liquidity and low risk bearing capability.

Marginal farmers have very limited access to agricultural development programmes, particularly various projects of National Horticulture Mission (Kian Ayog, 2009). Agricultural development programmes must be designed considering the large number of marginal farmers holdings so that they are able to get benefits of programs on their tiny land holdings.

Agricultural production scenario :

Analysis of food grain production during last 10 years revealed that average area under food grain declined from 72 lakh hectares at triennium ending 2000-01 to about 68 lakh hectares at triennium ending 2005-06 and further declined to 65 lakh hectares at triennium ending 2011-12, but their share in gross cropped area marginally declined from 90 per cent to 89 per cent to respective gross cropped area during the period.

TABLE 2 : DISTRIBUTION OF LANDHOLDINGS AND THEIR RESPECTIVE OPERATED AREA IN BIHAR DURING LAST 10 YEARS

Farm	2001-02		2005-06		2010-11	
Categories	% of total operational holdings	% of total operated area	% of total operational holdings	% of total operated area	% of total operated holdings	% of total operated area
Marginal (<1ha)	84.4	43.1 (0.30)	89.7	53.0 (0.25)	91.0	57.2 (0.25)
Small (1-2 ha)	9.2	19.2 (l.21)	6.7	19.6 (l.21)	5.9	19.0 (l.25)
Medium (2-4 ha)	6.4	35.6 (3.19)	3.6	26.5 (2.99)	3.1	23.1 (3.00)
Large (4 ha. and above)	0.1	2.1 (15.56)	0.03	0.9 (14.0)	0.02	0.7 (15.0)
Total holding in lakh/Area in lakh hect.	116	67 (0.58)	146	62 (0.42)	162	64 (0.39)

Note—Figures in parentheses indicate average size of land holdings in respective category of households .

Despite decline in area under food grain and unfavourable weather during last five years (almost 4 rainfall deficit years) food grain production crossed 14 million tonnes mark which never achieved in twentieth century. There was spectacular increase in food grain productivity from 1697 kgs per hectare in 2000-01 to 2102 Kgs per hectare during 2011-12. Production of rice, the main food grain crop which is grown in about two-third area of net sown area in kharif season, did not show any increase in productivity up to 2007- 08 but showed increasing trend during last four years and crossed 2400 kg per hectare in 2011-12 againt corresponding national average of 2372 kg .. Production of rice also crossed 8 million tonnes in 2011-12 whereas production of about 55 lakh tonnes of rice was achieved in 2003-04. However, rice production is still depends on weather in Bihar. Rice cannot be grown successfully in scanty rainfall due to unreliable and costly irrigation sources. About 60 per cent rice is grown in irrigated situation but the majority of farmers provide survival irrigation to rice crop because diesel operated tube well is the main source of irrigation which is costly, particularly for marginal farmers who purchase water at the rate of Rs. 70-100 per hour.

Wheat is the second important crop in Bihar which production was stagnant at 40 lakh tonnes up to Eleventh Five Year Plan but its annual production increased to 65 lakh tonnes in 2011-12. Average per hectare wheat productivity showed increasing trend from about 20 quintals/per hectare during 2001-06 to more than 24 quintals during last five years (2007-12). Per hectare maize productivity was also stagnant at 24 quintals during 2001-05 which also increased to 27 quintals in 2008-09 and further increased to 37 quintals in 2011-12. However, winter maize productivity of 80 quintals per hectare is common in Begusarai and Khagaria districts of Bihar. The high yield of winter maize is mainly due to favourable ecology for production of maize in winter season along with farmers' efforts in production of this crop in Bihar. State government made a little effort to boost winter maize production because farmers depend on non government sector for not only hybrid maize seeds but also for marketing, fertilizer and pesticide. Hence, there is an ample scope for increasing production of winter maize in Bihar. Increase in production and productivity of wheat and maize has been mainly contributed by adoption of modern production technology of these crops by farmers.

There has been significant increase in per hectare productivity of principal crops during last five years.

Among major states, Bihar was placed at twelfth position in rice productivity, seventh position in wheat and sixth position in maize productivity in 2000- 01. Despite increase in Productivity of these crops Bihar's rank in realizing per hectare yield remained almost the same.

Despite unfavourable weather in Bihar, there was spectacular increase in agricultural production which was made possible due to result of a combination of various factors like; increased farmer's access to quality seeds, increased use of inorganic and organic fertilizers, adoption of improved water management practices, massive extension efforts through centrally sponsored Mega agricultural development projects, and above all, ingenuity and industry of farmers. Among all the factors seed is main determinant of agricultural production on which facilitates the performance and efficacy of other inputs. Quality seed at affordable price is pre-requisite to increase crop productivity.

Seed is known for increasing agricultural production, good quality seeds alone can increase 30 per cent of agricultural production. In Bihar, high yielding varieties cover 65 per cent area under rice, 95 per cent area under wheat and 88 per cent area under maize but farmers are using poor quality seeds because most of these seeds are either home grown or spurious purchased from local market.

Seed replacement rate has a strong positive correlation with production and productivity of crops. Seed replacement rates of principal crops showed increasing trend in Bihar during lastfive years. Paddy seed replacement rare increased from 7 per cent in 2001-02 to 12. per cent in 2006-07 and further increased to 38 per cent in 2011-12(Table 3). Wheat seed replacement rate also increased from 29 per cent to 35 per cent and maize seed replacement rate from 29 per cent to 82 per cent during the period. Maize seed replacement rate is now 100 per cent in winter season because all farmers cultivate hybrid maize in winter season and there is adequate supply of maize seeds through private seed companies in Bihar. In 2001-02, seed replacement rate of lentil was only one per cent which increased to 15 per cent in 2011-12. Seed replacement rate of mustard also increased from 29 per cent to 47 per cent during the period.

The spectacular increase in seed replacement rate of principal crops has been due to massive efforts made by state government through various centrally sponsored projects namely; National Food Security Mission (NFSM), Rastriya Krishi Vikas Yojana (RKVY), Integrated Scheme for Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) and Macro mode. In these Mega projects, in Bihar, about 6 thousand quintals of seeds of principal crops were made available to farmers in 2006-07 which increased to more than 6.05 lakh quintals in 2011-12. Besides, about 26.7 thousand quintals of seeds under Chief Minister Veej Vistar Yojana and 940 quintals in Mini kit programme were also distributed to farmers in 2011-12. State agriculture department also revived state farms for seed production. Number of state farms for production seeds increased to 247 in 2011-12 from only 45 in 2006-07. Seeds were produced in more than 6 thousand villages under Veej Gram Yojana in 2011-12. Sone Command Development Authority, State Agricultural Universities, National Seed Corporation, State Farm Corporation and Private seed companies are also active in production and making available seeds of principal crops to farming community in Bihar.

TABLE 3—SEED REPLACEMENT RATES OF PRINCIPALS CROPS IN BIHAR DURING LAST 10 YEARS

(in percent)

Crops	2001-02	2006-07	2011-12
Paddy	7	12	38
Wheat	8	11	35
Maize	29	50	82
Lentil	01	7	15
Mustard/Rapeseeds	29	40	47

Source: 1. Annual Report, Department of Agriculture, Government of Bihar (Various issues)

2. National Seed Plan (2005), Ministry of Agriculture and Cooperation, Government of India

But Bihar is still deficient in seeds of pulses, vegetables and fruit plant saplings. Horticulture sector contributes about 50 per cent to total value of crops .produced in Bihar which is still neglected. But availability of quality seeds of vegetables is stilI much lower in Bihar, adversely affecting vegetable production in the state. Bihar government made a good effort in right direction but proper monitoring of these schemes could have made miracle in increasing agricultural productipn in Bihar.

Irrigation is one of the critical inputs for increasing agricultural production. In Bihar, about 61 per cent gross cropped area is irrigated which is much higher than the corresponding national average (45%) but among major states our irrigation efficiency is the lowest (134). Average gross irrigated area has been stagnated at 48 lakh hectares in Eleventh Five year Plan however there was marginal increase in area through tube wells but canal irrigated area declined during the period. Tube well irrigated area constitutes 70 per cent of total irrigated area but more than 90 per cent of them are private tube well. Despite government efforts more than 90 per cent of public tube wells are abandoned and even newly installed tube wells are not operational. State Government has installed few tube wells and handed over their management to individual (officially to committee) but the most of these tube wells are not functioning well in the interest of farming community and they are practically own by individual and they are chargjng high rate of irrigation from poor farmers who do not own their own tube wells.

Canal irrigation is considered to be a farmers' friendly and reliable source of irrigation. But it is most unreliable source of irrigation in Bihar. Canal system was an inefficient source of irrigation in Bihar which failed to provide irrigation facility to less than 50 per cent of its command area during the year 2009-10. Canal irrigated area declined from 16.66 lakh hectares in 2008-09 to 12.02 lakh hectares in 2009-10, indicating unreliability of canal irrigation system in Bihar. State Government has been making huge expenditure under plan and non plan heads on development and maintenance of irrigation infrastructure. Expenditure in Irrigation is spread over to many uncompleted projects. In addition, existing infrastructure has rapidly deteriorated as operations and maintenance is assigned lower priority. During last five years annual plan expenditure of about Rs. 2500 per hectare of irrigated area was incurred in Bihar but these investment has neither resulted in visible increase in irrigated area nor satisfactory maintenance of irrigation infrastructure in Bihar. However, eleven medium and major irrigation projects for increasing irrigated area was under progress in Eleventh Five Year Plan. About 55 percent of ground water is still to be exploited for irrigation purposes. Hence, there is vast potential for increasing irrigated area in Bihar which will help increasing agricultural production for not only consumption but for raw materials for agro-industry.

Fertilizer is known as an essential input for increasing crop production. A spectacular increase in fertilizer consumption has been observed during green revolution period in the country in general and Bihar in particular. In Bihar per hectare fertilizer (NPK) consumption was only 4 kilograms III early sixties which increased to 19 kilograms in 1975-76 and further increased to about 183 kilograms in 2010-11 but declined to 158 kilograms in 2011-12 due to deficient rainfall (Table 4).

TABLE 4 : PER HECTARE USE OF FERTILIZER (NPK) IN KILOGRAM AND THEIR RATIOS IN BIHAR DURING LAST 10 YEARS

Particulars	TE 2001-02	TE 2006-07	TE 2011-12
Per hect. use of fertilizer (NPK) in kgs)	109	121	158
NPK Ratio--N	12.0	7.6	6.6
P	2.2	1.3	2.1
K	1.0	1.0	1.0

Source: Annual Report, Department of Agriculture, Government of Bihar (Various issues)

Per hectare fertilizer consumption in crop production increased by 60 per cent during last 10 years from about 109 kilograms at triennium ending 2001-02 to 174 Kilograms at triennium ending 2011-12. Farmers are trying to use balanced use of NPK in Bihar and ratio of NPK improved from 12:2.2:1.0 at TE 2001-02 to 6.6:2.1; 1.0 at TE 2011-12.

Deficiency of micronutrients (zinc, boron and sulphur) has been reported from different parts of state but there is no facility where farmers could get their soil tested to know the extent of micro-nutrient deficiency. Government of Bihar made unsuccessful efforts to provide soil test (NPK) facility to farmers but a few farmers could get the report of soil test. Recently, Department of Agriculture started a campaign for popularizing organic farming in the state. State government provided assistance to farmers for construction of 86 thousand vermi compost units and distributed vermi compost for 86 thousand hectares area. About 50 commercial units also provided with financial assistance of Rs 25 lakh each for production of vermin compost. These commercial units are expected to produce three thousand tones vermin compost in a year. These efforts are commendable but more sincere and aggressive efforts are needed to save the soil health in Bihar. In this context it is worth pointing out that the rice production in water logged area of north Bihar was totally chemical free up to mid-eighties. The majority of farmers growing fruits and vegetables for their domestic use do not use fertilizers and chemicals. We should educate these farmers, on priority basis, for organic cultivation of these crops before making efforts for organic farming of food grain crops, which may threaten our food security in short period. It is also a difficult task for farmers to arrange organic/bio-fertilizers for huge area under food grains. Organic certification is another difficult and costly activity, particularly for small and marginal farmers, who constitute more than 96.5 per cent of farm households and own about 72.6 per cent of cultivated area in Bihar (Agri. Census 2005-06). The higher and imbalance use of chemical fertilizers threatened the soil health but soil of the state is still reach in organic carbon (0.5-1.0). However, increasing use of chemical fertilizers accompanied with declining use of manure would likely to have adverse effect on soil health.

During last 20 years there has been drastic change in use of inputs in production of inputs in production of principal crops (paddy and wheat) in Bihar. Per hectare use of animal labour in paddy cultivation declined from 227 pair hours in 1981-82 to 34 pair hours in 2008-09 whereas the corresponding decline was more in case of wheat cultivation that is; 305 to 32 pair hours (Table 5).

TABLE 5 : CHANGES IN INPUT USE PATTERN IN PRODUCTION OF PRINCIPAL CROPS IN BIHAR DURING 1981-82 TO 2008-09

(per hectare)

Particulars	Paddy		Wheat	
	1981-82	2008-09	1981-82	2008-09
Seeds (in kg)	48.8	52.3	97.0	115.0
Fertilizer-NPK (in kg)	5.5	81.0	20.0	128.0
Manure (qts)	4.3	2.0	6.0	0.1
Human labour (in hours)	778.0	767.0	759.0	439.0
Animal labour (pair hours)	227.0	34.0	305.0	32.0
Machine (expenses in Rs.)	3.0	1334.0	7.0	2914.0

Source: 1. Cost of Cultivation of Principal Crops m India, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi-1996

2. Reports of the Commission for Agricultural Costs and Prices for the Crops Sown during 2010-11 Season, Commission for Agricultural Costs and Prices, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi-2011).

Use of tractor, thresher and other agricultural machineries became more common in crop production and per hectare expenses on machineries increased from Rs 3.0 to Rs l334.0 in paddy cultivation and Rs 7.0 to Rs 2914.0 in wheat production during 1981-81 to 2008-09. There was more increase of fertilizer use in cultivation of wheat than paddy but decline in use of organic manure was more in wheat cultivation (6.0 to 0.1 quintals) than paddy cultivation (4.3 to 2 quintals) during 1981-81 to 2008-09. Decline in per hectare use of human labour was evident in wheat .. cultivation due to increasing use of machines in ploughing, threshing and irrigation. in ·production of wheat in Bihar during last 10 years. Hence, it may be said that there has been change from animal-manual based cultivation to machined cultivation of principal crops during last three decades in Bihar.

Agricultural Development Programmes

There are 14 major agricultural development programmes managed and monitored by Department of Agriculture, Government of Bihar which include 5 state sponsored, 4 centre sponsored and 4 Mission Mode projects. An attempt has been made here to examine the performance of three important agricultural development programmes i.e.; National Horticulture Mission (NHM), Rastriya Krishi Vikas Yojana (RKVY) and National Food Security Mission (NFSM).

National Horticulture Mission (NHM): It was launched in Bihar in the year 2005- 06 with the objective of bringing a holistic and integrated development in the horticulture sector. It is based on cluster approach, focused to development of selected crops, improvement in production and productivity, adoption of good agricultural practices aimed at promotion of export and thrust on post- harvest management. During first four years of NHM implementation, less than 40 per cent of fund allocated to this programme could be utilized but pace of implementation of various components of NHM was accelerated in 2010-11 when 57 per cent of allocated fund was' utilized for implementation of the project. In 2011-12, The allocation of fund declined by 50 per cent but about 64 per cent fund was utilized for development of horticulture sector in the state.

Among various components of NHM, promotion of export and post harvest management have not been taken up seriously in Bihar, which are very important for increasing income of farmers. Mango constitutes about 50 per cent of total fruit area in Bihar and it is one of the important crops of NHM programme. Area under Mango increased by 4 thousand hectares during 2005-09 and only 3 thousand hectares during last three years (2009-12). Department of Horticulture made effort in implementation of NHM but state has lagged much behind in executing various projects of NHM, mainly due to inappropriate design of the project for more than 90 per cent farm households along with poor monitoring of the scheme.

National Food Security Mission (NFSM) was launched in Bihar in the year 2007- 08 with objectives to increase productivities of rice, wheat and pulses along with to maintain/increase the fertility of soil. This programme has made some dent in rural area by distributing seeds and fertilizers but a large number of remote villages and poor farmers do not have access to this programme. Department of Agriculture could make much higher expenditure (86% of allocated fund) in 2009-10 but it has reduced to 59 per cent in 2010-11 and 35 per cent in 2011-12. Paddy seeds distributed during kharif 2011 could not be utilized properly by the majority of farmers, due to their poor knowledge about the seeds or their less confidence in new technology (seed).

Rastriya Krishi Vikas Yojna (RKVY): The project was launched In 2007-08 to increase investment in agriculture and allied sectors, reduce yield gap and address the agriculture and allied sectors in an integrated manner. In RKVY, agriculture mechanization is the major component which accounts for 85 per cent of total outlay of the project but only one-third outlay of agriculture mechanization could be utilized in 2010-11 and performance remained commendable in 2011-12 also but project for providing laser leveler and Rota vector could not be implemented satisfactorily due small size of land holding in Bihar. The performance of other components of the RKVY has been poor than the agriculture mechanization since inception of the project.

In all these Mega Projects, small and marginal farmers are least benefited due to their small size of land holdings, low socio-economic status and poor access to officials of agriculture department

Performance of Allied Sector

Livestock sector contributes about 40 per cent to the State Gross Agricultural Domestic Product of Bihar and

supports the livelihoods and food security of about two-third of rural households. This is one of the fastest growing sub-sectors of the agricultural economy in the state and recorded about 4.27%, 6.0 % and 3.0 percent annual growth in milk, meat and fish production, respectively during the Eleventh Five Year Plan. If developed appropriately, livestock sector has the potential to significantly enhance the rural economy. Despite the higher growth and substantial contribution to State GDP, Bihar is still not self-sufficient in milk, meat, eggs and fish production. These sectors have the capacity to provide opportunities for livelihood to people in their present location and situation. Bihar has abundant water resources such as ponds and tanks covering approximately 65000 hectares and major flowing rivers (around 2700 kms in length) which are fertile breeding grounds for pisci-culture. North Bihar also has capture fisheries resources like, chours and ox-bow lakes. Converting these capture fisheries to culture fisheries could make them important sources of income and employment for fishermen communities, apart from being an excellent source of cheap protein for people. Total fish production in the State is about 3.44 lakh tonnes, however, annual consumption of fish within the State is about 5.0 lakh tonnes. The underutilization of aquaculture resources, unscientific management of water bodies and lack of entrepreneurship are some of the most obvious reasons for the gap between demand for and supply of fish in Bihar.

Eleventh Plan envisions promotion of livestock sector to enable Bihar to become self sufficient in related products. As major inputs for agro processing, dairy and fisheries produce can become an important source for value addition within the state itself, which in turn opens up income and employment opportunities. An effort has been made to examine the progress made in various component of livestock sector in the state.

The milk production target in Bihar has almost been achieved by the end of Eleventh Plan but there has not been any visible sincere efforts made by state government, except Immunization programme which could not reach to remote villages. The programme of establishing Fodder Block Unit is still in planning stage .However, the state faced an embracing situation in supply of fodder to flood affected farmers in last flood. State Govt failed to revive their old Artificial Insemination Centres and a large number of villages are not provided with artificial insemination facilities. COMFED (Co-operative Milk Producers Federation Limited) is doing good work in milk marketing in Bihar but milk processing capacity has not increased for the last several years. COMFED could cover only livestock rich districts and farmers of backward districts are still deprived of benefits of marketing network of COMFED.

Fish production recorded an annual growth of about 6% during first four years of Eleventh Plan but the state govt. programme of establishing govt. sponsored hatchery and supporting farmers for construction of new ponds could not make much headway in the state. In Bihar, the major problem in development of agriculture and allied sector is poor implementation and monitoring of programmes.

In the Eleventh Plan, an Agriculture Road Map with an outlay of Rs. 3757.12 crore was implemented by the state government to boost the agriculture sector. Besides, several new initiatives have been implemented for the development of agriculture and allied sector in the state. Due to renewed emphasis on agriculture the state achieved annual average growth rate of 5.9 percent in GSDP of Agriculture and Allied Sectors against the target of 7 per cent during the Eleventh Five Year Plan.

During the last five years, Bihar experienced two severe droughts and faced scanty rainfall in two years. The state government disbursed crores of rupees as compensation to the farmers to save them from drought disaster. It should also be noted that much of Bihar's agricultural growth revolves around horticulture. Bihar is the fourth largest horticultural producer in the country. Fruits and vegetables are cultivated in nearly 10 per cent of cropped area, producing 3.9 million tonnes of fruits and 15.5 million tonnes of vegetables. But, leaving the corporate trade in litchi, less than 1 per cent of these horticultural produce is processed and not even five per cent finds place in multi-product area. It clearly indicates the extent of low and unstable prices and distress sale by farmers in the state.

Several new innovative programmes have been initiated by state governments like 'Mukhyamantri Teevra Beej Vistar Yojana', 'Beej Gram Yojana', Bihar Horticulture Development Society, 'Mukhyamantri Bagwani Mission Karyakram ', etc which will show their impacts on the growth rate only when the process of strong infrastructure development and monitoring of projects are taken up on priority basis . Besides, what is needed is to orient and prioritize public expenditure for sectors like; agriculture and small scale agro-processing that cater to the needs of the overwhelming

majority of Bihar's population for improving their skill, access to knowledge and technology.

Conclusions

During last five years, the annual growth rate of State AgGDP has been around 5.9 per cent wheras State Gross Domestic Product recorded growth of 10.9 per cent during the period which was higher than corresponding growth achieved at national level. But the growth has not been sustainable, mainly due to floods in 2007 and 2008 and draughts in 2009 and 2010. Despite almost stagnant irrigated area, a substantial increase in productivity of principal crops has been achieved during Eleventh Five Year Plan which was made possible due to increased seed replacement rate and more use of fertilizer. Use of organic manure and animal power declined but use of agricultural machineries increased in crop production, mainly due to uneconomic keeping of bullock on tiny land holdings. In this process marginal farmers are being exploited by resourceful farmers due to irrational hiring rate of agricultural machineries in rural Bihar. A number of central sponsored projects have already been initiated in the State but they have not yielded the desired results. The strong monitoring system of agricultural projects, investment in irrigation and research, improving access of farmers to inputs and agricultural development programmes, increased agricultural credit to small peasants and tenants and, of course, increased generation and improved transmission of electricity are the prerequisites for higher and sustainable agricultural growth in the State. In the absence of these, desired rate of growth will remain elusive. Agriculture Extension officials should also be trained for modern agriculture technology and package of practices.

REFERENCES

Govt. of lndia (1996), Cost of Cultivation of Principal Crops in India, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi-(1996)

Govt. of India (2005), National Seed Plan (2005), Ministry of Agriculture and Cooperation, Government of India,

Govt. of India (2011), Reports of the Commission for Agricultural Costs and Prices for the Crops Sown during 2010-11 Season, Commission for Agricultural Costs and Prices, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of lndia, New Delhi.

Government of Bihar, Annual Report, Department of Agriculture, Government of Bihar (Various issues)

Government of Bihar, Economic Survey Department of Finance (various issues)

Growth and Instability in Cotton Production in Rajasthan,

SHIRISH SHARMA* AND I.P. SINGH**

Abstract

The present study estimated growth rates, acreage response function, instability and sources of instability in cotton production in Rajasthan. The data on area, production, and yield were divided into two periods viz, Period I (1981-1995) and Period II (1996-2012). The study revealed that CGRs of area, production and yield of cotton during Period I increased significantly at the rate of 14.30 per cent, 15.20 per cent and 18.00 percent per annum respectively. During Period II, the area, production and productivity registered negative growth rates of 9,8.30 and 22.70 per cent, respectively. The analysis of acreage response function revealed that coefficient of irrigated area (0.95) was the only significant variable indicating that as irrigated area increases; the area under cotton will increase. The analysis of CV revealed that instability in area increased from 57.07 per cent in Period I to 59.48 per cent in Period II. The CV of productivity increased significantly from 83.39 per cent in Period I to 109.66 per cent in Period II. The increase in CV of production from 3.85 per cent in Period I to 9.32 per cent in Period II was mainly due to increase in area variance from 57.08 per cent in Period 1 to 59.48 per cent in Period II and increase in yield variance from 83.39 per cent in Period I to 106.66 per cent in Period II. This area and yield instability together caused instability in production which was more pronounced in Period II as compared to Period I.

Key word: Acreage response function, compound growth rate, cotton and instability

Rajasthan accounts for 5.03 per cent of the total area and 2.89 per cent of total production of cotton in the country. Main cotton growing area lies in the south-eastern and northern parts of the state. Important cotton producing areas are Ganganagar, Bhilwara, Ajmer, Pali, Jhalawar, Chittaurgarh, Alwar and Udaipur. The principal varieties cultivated include Punjab American, Rajasthan American, desi cotton etc. Agriculture growth and instability has remained subject of intense debate in the agricultural economics literature in India. While the need for increasing agricultural production or growth is obvious, the increase in instability in agricultural production is considered adverse for several reasons. It raises the risk involved in farm production and affects farmers' income and decisions to adopt high paying technologies and make investments in farming. Instability in production affects price stability and the consumers, and it increases vulnerability of low income households to market. Instability in agricultural and food production is also important for food management and macro-economic stability (Chand and Raju, 2009) Without studying past performance and trend, the strategic needs of the future cannot be framed meaningfully. It helps us to assess the progress of individual crops in a given period or at a particular point of time. It also helps to locate the weakness in existing planning programmes and draw a view of future possibilities through the mirror of past. It serves as the basis for the comparison of other sectors with the agriculture and within the agriculture sector itself; it provides the comparative prospects of the different fields. This study is, therefore, an attempt to determine the magnitude of instability as well as its sources in cotton.

Materials And Methods

Compound growth rates: The present analysis is based on the secondary data sources i.e. Cotton Advisory Board, Ministry of Agriculture, Government of India. The period of analysis is 1981-1982 to 2011-2012. The entire period was divided into two sub periods viz, Period I (1981- 1995) and Period II (1996-2012). Compound growth rates (CGR) of area, production and productivity of cotton were worked for different periods as well as for entire period by fitting exponential function given below;

$$Y = a\, b^{t}\, e^{u}$$

Upon logarithmic transformation the function gets converted into a linear form,

$$\ln Y = \ln a + t \ln b + u$$

Where,

Y = area, production and productivity of selected crop

t = time variable in years (1,2,3, ...),

a = intercept,

b = trend co-efficient, and

u = disturbance or error term

While estimating compound growth rate, Dandekar (1980) observed that when the exponential form is used,

*Shirishswm @gmail. Com ** Singhip. eco@gmail. Com Department of Agricultural Economics, Collage of Agriculture, SKRAU Bakaner (334001)

taking parameter b itself as the growth rate was not correct. Instead the formula for finding the growth fate was derived as follows.

$Y_t = Y_o (1+r)^t$

Upon logarithmic transformation

$\ln Y_t = \ln Y_o + t \ln(1+r)$

Where $\ln Y_o = a$,

$\ln (1+r) = b$

This gives the equation of the form of exponential type and gives compound growth rate when differentiated with respect to 't' as follows:

$(1/Y_t)(dY_t/d_t) = \ln (1+r)$

$eb = 1+r$

$r = e^b - 1$

Thus the compound growth rate in percentage is given by

$(e^b - 1) \times 100.$

The standard error of CGR is given by:

$SE(r) = \frac{100.b}{\log^e} \quad SE (\log b)$

Where, $\log^e = 0.4343$

The significance of CGR was tested by using following formula:

$$t = \frac{r}{SE(r)}$$

Acreage Response model:

$A_t = b_o + b_l LPSC + b_2 LASC + b_3 LYSC + b_4 YRSC + b_5 PRSC + b_6 LYCC + B_7 LPCC + b_8 RF\_IRR + b_9 DD + ... + Vt$

Where,

At = Current year area under study crop;

LPSC = One year lagged price of study crop deflated by CPI for agricultural labour

LASC = One year lagged area of study crop;

LYSC = One year lagged yield of study crop;

YRSC = Yield risk of studied crop measured by standard deviation of three preceding years;

PRSC = Price risk of studied crop measured by standard deviation of three preceding year;

LYCC = Lagged yield competing crop;

LPCC = One year lagged competing crop price deflated by CPI for agricultural labour;

RP _IRR = Seasonal Rainfall and/or irrigated area under study crop;

DD = District dummy;

V t = Error term;

Instability: It was analyzed by estimating coefficient of variation (CV) using the formula.

$CV = (\sigma / \mu) * 100$

Where;

σ = Standard deviation

μ = Mean

One important point might be noted in connection with the use of C.V., which is the most commonly used index for measuring instability. The C.V. has an easy interpretation in the context of measuring an overall variation in the data not showing any trend. But usually when we have a time series for variables showing some kind of trend, which may be linear or non-linear, C.V. does not take into account any such time trends of the data while measuring instability in the variate values. Thus, it may be desirable for general applicability that an index of instability should be so derived as to give information about the trend exhibited in the data. on the variable under study. Mitra (1989) suggested the following index as a measure of instability in the time series data.

$I = CV^2_* (1-R^2)$

I = Instability Index

R^2 = Coefficient of multiple determination

Sources of instability

To examine the sources of instability, the variance of production was decomposed into its sources, viz, area variance, yield variance, area-yield covariance and higher order interaction between area and yield by using the technique given by Hazell (1982) ;

$V(Q) = A^{-2} V(Y) + Y^{-2} V(A) + 2\bar{A}\bar{Y}COV(A, Y) - COV(A, Y)^2 + R$

Where,

V (Q) = Production variance;

$\bar{A}$ = Mean area

$\bar{Y}$ = Mean yield

V (Y) = Yield variance

V (A) = Area variance

COV (A, Y) = Area yield covariance

COV (A, Y)2 = Higher order covariance between area and yield

R = Residual term

Result and Discussion

The compound growth rates (CGR) of area, production and yield of cotton were estimated for the Period I, Period II and

overall period. The analysis of CGRs indicates that area, production and yield of cotton during period I increased significantly at the rate of 14.30, 15.20 and 18.00 per cent/ annum, respectively. During Period II, the area, production and productivity registered negative growth rates of 9, 8.30 and 22.70 per cent, respectively. The decline in area and productivity in Period II was significant at l per cent level of significance but decline in production was non significant. Overall analysis revealed that the area under cotton decreased significantly at the rate of 4.00 per cent/ annum. However, cotton production and productivity decreased at the rate of 0.90 and 4.20 per cent, respectively which was non significant. Similar analysis was also carried out in Punjab by Steena (2007).

TABLE 2 : COMPOUND GROWTH RATES OF AREA, RODUCTION AND YIELD OF COTTON IN RAJASTHAN

(Per cent/annum)

Period	Area	Production	Productivity
Period I	14.30*	15.20 *	18.00*
	(0.035)	(0.026)	(0.029)
Period II	-9.00*	-8.30 NS	-22.70*
	(0.019)	(0.048)	(0.040)
Overall	-4.00**	-0.90NS	-4.20 NS
	(0.015)	(0.018)	(0.022)

Note—Figures in the parenthesis indicate standard errors.
* Significant at 1 % level of significance ** Significant at 5% level of significance;

Acreage Response Function

There are two ways in which the farmer's supply response can manifest itself; he can either make adjustments in the acreage planted to a crop; or he can vary the pattern of input use and thus, try to adjust the output of the crop to market conditions. The farmers allocate land to different crops depending on expected revenue from different crops. Assuming input costs are the same or move uniformly overtime for different crops, the expected revenue depends on expected prices and expected yields. If yield levels remain constant overtime due to lack of significant technological changes, output response equals the acreage response. The regression results of the acreage response function with respect to various factors for cotton crop are presented in Table 2. The area response function using Nerlovian adjustment lag model were fitted through "step-up / backward" regression technique. These techniques allow the variable explaining maximum variability in the dependent variable to enter first in order of their explanatory power. The explanatory variables included in the acreage response function of cotton are lagged price of cotton, lagged area under cotton and irrigated area under cotton. These three variables explained quite good variation (95%) in the dependent variable i.e. acreage under cotton crop. The coefficient of irrigated area (0.95) was the only significant variable and it was positively moving the acreage allocation of cotton crop. It means that if the irrigated area increases, the area under cotton will also increase as cotton productivity responds to number of irrigations available .

TABLE 2 ACREAGE RESPONSE FUNCTION OF COTTON IN RAJASTHAN

Particulars	Coefficient	SE
Constant	1.72	0.998
Lagged price cotton	-0.23	0.148
Lagged area cotton	0.04	0.093
Irrigated area under cotton	0.95**	0.091
R^2	0.95	
Adjusted R^2 .	0.94	

** Denotes Significant at 5% level of probability .

Magnitude of Instability in Area, Production and Productivity of Cotton

The instability analysis in agriculture is very important. Instability in production of cotton is expected to be caused by instability in area and productivity. If the instability in both area and productivity declines, the instability in production declines. The coefficients of variation (CV) of area and productivity of cotton were computed and are presented in Table 3. The instability in area increased from 57.07 per cent in Period I to 59.48 per cent in Period II. The overall CV of area was 78.64 per cent. The CV of productivity increased significantly from 83.39 per cent in Period I to 109.66 per cent in Period 11. The overall CV of productivity was 94.75 per cent. This increase in instability in area and productivity caused instability in production. The CV of production was 67.89 per cent in Period I and it increased to 70.74 per cent in Period II. On an overall basis, the CV of production was 69.55 per cent. On the basis of above discussion, it can be concluded that instability in cotton area, production and productivity increased in Period II as compared to Period I.

TABLE 3 MAGNITUDE OF INSTABILITY IN AREA, PRODUCTION AND YIELD OF COTTON IN RAJASTHAN

	Period I		Period II		Overall	
Particulars	CV(%)	Instability	CV (%)	Instability	CV(%)	Instability
Area	57.08	1430.53	59.48	1376.55	78.64	5040.86
Production	67.89	1290.74	70.74	4138.58	69.55	4793.73
Productivity	83.39	1745.60	109.66	3896.77	94.75	7991.13

Sources of Variance in Production of Cotton

The sources of variance in production of cotton in Rajasthan are given in Table 4. The increase in CV of production from 3.85 per cent in Period I to 9.32 per cent in Period II was mainly due to increase in area variance from 57:08 per cent in Period I to 59.48 per cent in Period II and increase in yield variance from 83.39 per cent in Period I to 106.66 per cent in Period II. The instability in yield of cotton was more pronounced as compared to instability in area. This was mainly because of high incidence of cotton bollworm (Helicoverpa armigera) which significantly reduced yield. However, area and yield instability together caused instability in production which was more in Period II as compared to Period I.

TABLE 4 SOURCES of VARIANCE of PRODUCTION of COTTON

(Per cent)

Year	C.V. of production	Area Variance	Yield Variance	Area yield covariance	Higher order covariance
Period I	3.85	57.08	83.39	19.87	2.94
Period II	9.32	59.48	106.66	11.49	1.72
Overall	1.34	78.64	94.79	19.11	4.66

Conclusion

The area under cotton in Rajasthan showed decreased significantly at the rate of 4.00 per cent per annum. However, cotton production and productivity decreased at the rate of 0.90 per cent and 4.20 percent respectively which was non-significant. Acreage response function showed that the coefficient of irrigated area (0.95) was the only significant variable and it was positively moving the acreage allocation of cotton crop. It means that if the irrigated area increases, the area under cotton will also increase. The CV of production was 67.89 per cent in Period I and it increased to 70.74 per cent in Period II. On an overall basis, the CV of production was 69.55 per cent. On the basis of above discussion, it can be concluded that instability in cotton area, production and productivity increased in Period II as compared to Period I. The instability in yield of cotton was more pronounced as compared to instability in area. However, area and yield instability together caused instability in production which was more in Period II as compared to Period I.

REFERENCES:

Bohrnstedt, G.W., Goldberger, A.S., (1969), "On The Exact Covariance of Products of Random Variables", *Journal of American Statistics Association* 64,:1439—42.

Brennan and Michael, J. (1958), "The Changes in Cotton Acreage in South East: Implications for Supply Functions", *Journal of Farm Economics,* 40 (4) : 835-44.

Chand, Ramesh and S.S.Raju (2009), "Instability in Indian Agriculture During Different Phases of Technology and Policy", *Indian Journal of Agricultural Economics*, 64, 2,283-88.

Chattopadhyay, A. K. and P. S. Das (2000), "Estimation of Growth Rate: A Critical Analysis with Reference to West Bengal Agriculture", *Indian Journal of Agricultural Economics,* 55(2): 116-33.

Dandeker, V. M. (1980), "Introduction to Seminar on Data Base and 'Methodology for the Study of Growth Rates in Agriculture", *Indian Journal of Agricultural Economics,* 35(2): 1-20.

Jain, S. K. and Gopal Naik (2002), "Growth, Variability and Supply Response of the Futures Traded Commodities in India", *Agricultural Economics Research Review,* 15(2): 150-174.

Hazell, P. B. R. (1982), "Instability in Indian Food grain Production" *Research Report 30, International Food Policy Research Institute,* Washington, D.C., U.S.A.

Mitra, T. K., (1989), "Growth and Instability of Agricultural Prices in West Bengal: A Note", *Indian Journal of Agricultural Economics,* 44(1): 67-7l.

Nerlove, M. and Addison, William (1958), "Statistical Estimation of Long Run Elasticity of Supply and Demand" *Journal of Farm Economics,* 40 (4): 861-80.

Steena Chacko and Toor, M.S., 2007, "Changing Scenario of Cotton Production and Trade in India", *Journal of Agricultural Development and Policy,* 17 (1 & 2): 58-69.

Attention Subscribers

All correspondence regarding subscription of monthly journal "Agricultural Situation in India" should be made on the following address :

The Controller of Publications,
Ministry of Urban Affairs
Department of ublications,
Publication Complex (Behind Old Secretariat)
Civil Lines, Delhi-110054
Phone : 23817640, 23819689, 23817823

Shifts in the Cropping Pattern and Their Impact on Employment and Wages in the Context of Globalisation : A Study of Two Villages in Andhra Pradesh

E. Krishna Rao[1] and G. Nancharaiah[2]

I. Introduction

Indian government has implemented several reforms in agriculture sector to improve the production and promote equity soon after the independence. In the initial period of independence, the Indian government has initiated several land reform acts to abolish intermediate land tenure systems such as *Jamindari* and *Inamdari*. In order to meet the food needs of the country the Indian agriculture had been exposed to new technology from mid-sixties known as green revolution. A new phase started in India's economic policy in 1991 with the introduction of wide ranging policy reforms in all major sectors of the economy like trade, industry, agriculture, foreign investment and foreign technology, financial sector and public sector. The new economic policy environment is designed to create a favourable climate for agricultural output to increase. Real devaluation and trade reforms are expected to improve the terms of trade of tradable agriculture, make it internationally competitive and enable it to record large increase in exports and output. Domestic price reforms that free agriculture from internal controls and raise prices of agricultural output are expected to have positive impact on agricultural growth. Contrary to expectations, agriculture failed to show any pliability in its growth rates after the introduction of economic reforms. The growth rates of output of major crops recorded a visible deceleration in the post-reform period. Moreover, significant changes have taken place in the cropping pattern and shifts are being observed particularly from food-crops to non-food crops.

The available secondary data on cropping pattern at national level indicates that area under non-foodcrops attained a 1.16 percent of growth during the post-globalisation period, whereas area under foodcrops attained a -0.13 percent of growth during the same period (Gol, 2006). Though area under foodcrops declined, some of the important food crops like paddy, maize and vegetables area constantly increasing, on the other hand traditional non-food crops like tobacco and groundnut lost its area in the cropping pattern. Same tendency has been observed in the AndhraPradesh, which is one of prominent sates of agriculture sector. Area under nonfood crops attained 0.44 percent of growth during 1990-91 to 2004-05, on the other hand, area under foodcrops attained -0.76 during the same period. Among the non-food crops, tobacco, which is the important traditional commercial crop, area recorded -1. 72 percent of growth during the post-globalisation period (GoAP, 2006).

Cropping pattern has been defined as the proportion of area under different crops at a particular period of time. A change in the cropping pattern means a change in the proportion of area under different crops. The cropping pattern changes depend upon changes in demand patterns, development of irrigation, availability of marketing infrastructure and new trade arrangements. More importantly, area allocation among various crops depends on the relative profitability. Shifting from one crop to another crop is also a strong tool to minimize the risk and maximize the profit from farm. On the demand side, the most important factor that determines the cropping pattern is the consumption in a country. In addition to this, demand is also generated by exports. Changes in the demand at national as well as at international market influence the cropping pattern of a nation or a village. Studies conducted on cropping pattern changes revealed that these changes had significant impact on the livelihood of labour and farmers. Further studies conducted on labour intensity of crops found that commercial crops like tobacco and cotton are more labour intensive than the all food crops. With this background in this paper an attempt has been made (i) To study the shifts in the cropping pattern with reference to tobacco and factors affecting the changes in the context of globalisation of Indian economy since 1991, and (ii) the impact of shifts in the cropping pattern on employment, wages and income distribution at micro level, that is, at village level since 1991.

II. Methodology and Data Source

Tobacco is a principal cash crop of national importance. Even though the cultivation of tobacco is spread all over the country, the commercial cultivation of tobacco is mainly concentrated in states like Andhra Pradesh, Karnataka, Gujarat, Maharastra, Bihar, Tamilnadu and West Bengal. Among the tobacco growing states, particularly FCY tobacco growing states, Andhra Pradesh occupied the

[1]Assistant Regional Director, IGNOU Regional Centre, G.R. Complex, IIIrd florr, AnnaSalai, Nandanam, Chennai-35
[2] Professor of Economics and Dean, Scholl of Social Sciences, University of Hyderabad, Gachibowli, Hyderabad-46

first place in area and 2nd place in production. Moreover in Andhra Pradesh, about 84 percent of tobacco is being produced in Costal Andhra, remaining 16 percent has been produced in 2 Telangana (6 percent) and in Rayalaseema (l0 percent) regions in 2004-05(GoAP, 2006). Even in Costal Andhra, Prakasam district occupied the first place in area as well as in production. Since the colonial period, tobacco crop was the dominant crop in Guntur district. Guntur district was bifurcated in 1970 into Guntur and Prakasam districts. A part of the tobacco growing area has gone to Prakasam(Nata Duvvury, 1986). Since then, Prakasam district is well known in Andhra Pradesh for the cultivation of tobacco crop and has become one of the important tobacco growing districts in Andhra Pradesh. Thus the important tobacco producing Prakasam district has been selected for the present study in order to study the shifts in the cropping pattern at micro level.

The Prakasam district is divided into three revenue divisions namely Ongole, Kandukur and Markapuram. Of these three Ongole and Kandukur divisions are known for tobacco cultivation and the 95 percent of district tobacco is produced from these two divisions (C.P.O, 2006). Significant changes were recorded in Tangutur mandal of Ongole division and Jarugumalli mandal of Kandukur division. On the lines of cropping pattern changes, Jayavaram village from Tangutur mandal and Ramachandra Puram (R.C.Puram) village from Jarugumalli mandal, have been selected for this study. Jayavaram (Tangutur mandal), is an un-irrigated village and totally depends upon rainfall for the agriculture and the main crop is tobacco. R.C. Puram of Jarugumalli mandal is an irrigated village, which is accessible to irrigation facilities for agriculture through the river "*Paleru*" in the form of lift irrigation.

The present study is mainly based on the primary data on croppmg pattern, cost of cultivation, labour employment and wages, and operational holdings etc. These data are collected from the villages through interviewing the heads of the selected households and used a separate questionnaire for each household. In addition to this, the focus group discussion (FGDs) was conducted with the village community in order to acquire more accurate information and data. The household survey was conducted during May 2006 to March 2007 in the selected villages. Jayavaram village is inhabited by 318 households and R.C. Puram is inhabited by 272. The total households are classified into four categories such as landless labourers, small farmers, medium and large farmers. In order to get more accurate data and information from each category, uniformly 36 percent from each category households has been selected through Random Sampling Method (lottery method). Totally 117 households from Jayavaram and 100 households from Ramachandra Puram are selected on the basis of Random Sampling. In Jayavaram, out of 117 sample households, landless labour households are 44, small farmers' households are 50, medium farmers' households are 13 and large farmers' households are 10. In the village of R.C. Puram, out of 100 sample households, landless households are 42, small farmers' households are 38, medium farmers' households are 11 and large farmers' households are 9. The head of the household is interviewed to get the necessary data. The interviews were held both at the farmer's houses and also in the fields. Besides this, some general information is also collected from the village and mandal government officials. The primary data is supplemented by the data collected from these secondary sources.

III. Shifts in the Cropping Pattern in the Selected Villages

a) R. C. Puram

This village is predominantly dominated by agricultural sector and crops are raised during kharif and rabi season. The crops cultivated in khariff season are seasamum, fodder crops and eucalyptus. The sesamum plantation area is mostly depended upon rainfall, when there is sufficient rainfall for the cultivation of sesamum they went ahead for cultivation, otherwise it will be fallow land during the kharif season. In rabi season tobacco, paddy and chillies are cultivated and tobacco and paddy crops occupied the major proportion in the total cropped area. Plant crops like eucalyptus and subable3 are cultivated throughout the year as its harvesting period ranges from three to five years. It is observed that the rabi season is economically significant for farmers as well as for the labourers, as it generates higher levels of income. Thus the analysis on shifts in the cropping pattern is confined to the rabi season as kharif season cropping pattern shifts are menial in both the selected villages.

The data presented in the table 1 indicates that the changes in the area under different crops in the rabi season during 1993-94 to 2005-06. The crops cultivated in this season, other than paddy and tobacco, are classified into two categories such as other foodcrops (OFC) which includes jowar and vegetables and the other non-foodcrops ON FC) includes *subable*, eucalyptus and chillies. Among the rabi crops tobacco crop occupied major proportion of area till 1998-99, but afterwards its area drastically declined and paddy became the major crop. The share of tobacco area in total cropped area declined from 76.69 percent to 40.74 percent during the study period. This village is connected with the irrigation facility for agriculture through lift irrigation since 1992-93. The main source of irrigation is '*Paleru*[4]' , river, which provides water facility for the entire rabi season and some extent to khariff season. During the initial stages of lift irrigation only few farmers were taken

[3] Subable is the local name and the scientific name of this crop is *Leucocephala*

[4] This river located in the south side of the village.

up paddy cultivation but over a period of time most of the farmers got attracted towards the paddy cultivation and switched over to this crop cultivation. The data presented in the table 1 further indicates that the area under paddy increased from 16 acres in 1993-94 to 213.75 acres in 2005-06 and its share in total cropped area of sample households increased from 4.91 percent to 66.6 percent during the study period.

b) Jayavaram

The data presented in the table 2 explains the changes in the cropping pattern of sample households during rabi seasons since 1996-97 to 2005-06. Tobacco, bengalgram, eucalyptus and subable are major crops among the crops grown in rabi season. For the convenience of analysis, as R.C.Puram the non-food crops, other than tobacco, eucalyptus and *subable*, are included under the other non-foodcrops (ONFC) category and foodcrops other than bengalgram are included in other foodcrops (OFC) category.

Of total cropped area tobacco covers 74.22 percent 'of area and reported as major crop among the cropping pattern. But further it gradually dwindled and account only for 9.30 percent of area in 2005-06. Bengalgram was being cultivated since 1998-99 in this village and it was cultivated only in 23 acres, but its area astonishingly increased to 245.05 acres in 2005-06 and its share in total samples area increased from 6.13 percent to 64.84 percent during the same period. Area under plant crops (eucalyptus and *subable*) also increased substantially during the study period. Eucalyptus share in total cropped area increased from 2.65 percent to 13.10 percent and subable share increased from 2.12 percent to 9.12 percent during the study period. More over these two plant crops together constitute about 23 percent of area during 2005-06. It is observed that in both the selected villages the cropping pattern has been shifting from tobacco to other crops.

The main casual factors of this prevailing cropping pattern shifts in the selected villages are higher tobacco cost of cultivation, development of irrigation facilities, low price for tobacco, availability of irrigation, labour problems, tobacco cultivation is time consuming process and costly process and transport problems. However among these reasons availability of irrigation, high cost of cultivation for tobacco and low prices of tobacco produce is found the major reasons (Table 3). In addition to micro level reasons, at macro level, government policies, the trade reforms and export potential of the crop also strongly affected the cropping pattern as well as prices of particular crop. Many of the research studies corroborate this and further pointed out that the cropping pattern has been significantly influenced by several micro and macro factors (Gopalappa, 1996, Gulati *et al*, 1999). Hence there is a need to examine the interlinkage between micro and macro level reasons in detail.

IV. Factors Responsible for Shifts in the Cropping Patters

a) Trade Liberalisation and Globalisation

The data presented in the table 3. clearly explains low returns and the availability of irrigation are the major casual factors for shifting from tobacco to other crops in the selected villages. The low returns directly or indirectly depends upon the domestic and international prices of partular produce, government policies and demand at domestic and international market. As a result of trade liberalization significant changes have been taken in india's external sector. Importantly, after the introduction of reforms, several traditional agricultural exports lost its place in external basket, while some of the new products entered in the external basket. The new items like horticulture products, groundnuts, meat and preparations, processed fruits and juices, processed vegetables, sesame and nigerseeds, shellac, wheat, rice entered in to the export basket. As far as the global competitiveness of agricultural commodities is concerned there are seven commodity groups where India has lost market share substantially. These are cashew kernals, fruits/vegetables, pulses, spices, sugar, tea and mate and tobacco. The share of Indian tobacco exports at external market has been deteriorating, which accounted for 2 percent of India's export basket at world market in 1970s declined to 0.8 in 2005-06 (Chaly Preetha Elizabeth, 2007 & Jha, Brajesh, 2002). The decelerated demand trend of tobacco at international market may also have strong impact on its production area.

b) Government Policies on Tobacco Consumption

The consumption of tobacco and tobacco products declined rapidly in recent periods, due to health concern and anti-tobacco policies at world level as well as at the national and state level. It is important to note that the China is the major consumer of tobacco but its share in total world tobacco consumption declined from 40.88 percent in 2001-02 to 38.79 percent in 2004-05(GoI, 2006). Most of these countries adopted anti-tobacco consumption legislation in the context of health concerns. India too enacted several anti-tobacco legislations to control tobacco consumption such as Cigarettes Act of 1975, the motor vehicles act of 1988, The Cable Television Networks Amendment Act of 2000, Cigarettes and other Tobacco Products Bill 2001, The Centre passed The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and distribution) Act, 2003 (Chaly Preetha Elizabeth, 2007).

The first ever international treaty organized by W.H.O in the form of "Frame work Convention on Tobacco Control (FCTC)". Indian government had signed along with 168 countries and ratified the treaty on 5th February 2004. A legislation to reduce the demand of tobacco and prevent the youngsters from getting into deadly tobacco trap was

also enacted by the Union of India in 2004 (Shimkhada et ai, 2003 & GoI, 2003). In addition to these acts, recently the Indian government has also banned smoking in public places (since 2nd October 2008). Thus the emergence of these external and internal anti-tobacco legislations also have shown negative impact on tobacco exports and most of the world countries restricted to no-tobacco consumptions.

c) Agricultural Prices of Important Crops

Average wholesale prices of important agricultural commodities have been presented in the table 4 since 1989-90 to 2005-06 at state level. The analysis is limited to paddy, tobacco and bengalgram, which are major crops in the selected villages. It could be observed from the data presented in the table that the wholesale prices of paddy and bengalgram have been increasing significantly, whereas the price of tobacco has been fluctuating during the study period. Due to the high demand for India's rice at international market and exports, the prices of rice increased significantly at domestic market. The demand for Indian rice at international market and the government policies regarding paddy cultivation, may be important reasons for increase in paddy prices significantly. The table further reveals that during the study period bengal gram prices attained 6.37 percent of growth. Thus the changing tendency of prices clearly indicates that the paddy and bengalgram prices growth rate is slightly higher than the tobacco prices growth.

d) Costs and Returns from Tobacco, Paddy and Bengalgram Cultivation

The costs and returns of paddy, tobacco and bengal gram cultivation in the selected villages have been presented in the table 5. To calculate total output value of respective crop production, the prevailing village market prices of tobacco, paddy and bengalgram have been taken into account. It is observed from the data that the input-output ratio in terms of total cost of production (Cost C), the tobacco growing farmers gained Rs. l.48/- and paddy growing farmer gained Rs.2.02, over a rupee spent on cultivation in R.C.Puram. In the case of Jayavarm, the input-output ratios are Rs.2.39/- for bengal gram growing farmers and Rs.l.53/- for tobacco growing farmers. The data further reveals that the bengal gram and paddy is more profitable crop than the tobacco and the tobacco crop cultivation requires more investment than paddy and bengalgram.

VIII. Impact of Cropping Pattern Shifts on Labour Employment and Wages

a) R.C.Puram

Table 6 postulates the labour mandays[5] in tobacco and paddy which, are occupied major proportion in the village cropping pattern. All operations taken together for one acre tobacco cultivation provides a total of 98 mandays, of which 52 for female and 46 for male labourers. On the other hand one acre of paddy cultivation provides a total of 62 mandays, of which 33 for female and 29 for male workers. In both the crops cultivation is dominated by the female workers. The reasons for domination of female workers in the process of tobacco and paddy cultivation are varied. Firstly the lower wage for female workers than their counter part male labourers and secondly the female labourers are specialized in some operations. Comparatively tobacco crop cultivation provides more employment than paddy crop. As a result of cropping pattern shifts in the village from tobacco to paddy, the labour lost 36 mandays for one acre cultivation. It clearly enlightens that, the shift in the cropping pattern from tobacco to paddy adversely affected the labour employment days.

The data presented in the table 8 indicates that in the tobacco fields labour wages are slightly higher than in paddy fields. Due to the shifting in the cropping pattern from tobacco to paddy, per day a male labour has been lost Rs.3.87/-, whereas a female also loses Rs.5.35/. Taking male and female average wages together in both the fields results the loss of Rs.4.70/- per day due to the shift of cropping pattern. The loss of employment days and low wages in paddy fields has been leading to migration of agricultural labourers to the towns for their livelihood. It is found from the household survey that 45 percent of agricultural labourers migrated to cities like Hyderabad and Vijayawada to seek the employment for their subsistence and working as construction workers.

b) Jayavaram

Labour employment mandays for tobacco, bengalgram 'and plant crops have been presented In the table 9. The major operations incurred in the tobacco crop cultivation are from land preparation to kachha grading[6]. The employment mandays are varying from operation to operation and one acre of tobacco cultivation provides a total 99 mandays of employment. Out of which, women are employed in 51 mandays and their counterpart male workers are employed in 48 mandays. The data further depicts that one acre cultivation of bengal gram provides only 45 employment manday, of which 21 are for male and 24 are for female labourers respectively. As tobacco, this crop is also dominated by the female labourers and occupied the share of 53.32 percent in total mandays. Plants cultivation provides 42 employment mandays, of which 23 mandays are for male labourers and 19 mandays are for female labourers. One can understand from the table that among the three major crops cultivated in the village, tobacco provides more employment. Due to the shifts in the village

[5] Like Directorate of Economics and Statistics, Government of Andhra Pradesh, this study also takes 8 working hours per a day.

[6] This is the farm level ending operation of tobacco cultivation. There are two types of grading operations in tobacco cultivation process: (i) farm grading *(kachha grading)* and (ii) Ag-mark grading. Before selling their final product in the tobacco boards, farmers use to go for *kachha* grading to separate same colour leaves after curing. But the traders who buy the product in tobacco boards through auction system usually go for Ag-mark grading on the basis of their export order.

from tobacco to bengalgram, has resulted in the loss of 54 mandays, whereas the shift from tobacco to plant crops (eucalyptus and subable), has resulted in the loss of 57 mandays(per acre).

Wages of different crops of different operations prevailing in the village have been presented in the table 9. On an average in bengalgram a male labour is being paid Rs.86.90/- and a women labour is being paid Rs.52.50/- per day, whereas it was Rs.96.25/- and Rs.68.33/- in tobacco fields and Rs.90.42/- and Rs.57.0/- in plant cultivation respectively. The labour wage data clearly envisage that in tobacco fields the male and female labourers are being paid higher wages than other crops.

Thus the shifts in the cropping pattern from tobacco to bengal gram and plant crops have adversely affected the labour employment and wages. Due to the low labour absorption in bengalgram and plants, 25 percent of agricultural labourers are working as riksha pullars, casual labourers in cement shops, casual labourers in tobacco companies and hotels in the Tangutur town, which is only 2.5 km far from this village. However this town is industrially sound and number of tobacco firms are located, which provide employment to the women workers in the entire year and there exists a lesser absorption of male labourers. But as compared to the agricultural sector the women are being paid lower wages in tobacco companies.

Conclusions

(i) This study found that the cropping pattern has been shifting from tobacco to paddy in R.C.Puram Village and to bengalgram and plant crops (eucalyptus and subable) in Jayavaram. The reasons for shifting from tobacco to other crops are different in both the villages.

(ii) The shifts in the cropping pattern from tobacco to paddy, bengal gram and plant crops, is found to have an adverse impact on labour employment and wages. It is found that in tobacco, paddy and bengalgram crops cultivation, the proportion of women workers are more than the male workers on an average. However they are paid lower wages than men workers. In both the villages the labourers are being paid lower wages than minimum statutory wages.

(iii) It is also found that the trade liberalization has positive impact on India's external sector. And after the globalization rice exports have risen significantly, leading to rise in domestic prices of rice at national as well as at Andhra Pradesh state level.

(iv) In the light of these findings it is suggested that the government should provide alternative employment to the agricultural laboures through the different rural development programmes and poverty eradication programmes. It is also suggested that the government should strengthen the existed legislations and implement it effectively to give the equal wage to men and women for same work and same working hours and enforce the minimum wages act effectively.

REFERENCES

1. Statistical Abstract of India, Directorate of Economics and Statistics, GOI, 2005-06.

2. Season and Crops Report of Andhra Pradesh, Directorate of Economics and Statistics, GoAP, 2005-06 .

3. Statistical Abstract of Andhra Pradesh, Directorate of Economics and Statistics, GoAP, 2005-06.

4. Duvvuri, Nata., " Commercial Capital and Agraricultural Relation: A study of Guntur Tobacco economy", EPW, July, 1986, Pp:163-184.

5. Statistical Handbook of Prakasam district, c.P.O, Ongole, 2005-06.

6. Gopalappa.D.V., "Crop Diversification and Income Levels in KarimNagar District of Andhra Pradesh", Indian Journal of Agricultural Economics, Vol.51 ,No.3, July-Sept, 1996, P.381.

7. Gulati, A. and T.G.Kelly, TRADE LIBERALIZATION AND INDIAN AGRICULTURE: CROPPING PATTERN CHANGES AND EFFICIENCY GAINS IN SEMI-ARID TROPICS, Oxford University Press, New Delhi, 1999.

8. Tobacco Board Annual Report 2004-05, Ministry of Commerce, GOI, P.63.

9. Veeramani,C., "Sources of India's Export Growth In Pre- And Post-Reform Periods", Economic and Political Weekly, June 23, 2007, Pp:2419-2427.

10. Bhattacharya, B., AGRICULTURAL EXPORTS Vol. 18, state of the Indian farmers: A Millennium study (27 Volumes Plus CD-Rom, Ministry of Agriculture, Government of India), Academic Foundation, New Delhi, 2004, P.90.

11. Jha Brajesh., "India's Tobacco Exports: Recent Trends, Determinants and Implications, Indian Journal of

Agricultural Economics, Vo1.57, Jan-Mar, 2002, Pp: 53-63.

12. Chaly Preetha Elizabeth "Tobacco Control in India", Indian journal of Dental Research, Vol: 18,2007, Pp: 2-5 and Government of India, REPORT ON TOBACCO CONTROL IN INDIA, Ministry of Health & Family Welfare, 2004. www.mohfw.nic.in

13. Shimkhada R, Peabody S W, "Tobacco Control in India", Bull World Health Organ, 81(1), March 11,2003, Pp: 48-52 and The Cigarettes and other Tobacco Products Act 2003, Ministry of Health &Family welfare, Government of India. www.mohfw.nic.in.

14. Dantwala, M.L., "Prices and Cropping Pattern" Economic and Political Weekly, Vo1.21, No 16, April 19, 1986, P.694.

15. Gulati, Ashok and Anil Sharma., "Freeing Trade in Agriculture: Implications For Resource Use Efficiency and Cropping Pattern Changes" Economic and Political Weekly, December 27, 1997, Pp: A 155-164,

16. Bhalla, G.S., "Agricultural Growth and Regional Variations" in R. Radhakrishna and others(ed tl) INDIA IN A GLOBALIZING WORLD:Some Aspects of Macro Economy, Agriculture and Poverty, Essays in honour of CH.hanumantha Rao,Academic Foundation, New Delhi and CESS, Hyderabad, 2005, Pp: 309-346.

17. Government of India, Economic Survey 2005-06, Ministry of Finance, Economic Division, New Delhi, website: http:/indiabudget.nic.in.,

TABLE: I. AREA UNDER PRINCIPLE CROPS AMONG SAMPLE HOUSEHOLDS IN RABI SEASON

(IN ACRES)

Year/crop	Paddy	Tobacco	O.F.C	O.N.F.C	T.F.C	T.N.F.C	T.C.A
1993-94	16	250	35	25	51	275	326
	(4.91)	(76.69)	(10.74)	(7.67)	(15.64)	(84.36)	(100.0)
1995-96	38	200	34.25	32	72.25	232	304.25
	(12.49)	(65.74)	(I 1.26)	(10.52)	(23.75)	(76.25)	(100.0)
1998-99	96.5	165	34	32	130	197	327.5
	(29.47)	(50.38)	(10.38)	(9.77)	(39.69)	(60.15)	(100.0)
1999-00	128	132	26	38	154	170	324
	(39.51)	(40.74)	(8.02)	(11.73)	(47.53)	(52.47)	(100.0)
2000-01	193	5.75	53	73	246	78.75	324.75
	(59.43)	(1.77)	(16.32)	(22.48)	(75.57)	(24.25)	(100.0)
2001-02	205	74	29.25	20	234.25	94	328
	(62.50)	(22.56)	(8.92)	(6.10)	(71.42)	(28.66)	(100.0)
2002-03	208	63	24	26	232	89	321
	(64.80)	(19.63)	(7.48)	(8.10)	(72.27)	(27.73)	(100.0)
2003-04	210	35	43.1	32	253.1	67	320.1
	(65.60)	(10.93)	(13.46)	(10.00)	(79.07)	(20.93).	(100.0)
2004-05	210	29	41	35	251	64	315
	(66.67)	(9.21)	(13.02)	(11.10)	(79.68)	(20.32)	(100.0)
2005-06	213.75	23	48	36	261	59	320.75
	(66.64)	(7.17)	(14.96)	(11.22)	(81.37)	(18.39)	(100.0)

Source : Household Survey.

Note : figures in the parenthesis indicate the percentages in total cropped area in particular agricultural year.

TFC=Total foodcrops, OFC=other foodcrops, TNFC=Total non-foodcrops, ONFC=other non-foodcrops, TCA=Total cropped area.

TABLE : 2. CROPPING PATTERN AMONG SAMPLE HOUSEHOLDS IN RABI SEASON

(IN ACRES)

Year/ crop	Tobacco	Bengalgram	Eucalyptus	Subable	O.N.F.C	O.F.C	T.F.C	T.N.F.C	T.C.A
1996-97	280	---	10(2.65)	8	28.5	50.75	50.75	326.5	377.25
	(74.22)			(2.12)	(7.55)	(13.45)	(13.45)	(86.55)	(100.0)
1998-99	253.25	23.0	15	10.5	25.35	48.25	71.25	304.1	375.35
	(67.47)	(6.13)	(4.00)	(2.80)	(6.75)	(12.85)	(18.98)	(81.02)	(100.0)
2000-01	26.75	153.65	29.75	18.5	68.75	69.85	223.5	143.75	367.25
	(7.28)	(41.84)	(8.10)	(5.04)	(18.72)	(19.02)	(60.86)	(39.14)	(100.0)
2001-02	108.25	185.35	36.05	27.0	10.75	9.65	195	182.05	377.05
	(28.71)	(49.16)	(9.56)	(7.16)	(2.85)	(2.56)	(51.72)	(48.28)	(100.0)

TABLE : 2. CROPPING PATTERN AMONG SAMPLE HOUSEHOLDS IN RABI SEASON—*CONTD.*

(IN ACRES)

Year/ crop	Tobacco	Bengalgram	Eucalyptus	Subable	O.N.F.C	O.F.C	T.F.C	T.N.F.C	T.C.A
2002-03	90.05	206.75	43.75	28.25	6.35	2.15	208.9	168.4	377. 3
	(23.87)	(54.80)	(11.60)	(7.49)	(1.68)	(0.57)	(55.37)	(44.63)	(100.0)
2003-04	62.25	235.25	45.0	28.25	4.75	2.0	237.25	140.25	377.5
	(16.49)	(62.32)	(11.92)	(7.48)	(1.26)	(0.53)	(62.85)	(37.15)	(100.0)
2004-05	48.75	238.75	48.25	32.75	6.5	2.25	241	136.25	377.25
	(12.92)	(63.29)	(12.79)	(8.68)	(1.72)	(0.60)	(63.88)	(36.12)	(100.0)
2005-06	35.15	245.05	50.65	35.45	8.32	5.45	250.5	127.42	377.92
	(9.30)	(64.84)	(13.10)	(9.12)	(2.20)	(1.44)	(66.28)	(33.72)	(100.0)

Source: Household Survey.

Note: Figures m the parenthesis indicate the percentages m total cropped area in particular agricultural year. TFC=Total foodcrops, OFC=other foodcrops, TNFC=Total non-foodcrops, ONFC=other non-foodcrops, TCA=Total cropped area.

TABLE: 3. REASONS FOR SHIFTING FROM TOBACCO TO OTHER CROPS AMONG SAMPLE HOUSEHOLDS

S. No	Reasons	% Of sample farmers	
		R.C.Puram	Javavaram
i	Labour Problems	8.62	---
ii	High Cost of Cultivation	24.13	41.55
iii	Low price for Tobacco	25.86	36.40
iv	Availability of irrigation	31.05	---
v	Tobacco cultivation is time consuming and costly process	6.90	4.10
vi	Risk involved	---	8.10
vii	Diseases of tobacco plants	---	9.85
viii	Transport problems	3.44	---
	Total	100.0	100.0

Source: *Household survey.*

TABLE : 4. AVERAGE WHOLESALE PRICES OF IMPORTANT AGRICULTURAL COMMODITIES IN ANDHRA PRADESH STATE LEVEL

(price for quintal in Rs.)

Year	Paddy	Jowar	Baira	Chillies	Bengalgram	Tobacco
1989-90	211.04	238.21	203.88	878.80	667.00	1038.55
1990-91	245.47	233.51	214.29	2038.27	798.53	1955.99
1991-92	332.46	398.64	358.74	3485.66	757.49	2112.80
1992-93	351.95	439.49	377.23	1057.34	853.73	1596.84
1993-94	377.04	315.46	298.82	1762.70	1117.33	1390.14
1994-95	436.20	362.69	401.61	3112.61	1048.56	1841.71
1995-96	457.87	495.01	455.58	3183.49	1028.18	3273.02
1996-97	491.53	585.44	426.20	2802.37	1366.57	3000.00
1997-98	559.13	557.26	423.49	3112.63	1448.85	2947.92
1998-99	597.65	680.70	530.25	3986.08	1489.00	3055.93
1999-00	657.77	852.83	592.05	3663.34	1504.70	3318.75
2000-01	604.09	791.08	573.73	3447.14	1655.94	3148.70
2001-02	630.03	712.28	595.16	3178.01	1690.80	3251.56
2002-03	653.03	722.43	607.72	3382.37	1673.65	3306.23
2003-04	651.05	683.23	618.17	3720.05	1674.88	3527.44
2004-05	646.73	707.31	606.41	3381.79	1719.93	3468.69
2005-06	663.38	729.07	617.00	3223.79	1772.00	3502.36
Compound Growth Rates						
1989-90 to 1995-96	13.72	10.68	13.72	15.47	8.30	10.93
1995-96 to 2001-02	5.63	7.86	6.38	2.06	7.08	0.70
2001-02 to 2005-06	0.94	0.25	0.70	0.28	1.22	1.98
1989-90 to 2005-06	6.85	7.44	6.67	5.91	6.37	6.45

Source: Statistical Abstract of A. P., 1991 to 2007, Directorate of Economics and Statistics, Govt. of AP., Hyderabad, Compound Growth rate calculated by using the formula, $p_t=P_o$ (1+ r)

TABLE : 5. COST STRUCTURE AND RETURNS IN TOBACCO, PADDY AND BENGALGRAM CULTIVATION

(Rs/AC)

Costs/Size of Holdings	R. C. Puram		Jayavaram	
	Paddy	Tobacco	Bengalgram	Tobacco
Total operational cost(A)	8283.86	14245.27	6890.49	14393.21
Total fixed Cost(B)	5997.82	5818.26	5920.323	6129.217
Total Cost of Production (C)	14281.68	20063.53	12810.82	20522.43
Productivity(Kgs/bags)	32.33*	530.19	756.33	536.33
Price received(Rs per Kg)	526.67	41.28	22.66	42.25
Gross Returns**	17269.63	21934.96	17138.51	22823.49
Net return over cost A	8985.78	7689.70	10248.02	6129.22
Net Return Over Cost C	2987.96	1871.44	4327.70	2301.07
Net return Over excluding owned land rent & imputed Value	8534.29	7151.10	9982.28	7870.07
Input-out ratio over cost A	2.08	1.54	2.49	1.59
Input-output ratio over cost C	1.21	1.09	1.34	1. 11
Input-output ratio excluding owned land rent and imputed labour cost	2.02	1.48	2.39	1.53

Source: Household Survey, **Note:** *Paddy productivity calculated in bagas, I bag = 75kgs,**The gross value of product is calculated on the basis of prevailed local village market prices., which is Included paddy straw and the tobacco seed[7] value.

TABLE: 6. LABOUR MANDAYS IN TOBACCO AND PADDY CROP CULTIVATION

(Per Acre)

Operation	Tobacco			Paddy		
	Male	Female	Total	Male	Female	Total
Applying Manure	2	---	2(2.04)**	I	---	1(1.61)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Ploughing	6	---	6(6.12)**	7	---	7(11.29)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Applying Fertilizers	2	---	2(2.04)**	2	---	2(3.23)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Transplantation& gap	6	7	13(13.27)**	1	10	11(17.74)**
filling	(46.15)*	(53.85)*	(100.0)*	(9.09)*	(90.91)*	(100.0)*
Plant protection &	---	6	6(6.12)**	---	8	8(12.90)**
weedout		(100.0)*	(100.0)*		(100.0)*	(100.0)*
Pumping pesticides	6	---	6(6.12)**	5	---	5(8.06)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*

TABLE: 6. LABOUR MANDAYS IN TOBACCO AND PADDY CROP CULTIVATION—*CONTD.*

(Per Acre)

Operation	Tobacco			Paddy		
	Male	Female	Total	Male	Female	Total
Depestation with hand	---	5	5(5.10)**	---	---	---
		(100.0)*	(100.0)*			
Plucking	---	---	---	3	---	3(4.84)**
				(100.0)*		(100.0)*
Harvesting/Reaping	7	21	28(28.57)**	I	9	10(16.13)**
	(25.0)*	(75.0)*	(100.0)*	(10.0)*	(90.0)*	(100.0)*
Curing	15	---	15(15.31)**	---	---	---
	(100.0)*		(100.0)*			
Grading	2	13	15(15.31)**	3	2	5(8.06)**
	(13.33)*	(86.67)*	(100.0)*	(60.0)*	(40.0)*	(100.0)*
Threshing	---	---	---	6	4	10(16.13)**
				(60.0)*	(40.0)*	(100.0)*
Total	46	52	98(100.0)**	29	33	62(100.0)**
	(46.94)*	(53.06)*	(100.0)*	(46.77)*	(53.23)*	(100.0)*

Source : E-Household Survey. **Note :** *Figures in the parenthesis indicates the percentage share in the respective operation mandays ** indicates the percentage share of respective operation in total mandays. I man day= 8 working hours.

TABLE: 7. LABOUR WAGES IN TOBACCO AND PADDY CROP CULTIVATION IN DIFFERENT OPERATION

(Rs./day)

Operation	Tobacco				Paddy			
	Male	Female	Average	F/M ratios (%)	Male	Female	Average	F/M ratios (%)
Applying Manure	50.00	---	50.00	---	50.00	---	50.00	---
Ploughing	100.00	---	100.00	---	110.00	---	110.00	---
Applying Fertilizers	50.00	---	50.00	---	50.00	---	50.00	---
Transplantation	55.00	50.00	52.31	90.90	60.00	50.00	50.91	83.33
Gap filling	55.00	50.00	52.31	90.90	---	---		---
Plant protection & Weeding	---	35.00	35.00	---	---	40.00	40.00	---
Applying pesticides	100.00	---	100.00	---	100.00	---	100.00	---
Plucking	---	---	---	---	70.00	---	70.00	---
Depestation with hand	---	35.00	35.00	---	---	---	---	---
Harvesting	100.00	100.00	100.00	100.00	---	---	---	---
Reaping	---	---	---	---	80.00	80.00	80.00	100.00
Heaping	---	---	---	---	70.00	55.00	64.00	78.57
Threshing	---	---	---	---	70.00	55.00	64.00	78.57
Curing	95.00	---	95.00	---	---	---		---
Grading	65.00	30.00	34.67	46.15	---	---		---
Average	86.63	62.02	73.57	71.59	82.76	56.67	68.87	68.47

Source: Household Survey.

[7]After the harvesting of tobacco crop, some farmers use to sell the straw and seeds(by-product) and some are not, the value of seeds is meager, even though it is also included in the total returns value.

TABLE: 8. LABOUR MANDAYS IN TOBACCO, BENGALGRAM AND PLANT CROP CULTIVATION

(Per Acre)

Operation	Tobacco			Benaalaram			Plants		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Applying Manure	I	---	1(1.01)**	2	---	2(4.44)* *	I	---	1(2.38)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Ploughing	6	---	6(6.06)**	5'	---	5(11.11)**	6	---	6(14.28)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Applying Fertilizers	2	---	2(2.02)**	3	---	3(6.67)**	I	---	1(2.38)**
	(100.0)*		(100.0)*	(100.0)*		(100.0)*	(100.0)*		(100.0)*
Transplantation &	6	7	13(13.13)**	---	---	---	5	6	1 1(26.19)* *
gap filling	(46.15)*	(53.85)*	(100.0)*				(45.45)*	(54.54)*	(100.0)*
Sowing seeds	---	---	---	3	---	3(6.67)**	---	---	---
				(100.0)*		(100.0)*			
Plant protection &	---	5	5(5.05)**	---		I111(24.44)**	---	8	8(19.05)**
weedout		(100.0)*	(100.0)*		(100.0)*	(100.0)*		(100.0)*	(100.0)*
Pumping pesticides	7	---	7(7.07)**	3	---	3(6.67)**	---	---	---
	(100.0)*		(100.0)*	(100.0)*		(100.0)*			
Depestation	---	7	7(7.07)**	---	---	---	---	---	---
with hand		(100.0)*	(100.0)*						
Harvesting/Reaping	8	20	28(28.28)* *	---	9	9(20.0)**	10	5	15(35.71)**
	(28.57)*	(71.43)*	(100.0)*		(100.0)*	(100.0)*	(66.67)*	(33.33)*	(100.0)*
Curing	16	---	16(16. 16)* *	---	---	---	---	---	---
	(100.0)*		(100.0)*						
Grading	2	12	14(14.14)* *	---	---	---	---	---	---
	(14.29)*	(85.71)*	(100.0)*						
Threshing	---	---	---	5	4	9(20.0)**	---	---	---
				(60.00)*	(40.00)*	(100.0)*			
Total	48	52	99(100.0)* *	21	24	45(100.0)**	23	19	42(100.0)**
	(48.48)*	(52.52)*	(100.0)*	(46.67)*	(53.33)*	(100.0)*	(54.76)*	(45.24)*	(100.0)*

Source: *Household Survey,* ***Note:*** ** Figures m the parenthesis indicate the pet centage share in the respecttve operation mandays*

*** indicates the percentage Share of respective operation in total mandays. I man day= 8 working hours.*

TABLE: 9. WAGES IN TOBACCO, BENGALGRAM AND PLANT FIELDS IN JAYAVARAM

(Rs./Day)

Operations/Crop	Tobacco				Bengalgram				Plants			
	Male	Female	Average	F/M ratio	Male	Female	Average	F/M ratio	Male	Female	Average	F/M ratio
Applying Manure	70.00	---	70.00	---	70.00	---	70.00	---	70.00	---	70.00	---
Ploughing	110.00	---	110.00	---	110.00	---	110.00	---	110.00	---	110.00	---
Applying Fertilizers	70.00	---	70.00	---	70.00	---	70.00	---	70.00	---	70.00	---
Transplantation/ sowing seeds	60.00	55.00	57.31	91.67	75.00	---	75.00	---	60.00	55.00	57.27	91.66
Gap filling	60.00	55.00	57.31	91.67	---	---	---	---	60.00	55.00	57.27	91.66
Plant Protection /weedout	---	40.00	40.00	---	---	40.00	40.00	---	---	40.00	40.00	---
Pumping pesticides	110.00	---	110.00	---	100.00	---	100.00	---	---	---	---	---
Depestation with hand	---	40.00	40.00	---	---	---	---	---	---	---	---	---
Harvesting	110.00	110.00	110.00	100.00	---	60.00	60.00	---	100.00	90.00	96.67	90.00
Threshing	---	---	---	---	80.00	70.00	75.56	87.50	---	---	---	---
Curing	100.00	---	100.00	---	---	---	---	---	---	---	---	---
Grading	70.00	35.00	40.00	50.00	---	---	---	---	---	---	---	---
Average	96.25	56.25	81.87	58.44	86.90	52.50	68.56	60.41	90.42	57.00	75.23	63.04

Source **:** Household Survey

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.

AGRO-ECONOMIC RESEARCH

Effect of Mechanization on Agricultural Growth and Comparative Economics of Labour and Machinery in Bihar

Introduction

Traditionally, Indian farmers relied on equipments, which were simple and could be easily fabricated by village craftsmen. Since introduction of mechanical power, agricultural engineering started gaining importance and thus; organized professional activities started. Though farm mechanization is increasing in India, it is mostly region specific. Besides the region specificity, the growth of agricultural mechanization is mainly hindered by the impediment of .decreasing trend in operational land holdings. One of the major factors for poor response of farmers towards mechanization may be that mechanization of small and contiguous groups of land is found to be against economics of scale. Having understood the conformity of farm mechanization with increased production level at lower costs of production; in course of time policy efforts have been made by the Government of India. In addition to two Central Sector Schemes (namely; (i) Promotion and Strengthening of Agricultural Mechanization through Training, Testing and Demonstration, and; (ii) Post-harvest Technology and Management during the 11 th Plan Period programmes like; MMA, RKVY, NHM and NFSM are also being implemented for promotion of mechanization. In the above backdrop and based on the primary survey of 100 farmers randomly chosen (50 each from high and low mechanized villages/ strata), this study seeks to study the effects of mechanization on agricultural growth and comparative economics of labour and machinery in Bihar.

While the secondary data sources and information provide the breadth of effects of mechanization in agricultural sector as a whole, the primary data based inputs provide the depth. We are sure that the Policy Makers; Agricultural Scientists, scholars, practitioners and officers of Agriculture and allied departments will find this study useful for their purposes.

Reference Period

Reference period of secondary data used in this study is 2001-02 to 2009-10. For primary data, it was 2008-09 to 2010-11.

Mechanization Programmes and Trends of Mechanization in Bihar

In Bihar, agricultural sector is faced with mainly four key challenges: (i) nano size of land holdings, (ii) low yields and high risks, (iii) biotic and abiotic constraints in raising crop yields, and; (iv) weak institutions accompanied by poor infrastructure. As far as efforts of the Government to promote and strengthen mechanization in agricultural sector are concerned since the year 2009-10 during the 11th Five Year Plan, i.e., agricultural machines, tools and equipments are being made available to farmers on subsidy basis mainly under the six schemes/programmes, viz., (i) MMA, (ii) ISOPOM, (iii) Jute Technology Mini Mission - Il, (iv) NFSM,-(v) RKVY, and; (vi) State Plan on Power Tiller Promotion Scheme. Range of subsidy' on agricultural machineries/fmplements being very wide (from Rs. 3,000 only on conoweeder to Rs. 30,000/- only meant for rotavator). As small implements were distributed largely, which had led in exceeding of physical targets in some years, so big machines could be distributed in less than targeted numbers.

Share of cost of human labour as percentage of operational cost was found higher in case of paddy. Cost of bullock labour as percentage of operational cost and machine labour as percentage of the same were found higher in cases of lentil and wheat respectively.

Further, higher shares of the cost of human labour and cost of bullock labour to total cost were found for paddy respectively. Cost of machine labour to total cost could be seen the higher in case of wheat and lower for paddy.

It is interesting to have the determinate observation that the share of machinery cost in regard to value of production was higher in case of paddy for human labour, the same for bullock labour and machine labour in case of wheat. Data reveals higher share of cost of human labour for maize, cost of bullock labour for lentil and cost of machine labour for paddy' as percentage of value of production. The most interesting and substantial facts revealed here, are that shares of cost of (i) human, (ii) bullock, and; (iii) machine labour as percentage of value of production were minimum or the lowest for pulse crops only.

As far growth of costs in human labour, bullock labour and machine labour in the year 2008-09 as compared to 1996-97 is concerned maximum increase in human labour was observed in case of wheat, higher decline in bullock labour was seen in case of gram and higher increase in machine labour was found in paddy. The growth of

* A.E.R.C. for Bihar & Jharkhad, T.M. Bhagalpur University, Bhagalpur-812007

production during the period (in percentage terms) was quite higher in value of production terms for wheat. Like the growth of costs scenario quite higher increase in machinery cost was observed in case of paddy again.

Demographic Profile and Cropping Pattern

It can be circumstantiated that surveyed farmers belonging to .medium farm size class had higher average number of adult family members, whereas in regard to male members, small farmers' class was ahead. In regard to illiteracy, education levels up to primary and secondary and above sample marginal farm households were ahead. This could be due to their larger number in the sample. In percentage terms, on the parameter of education of the head of the family large sample households were at top having secondary and above qualification. On average (total) of educational front, medium farmers were ahead. As far percentage distribution of adult educated sample farmers is concerned, small farm size class was at top. Marginal size class had maximum number of SCs & OBCs households. There were no ST farm households in the sample. Percentage distribution of caste composition shows small farm households dominated by OBC, marginal by SC and large by the members of other castes. Higher average areas having irrigation facility were found in case of large and medium farms. In regard to unirrigated areas also, these two farm size classes were ahead. As far percentage distribution of irrigated area is concerned, in regard to total irrigated and total unirrigated areas medium & small and marginal & large respectively were ahead. No canal and tank irrigation was found in the area of study. There was a little fall in Crop Duration Index (CDI) in the year 2010-11 as compared to 2008-09. However, as a result of scanty rainfall in the year 2009-10, there was a clearly revealed decline in CDI. Paddy, wheat and maize were the main cereals grown by the sample households, whereas under pulse crops, lentil, moong and gram got good shares of areas in cropping pattern during the three years.

Costs of Mechanization

The analysis causes to lead the finding that wheat incurred maximum input costs on seed and irrigation. In regard to organic manure and fertilizer maize was ahead. Wheat also cornered maximum amount as cost on pesticides/ weedicides. It is revealed that level of mechanization in the forms of tractor and harvest combine/ carriage cost was higher in wheat than paddy and other crops, In percentage terms, distribution of input costs, in regard to hired labour (bullock and manual taken together), and hired machinery costs (including tractor and harvest combine) paddy and wheat respectively were ahead. As the harvest combine machine was made available for service/use of farmers in mechanized villages after the establishment of Farm Mechanization Bank in Mohanpur village of Shahkund block in the year 2010, so we have actually considered expenditures incurred on carriage of large quantum of harvested grains by tractors under the above noted head.

Here it could be noted that maximum and minimum percentages of machinery costs to value of output and same to marketed surplus were meant for wheat and gram. But, in percentage terms of marketed surplus to value of output paddy was at top and wheat at the bottom suggesting that retention of wheat was higher in this region of the state. Percentages of mechanization costs to value of output were also lower in case of lentil and paddy as compared to maize and wheat.

Data in tables demonstrate that in quantitative terms, the operation of ploughing cornered higher per hectare costs. In context of manually and power operated costs of mechanization, sowing were ahead. In case of power and tractor operated costs of mechanization irrigation and transportation and marketing shared maximum expenditures.

In quantitative terms (on aggregate level) higher cost of mechanization was computed for the operation of ploughing and lower being for threshing. Minimum percentages of the costs of mechanization were found in animal operated activities for threshing, manually operated activities of sowing and the lower in case of ploughing by tractor operated machines.

Pattern of Mechanization

Before going to conclusions it is envisaged that most of the sample households owned manual and animal operated machines. Ownership of machinery operation wise also revealed larger percentages of manually operated machines/ tools used in the activities like: sowing weeding, plant protection and harvesting. For irrigation, cen-per-cent of the farm households used pump sets mostly diesel run, either owned by them or on custom hiring basis. Animal and manually operated machines/ devices were used by most of the farmers for (i) threshing, (ii) weeding, and; (iii) harvesting respectively, whereas tractor was operated prominently for ploughing purposes. While ploughing and harvesting were. the main operations, where animal and manually operated machines were employed for larger hours of time usage, there, on the other hand, irrigation and ploughing were ahead by power and tractor operated machines respectively. In percentage terms, operations like: (i) weeding, (ii) plant protection, and: (iii) harvesting shared longer hours of usage by manually operated devices. Longer time and larger total costs (in absolute number and percentage both) could be seen in ploughing and seed-bed preparation by animal operated machines. There is sufficient data to believe that adoption of mechanized practices in operations like sowing and planting were very low in case of surveyed farmers. It was seen that cent-per-cent irrigation operation was performed by diesel pump sets. However, weeding and inter-culturing activities were undertaken cent-per-cent by manually operated devices. Both of these operations took equally large hours of time usages. Cent-per-cent of the plant protection equipments

were used, which were manually operated and it took (all in total) 16 hours of time per hectare of cropped area. Operation of harvesting needed quite longer hours of time than plant protection, irrigation, sowing and planting and ploughing & seed-bed preparation. It was wholly performed by manual sickle. Even having used paddy thresher by cent-per-cent of the sample households, it had to be given maximum number of hours. General observation is also revealed here that more time was devoted containing quite higher percentage of the total usage in transporting the agricultural produces for marketing by animal operated means of conveyance. Per hour cost incurred in machine driven device was higher than that of animal operated device.

Farmers' Perceptions

The analysis related to farmers' perceptions has been made in absolute and percentage terms. The factors for which farmers' perception have been obtained contained: (i) economical, (ii) quicker operations, (iii) reduction in drudgery, and; (iv) any other. For measuring the intensity of perception, ranking (viz., Rank - I, Rank-Il and Rank - Ill) has been taken into consideration.

Quicker operation, economical and quicker operations again were considered main reasons by the farmers for the use of machinery revealed in the form of getting Rank - I, Il & III respectively. In percentage terms also, the scenario was similar. Irrigation and ploughing related operations were the main for which machines were widely used. For all the three ranks, these operations were prominent. In the study area, tractor operated plough and then animal operated plough were reported as most appropriate machines/ devices for this purpose. It was observed that manually and animal operated seed drills were the most appropriate sowing and planting machines by the sample households. Cent-per-cent surveyed farm households pronounced diesel pump set to be the most appropriate machine for irrigation. Farmers' perception towards manually operated weeding and inter-culture machines to be highly suitable was in consonant with earlier data showing number of farmers using machineries. Among plant protection equipments, manually operated machine was considered as appropriate one by larger proportion of farmers. No other machine except self propelled reaper was described as appropriate as sickle for harvesting by the sample farmers.

Power operated thresher was perceived as most appropriate machine for threshing. Though quite large number of sample households used manual and animal operated devices for this purpose. For marketing and transportation tractor trolley like: device/machine was perceived as the most appropriate means. Main revealed problem in case of animal operated plough and tractor plough were expensive to hire and expensive to purchase respectively. Hire facility not available and expensive to hire in case of tractor driven seed-cum-fertilizer drill respectively were noted as major problems by surveyed farmers. While expensive to hire and hire facility not available in case of manually operated weeding and inter-culture machines respectively were the major problems as perceived by the farmers. In regard to irrigation related problems; (i) expensive to purchase, (ii) expensive to hire, (iii) repair and service facilities expensive, and; (iv) high maintenance cost were experienced as low and middle ranking major problems. In case of plant protection machineries used problems of hiring facility not available and expensive to hire were major but low ranking problems. Hire facility not available (in case of manual sickle), particularly when labourers were not available in desired 'number, non- availability of paddy thresher on time and expensive to hire bullock driven cart marketing means of transportation have been reported as major problems. Better land utilization and reduced drudgery were the two prominently reported answers in response to usefulness of machineries. It was interesting to note that majority of the total farmers surveyed were though not aware of all the government programmes and types of assistance being provided, however, some of them did receive assistance of one kind or the other under some of programmes/ schemes. Quite lower percentage of total farmers surveyed didn't find the programme useful, as they were not even aware about most of the farm mechanization initiatives. However, a little less than half of the total farm households surveyed found the programmes/ schemes useful. It is clearly revealed that whatever increases in production were observed in regard to paddy, wheat and gram had caused as a result of mechanization. Conclusively, positive effects of mechanization on agricultural growth, and comparative economics of labour and machinery are there. Its adjacency to actual contribution needs to be examined separately.

Action points

On the basis of analytical discussions, and secondary and primary data based observations made through the preceding six chapters, the following Action Points can be appropriately suggested:

1. Higher costs of mechanized farming, particularly in wheat, are due to good number of irrigation and threshing operations. It could be reduced to some extent by exploring and developing low cost irrigation infrastructure. *(Attn: Department of Water Resources, Government of Bihar, Director-Cum-Dean, Research, "Bihar Agricultural University, Sabour, (Bhagalpur)" RAU, PUSA (Samastipur) and WALMI (Patna).*

2. Zero tillage (particularly in wheat), saves about 1 and half hour of time required for preparing one hectare of land. It also helps in reducing the consumption of diesel by about 20 litres required in

sowing wheat/hectare of land. So, 'zero tillage method' needs to be popularized and promoted. *(Attn: Directorate of Agricultural Extension, Government of Bihar).*

3. In the areas/ regions of low agricultural mechanization, emphasis should be given on establishing Farm Machinery Banks on district/ commissionery level. *(Attn: Ministry of Agriculture, Government of India & Department of Agriculture, Government of Bihar).*

4. In view of increasing number of farmers willing to adopt mechanization in their agricultural operations, the areas/regions where 'Farm Mechanization Banks' are already in existence, the number of particular type of machines/implements should be increased. *(Attn: Director, Agriculture, Government of Bihar and Ministry of Agriculture, Government of India).*

5. As 'Power tillers or 2WTs (two-wheel tractors)' perform the same tasks as' '4WTs,' and these are more effective and desirable for marginal and small holdings, so use of 'Power Tillers (PTs)' needs to be assisted and promoted. *(Attn: Department of Agricultural Extension, Directorate of Agriculture, Government of Bihar, NABARD and Other Public Sector Banks).*

6. Even farmers with small holdings wish to use selected improved farm equipments through custom hiring to increase productivity and to reduce 'cost of production.' So, demonstration and on the field training should be given/ arranged on regular intervals in regard to uses of machine and animal drawn steel plough, disc harrow/cultivators, seed drill, row planter, etc. *(Attn: Directorate of Extension, Government of Bihar).*

7. With a view to overcome the problems of scarcity of capital and/resource to hire machines/ tools, Users group or Farmers Co-operative Societies should be formed under mechanization schemes. Further, it should be linked with banks through Micro finance lending. *(Attn: Ministry of Agriculture, Government of India, NABARD, Department of Institutional Finance, Government of Bihar).*

8. In comparatively low mechanized villages/areas, some of the prominent impediments were non-availability of assured sources of irrigation and very poor power supply position, particularly for agricultural operations. To remove these constraints, separate electricity feeders for rural areas be given on priority basis. *(Attn: Department of Water Resources, Government of Bihar, and Bihar State Power Holding Company Ltd. (BSPHCL), Patna.*

9. Mechanized practices in agricultural operations (particularly sowing, planting, etc.) have crept in. But, its level is very low. So, there is need to make farmers more responsive towards mechanization of agriculture by suitably explaining and properly training them about the comparative advantages and usage of agricultural tools, machineries and equipments. *(Attn: Directorate of Agriculture Extension, Government of Bihar).*

10. No use or limited uses of Harvester combine, thresher and other machines/ implements were the result of non-familiarity of farmers with these machines and lack of technical knowledge about how to operate them. So, on regular intervals, trainings to operate those machines/ implements need to be urgently given. *(Attn: Directorate of Agricultural Extension, Government of Bihar).*

11. To expand the purview of Agricultural mechanization, "Rice-rubber Houlier Sail-arm Machine and facility of laser leveler (on hiring basis) should be made available. *(Attn: Directorate/ Division of Extension, Agricultural Engineering, Directorate of Agriculture, Government of Bihar).*

12. Tractor for "Farm Machineries Bank" should be made available on permanent basis. *(Attn: Directorate of Agriculture, Government of Bihar.*

13. With a view to promote mechanization in agriculture in less mechanized areas of Bhagalpur, Banka and Munger districts, unchecked excavation of sand, particularly from the bed of river Chandan and construction of check dams at some points in this river, need to be strictly stopped and constructed respectively, so that adequate irrigation is ensured during all seasons. *(Attn: Departments of Mines and Water Resources, Government of Bihar).*

14. In view of the lower share of machine labour costs of incurred in pulse crops as percentage of values of their production, greater emphasis needs to be given for promoting mechanized practices in cultivation of pulses. *(Attn: Ministry of Agriculture, Government of India, Department of Agriculture, Government of Bihar).*

COMMODITY REVIEWS
Foodgrains

During the month of Feb, 2014 the Wholesale Price Index (Base 2004-05=100) of pulses, declined by 0.65%. Cereals and Foodgrains increased by 0.30%, 0.09% and respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of February, 2014	WPI for the Month of January, 2014	WPI A year ago	Percentage change during	
					A month ago	A year ago
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	231.5	229.9	203.7	0.70	13.65
Wheat	1.116	220.7	220.9	207.2	-0.09	6.52
Jowar	0.096	261.2	253.1	237.3	3.20	10.07
Bajra	0.115	252.9	255.2	257.5	-0.90	-1.79
Maize	0.217	241.3	246.1	249.3	-1.95	-3.21
Barley	0.017	217.8	221.1	215.8	-1.49	0.93
Ragi	0.019	317.7	321.6	337.3	-1.21	-5.81
Cereals	3.373	230.6	229.9	211.4	0.30	9.08
Pulses	0.717	227.9	229.4	237.7	-0.65	-4.12
Foodqralns	4.09	230.1	229.9	216.0	0.09	6.53

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 Fabruary, 2014.

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Rice	Rising Steady& Falling	Haryana	A.P.		Assam
.		U.P.	Jharkhand	.	Kerala
Wheat	Rising	Haryana Jharkhand M.P. U.P.	Gujarat Karnataka	Rajasthan	
Jowar	Mixed	Rajasthan		A.P. Gujarat Maharashtra	Karnataka
Bajra	Rising, Falling & Mixed	Gujarat	A.P.	Haryana	
		Maharashtra	Kamataka	Rajasthan	
Maize	Rising & Mixed	A.P.	Kamataka	Haryana	Rajasthan
		Jharkhand		U.P.	

Procurement of Rice

3.61 million tonnes of Rice (including paddy converted into rice) was procured during February, 2014 as against 4.05 million tonnes of rice (including paddy converted into rice) procured during February, 2013. The total procurement of Rice in the current marketing season i.e. 2013-2014, up to 28-02-2014 stood at 24.58 million tonnes, as against 26.80 million 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 2013-14 (up to 28-02-2014)		Corresponding Period of last Year 2012-13		Marketing Year (October-September) 2012-13		2011-12	
	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	3047	12.40	3504	13.07	6464	19.00	7548	21.53
Chhatisgarh	5337	21.71	4789	17.87	4804	14.12	4115	11.74
Haryana	2396	9.75	2597	9.69	2609	7.67	2007	5.72
Maharashtra	114	0.46	166	0.62	192	0.56	190	0.54
Punjab	8106	32.98	8558	31.93	8558	25.16	7731	22.05
Tamil Nadu	587	2.39	250	0.93	481	1.41	1596	4.55
Uttar Pradesh	934	3.80	1890	7.05	2286	6.72	3357	9.58
Uttarakhand	305	1.24	337	1.26	497	1.46	378	1.08
Others	3755	15.28	4713	17.58	8129	23.89	8138	23.21
Total	**24581**	**100.00**	**26804**	**100.00**	**34020**	**100.00**	**35060**	**100.00**

Source : Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2013–2014 up to August, 2013 is 25.09 million tonnes against a total of 38.11 million tonnes of wheat procured during last year. The details are given in the following table:

PROCUREMENT OF WHEAT

(in thousand tonnes)

State	Marketing Season 2013-14 (up to 01-08-2013)		Corresponding Period of last Year (2012-13)		Marketing Year (April-March) 2012-13		2011-12	
	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	5873	23.41	8666	22.74	8665	22.71	6928	24.45
Madhya Pradesh	6355	25.33	8507	22.32	8493	22.26	4965	17.52
Punjab	10897	43.43	12836	33.68	12834	33.64	10958	38.67
Rajasthan	1268	5.06	1964	5.15	1964	5.15	1303	4.60
Uttar Pradesh	683	2.72	5063	13.29	5063	13.27	3461	12.21
Others	16	0.06	1071	2.81	1129	2.96	720	2.54
Total	**25092**	100.00	**38107**	100.00	**38148**	100.00	**28335**	100.00

Source: Department of Food and Public Distribution.

Commercial Crops

Oil Seeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 203.7 in February, 2014 showing an increase of 0.7 percent over the previous month. However, it declined by 0.3 percent over the previous year. The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Copra (4.0 percent), Cotton Seed (3.9 percent), Soya bean (3.4 percent) and Groundnut seed (0.9 percent) increased over the previous month. However, the WPI of Safflower Seed (1.5 percent), Gingelly seed (1.9 percent), Sunflower Seed (2.4 percent), Rape & Mustard Seed (3.0 percent) and Niger seed (3.4 percent) decreased over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 146.6 in February, 2014 showing a fall of 0.3 percent and 1.7 percent over the previous month and over the previous year. The WPI of Soyabean Oil (0.1 percent), Groundnut Oil (0.6 percent), Copra Oil (0.7 percent), Gingelly oil (1.3 percent), Sunflower Oil (1.8 percent) and Mustard Oil (2.1 percent) decreased over the previous month. However, the WPI of Cottonseed oil (0.7 percent) increased over the previous month.

Fruits & Vegetable: The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 203.6 in February, 2014 showing a fall of 2.6 percent over the previous month. However, it increased by 7.2 percent over the previous year .

Potato: The Wholesale Price Index (WPI) of Potato stood at 172.3 in February, 2014 showing a fall of 13.2 percent over the' previous month. However, it increased by 8.4 percent over the previous year.

Onion: The Wholesale Price Index (WPI) of Onion stood 302.0 in February, 2014 showing a fall of 11.6 percent and 20.1 percent over the previous month and over the previous year.

Condiments & Spices: The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 265.6 in February, 2014 remained unchanged over the previous month. However, it increased by 20.7 percent over the previous year. The WPI of Black Pepper and Turmeric increased by 1.2 percent and 1.4 percent over the previous month. However, the WPI of Chillies (Dry) declined by 2.5 percent over the previous month.

Raw Cotton: The Wholesale Price Index (WPI) of Raw Cotton stood at 244.2 in February, 2014 showing an increase of 0.8 percent and 20.9 percent over the previous month and over the previous year.

Raw Jute: The Wholesale Price Index (WPI) of Raw Jute stood at 272.9 in February, 2014 showing a fall of 0.3 percent over the previous month. However, it increased by 7.4 percent over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF FEBRUARY, 2014

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation Over	
	Feb., 2014	Jan., 2014	Feb., 2013	Month	Year
OIL SEEDS	**203.7**	**202.2**	**204.3**	**0.7**	**-.3**
Groundnut Seed	195.5	193.7	265.9	0.9	-26.5
Rape & Mustard Seed	186.9	192.7	209.0	-3.0	-10.6
Cotton Seed	182.6	175.8	164.0	3.9	11.3
Copra (Coconut)	143.9	138.4	95.6	4.0	50.5
Gingelly Seed (Sesamum)	464.1	473.0	374.7	-1.9	23.9
Niger Seed	171.7	177.8	182.4	-3.4	-5.9
Safflower (Kardi Seed)	151.2	153.5	150.4	-1.5	0.5
Sunflower	191.8	196.5	188.1	-2.4	2.0
Soyabean	227.9	220.5	199.0	3.4	14.5
EDIBLE OILS	**146.6**	**147.1**	**149.1**	**-0.3**	**-1.7**
Groundnut Oil	172.0	173.0	197.0	-0.6	-12.7
Cotton Seed Oil	185.4	184.2	175.1	0.7	5.9
Mustard & Rapeseed Oil	155.8	159.2	154.2	-2.1	1.0
Soya bean Oil	158.4	158.6	163.9	-0.1	-3.4
Copra Oil	123.3	124.2	115.2	-0.7	7.0
Sunflower Oil	125.9	128.2	142.1	-1.8	-11.4
Gingelly Oil	185.7	188.2	196.1	-1.3	-5.3
FRUITS & VEGETABLES	**203.6**	**209.0**	**190.0**	**-2.6**	**7.2**
Potato	172.3	198.6	159.0	-13.2	8.4
Onion	302.0	341.6	377.8	-11.6	-20.1
CONDIMENTS & SPICES	**265.6**	**265.7**	**220.1**	**0.0**	**20.7**
Black Pepper	610.6	603.5	538.9	1.2	13.3
Chillies (Dry)	293.8	301.4	251.6	-2.5	16.8
Turmeric	216.1	213.1	185.3	1.4	16.6
Raw Cotton	**244.2**	**242.3**	**202.0**	**0.8**	**20.9**
Raw Jute	272.9	273.6	254.2	-0.3	7.4

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

STATISTICAL TABLES

Wages

I. Daily Agricultural Wages in some States (Category-wise)

(In Rupees)

State/Distt.	Centre	Month & Year	Daily Normal Working Hour	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
										Carpenter	Black Smith	Cobbler
				M	W	M	W	M	W	M	M	M
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Andhra Pradesh												
Krishna	Ghantasala	May., 2013	8	250	150	NA	NA	NA	NA	NA	NA	NA
Guntur	Tadikonda	May., 2013	8	NA	NA	NA	NA	NA	200	NA	NA	NA
Rangareddy	Arutla	May, 2013	8	225	175	NA	NA	NA	NA	NA	NA	NA
Karnataka												
Bangalore	Harisandra	Spe., 13	8	250	200	200	175	200	180	350	250	NA
Tumkur	Gedlahali	Spe., 13	8	170	160	175	165	175	165	200	190	NA
Maharashtra												
Nagpur	Mauda	Feb., 2012	8	100	100	NA	NA	NA	NA	NA	NA	NA
Ahmednagar	Akole	Feb, 2012	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand												
Ranchi	Gaintalsood	April, 2012	8	100.00	100.00	NA	90	90	NA	58	58	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	Plough-ing	Sow-ing	Weed-ing	Harvest-ing	Other Agri. Labour	Herds-man	Skilled Labour		
											Car-penter	Black-smith	Cob-bler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Assam													
Barpeta	Loharapara	March, 12	M	8	180.00	180.00	180.00	180	180		180.00	180.00	180.00
			W	8	NA	NA	160.00	160	160	NA	NA	NA	NA
Bihar													
Muzaffarpur	Bhalui Rasul	April to,	M	8	130.00	120.00	80.00	130	150	120	200.00	180.00	250.00
		June, 2012	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shekhpura	Kutaut	May and	M	8	NA	NA	185.00	NA	185.00	NA	245.00	NA	NA
		June, 2012	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh													
Dhamtari	Sihaba	Oct, 2013	M	8	NA	NA	NA	100	80	80	250	100	80
			W	8	NA	NA	NA	80	70	80	150	80	NA
Gujarat													
Rajkot	Rajkot	Jan., 2013	M	8	209	225	150	170	147	150	360	360	240
			W	8	NA	169	150	179	145	142	NA	NA	NA
Dahod	Dahod	Jan., 2013	M	8	100.00	100	100.00	100.00	100	NA	200.00	144.00	150
			W	8	NA	100	100.00	100.00	100	NA	NA	NA	NA
Haryana													
Panipat	Ugarakheri	Dec., 2013	M	8	300	300	300	300	300	NA	NA	NA	NA
			W	8	NA	250	200	250	250	NA	NA	NA	NA

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

(In Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Himachal Pradesh													
Mandi	Mandi	Sep., 13	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kerala													
Kozhikode	Koduvally	Nov., 2013	M	4 to 8	920.00	550.00	NA	550.00	710.00	NA	650.00	NA	NA
			W	4 to 8	NA	NA	450	450	500	NA	NA	NA	NA
Palakkad	Elappally	Nov, 2013	M	4 to 8	400	350	NA	400	400	500	NA	NA	NA
			W	4 to 8	NA	NA	250	300	250	NA	NA	NA	NA
Madhya Pradesh													
Hoshangabad	Sangarkhera	Dec.. 2013	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Satna	Kotar	Dec.. 2013	M	8					—NA—				
			W	8									
ShyopurKala	Vijaypur	Dec. 2013	M	8	NA	200	200	NA	NA	NA	250	250	NA
			W	8	NA	200	200	NA	NA	NA	NA	NA	NA
Odisha													
Bhadrak	Chandbali	Jan, 2014	M	8	180	130	130	250	216.66	150	350	200	200
			W	8	NA	120	120	200	180	140	NA	NA	NA
Ganjam	Aska	Jan, 2014	M	8	250	200	200	200	225	200	350	350	200
			W	8	NA	150	150	100	1400	100	NA	NA	NA
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	NA	NA	90	95	NA	99.44	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan													
Barmer	Vishala	Nov., 2013	M	8	300	300	NA	NA	NA	100	400	225	300
			W	8	300	300	NA	NA	NA	NA	NA	225	NA
Jalore	Panwa	Nov, 2013	M	8	NA	NA	NA	NA	NA	200	350	300	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
*Tamil Nadu**													
Thanjavur	Pulvarnatham	Sept, 2013	M	8	257	294	NA	300	297.93	NA	NA	NA	NA
			W	8	NA	NA	119.29	112.5	126.43	NA	NA	NA	NA
Tirunelveli	Malayakulam	Sept, 2013	M	8	NA	NA	NA	300	388.71	NA	NA	NA	NA
			W	8	NA	NA	140	132	NA	NA	NA	NA	NA
Tripura													
State average			M	8	238	201	203	209	207	199	253	235	240
		March, 12	W	8	NA	154	152	154	154	149	NA	NA	NA
*Uttar Pradesh**													
Meerut	Ganeshpur	Jan., 2013	M	8	205	207	206	204	206	NA	320	NA	NA
			W	8	NA	180	180	180	180	NA	NA	NA	NA
Aurraiya	Aurraiya	Jan., 2013	M	8	150	193	192	150	193	NA	300	NA	NA
			W	8	NA	160	167	120	167	NA	NA	NA	NA
Chandauli	Chandauli	Jan., 2013	M	8	150	150	125	125	125	NA	271	NA	NA
			W	8	NA	150	125	125	125	NA	NA	NA	NA

M-Man W-Woman

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

*- States reported district average daily wages

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Feb.-14	Jan.-14	Feb.-13
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	-	-	1500
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1645	1630	1545
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1755	1823	1568
Jowar	—	Quintal	Maharashtra	Mumbai	2650	2600	2300
Gram	No III	Quintal	Madhya Pradesh	Sehore	2531	2440	-
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1360	1400	1420
Gram Split	—	Quintal	Bihar	Patna	4570	4615	5300
Gram Split	—	Quintal	Maharashtra	Mumbai	4800	4800	6900
Arhar Split	—	Quintal	Bihar	Patna	6640	6650	5650
Arhar Split	—	Quintal	Maharashtra	Mumbai	7000	6800	6550
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6345	6340	5600
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	6330	6400	5800
Gur	—	Quintal	Maharashtra	Mumbai	3500	3500	3350
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	—	4200	3200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2320	2285	2430
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3260	3340	3720
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3600	3550	4700
Mustard Seed	—	Quintal	West Bengal	Kolkata	3500	3200	4100
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4070	4140	4270
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	3700	3685	3680
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1700	1650	1500
Cotton Seed	MCU5	Quintal	Tamil Nadu	Coimbatore	—	1550	1550
Castor Seed	—	Quintal	Andhra Pradesh	Hyderabad	3500	3600	3200
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	5770	5720	6000
Copra	FAQ	Quintal	Kerala	Alleppey	8450	8000	4550
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	–	3800	3900
Groundnut	—	Quintal	Maharashtra	Mumbai	6200	6300	8400
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1218	1241	1338
Mustard Oil	Ordinary	15 Kg.	West Benaal	Kolkata	1230	1230	1395
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1140	1200	1845
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1230	1230	1950
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1349	1332	1338
Castor Oil	—	15 Kg.	Andhra Pradesh	Hyderabad	1215	1230	1165
Sesamum Oil	—	15 Kg.	NCT of Delhi	Delhi	1350	1335	1700
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2850	3000	3150
Coconut Oil	—	15 Kg.	Kerala	Cochin	1800	1718	983
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1900	1930	1855
Groundnut Cake	—	Quintal	Andhra Pradesh	Hyderabad	2714	2600	3214
Cotton/Kapas	NH44	Quintal	Andhra Pradesh	Nandyal	4500	4600	3900
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	4156	-	3766
Jute Raw	TD5	Quintal	West Benaal	Kolkata	2800	2850	2750
Jute Raw	W5	Quintal	West Benaal	Kolkata	2750	2800	2750
Oranges	—	100 No	NCT of Delhi	Delhi	417	417	583
Oranges	Big	100 No	Tamil Nadu	Chennai	530	460	500
Oranges	Nagpuri	100 No	West Benaal	Kolkata	–	–	–
Banana	—	100 No.	NCT of Delhi	Delhi	292	250	150
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	448	458	354

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Feb.-14	Jan.-14	Feb.-13
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	56000	55000	51000
Almonds	—	Quintal	Maharashtra	Mumbai	62000	61000	45000
Walnuts	—	Quintal	Maharashtra	Mumbai	63000	64000	62000
Kishmish	—	Quintal	Maharashtra	Mumbai	11500	13000	12500
Peas Green	—	Quintal	Maharashtra	Mumbai	4400	4600	3250
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	740	880	530
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	2400	2600	1900
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1350	1000	1200
Potatoes	Red	Quintal	Bihar	Patna	810	1000	730
Potatoes	Desi	Quintal	West Bengal	Kolkata	810	700	580
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	—	2333	—
Onions	Pole	Quintal	Maharashtra	Nashik	800	950	1350
Turmeric	Nadan	Quintal	Kerala	Cochin	11500	10000	9900
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	9600	9500	8300
Chillies	—	Quintal	Bihar	Patna	9200	9200	7420
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	50000	49500	37500
Ginger	Dry	Quintal	Kerala	Cochin	23000	20000	14500
Cardamom	Major	Quintal	NCT of Delhi	Delhi	125000	125000	72000
Cardamom	Small	Quintal	West Bengal	Kolkata	95000	95000	100000
Milk	Cow	100 Liters	NCT of Delhi	Delhi	–	–	3600
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3200
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	28681	28681	28014
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	32000	30500	25500
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	30440	30460	28000
Fish	Rohu	Quintal	NCT of Delhi	Delhi	10500	1000	10700
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	33000	32000	26200
Eggs	Madras	1000 No,	West Bengal	Kolkata	4500	4700	4000
Tea	—	Quintal	Bihar	Patna	20000	20000	19800
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	–	13000	9000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	–	26000	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	–	14000	14000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2900	2950	2775
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2800	2850	2680
Tobacco	Bidi Tobacco	Quintal	West Benaal	Kolkata	3700	3700	3450
Rubber	—	Quintal	Kerala	Kottayam	14300	13500	14600
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29700	29500	28000

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2014

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T. Rs./Qtl.	9000.00 56079.00	9000.00 55818.00
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/1bs Rs./Qtl.	3.46 47516.61	3.44 47022.08
	Spot U.K. 320s	U.K.	—	Dollar/M.T. Rs./Qtl.	7648.65 47658.74	7614.88 47227.49
Castor Oil	Any Origin ex tank Rotterdam	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1600.00 9969.60	-
Celery Seed	ASTA cif	India	—	Dollar/M.T. Rs./Qtl.	1500.00 9346.50	1500.00 9303.00
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T. Rs./Qtl.	4100.00 25547.10	4100.00 25428.20
Cinnamon Bark		Mada-gascar	—	Dollar/M.T. Rs./Qtl.	1100.00 6854.10	1100.00 6822.20
Cloves	Singapore	Mada-gascar	—	Dollar/M.T. Rs./Qtl.	13250.00 82560.75	13250.00 82176.50
Coconut Oil	Crude Phillipine/ Indonesia	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1280.00 7975.68	1420.00 8806.84
Copra	Phillipines cif Rotterdam	Philli pine	—	Dollar/M.T. Rs./Qtl.	806.50 5025.30	895.50 5553.89
Corriander		India	—	Dollar/M.T. Rs./Qtl.	1500.00 9346.50	1500.00 9303.00
Cummin Seed		India	—	Dollar.M.T. Rs./Qtl.	2250.00 14019.75	2250.00 13954.50
Fennel seed		India	—	Dollar/M.T. Rs./Qtl.	2600.00 16200.60	2600.00 13954.50
Ginger	Split	Nigeria	—	Dollar/M.T. Rs./Qtl.	1800.00 11215.80	1800.00 11163.63
Groundnut kernels	US 2005, 40/50	European Ports	—	Dollar/M.T Rs./Qtl.	1250.00 7788.75	1250.00 7752.50
Groundnut Oil	Crude Any Ori gin cif Rotterdam	U.K.	—	Dollar/M.T Rs./Qtl.	1500.00 9346.50	1500.00 9303.00
Lentils	Turkish Red Split U.K. Crop 1+1 water	—	Pound/M.T	606.12 Rs./Qtl.	599.09 6230.91	9201.78
Maize		U.S.A	Chic-ago	C/56 lbs. Rs./Qtl	427.50 1046.85	455.50 1110.23
Oats		Canada	Winni-peg	Dollar/M.T. Rs./Qtl.	465.48 2900.41	569.22 3530.30
Palm Kernal Oil	Crude Malaysia/ Indonesia	Nether-lands	— —	Dollar/M.T. Rs./Qtl.	1170.00 7290.27	1375.00 8527.75
Palm Oil	Crude Malaysian/ Sumatra	Nether-lands	— —	Dollar/M.T. Rs./Qtl.	855.00 5327.51	950.00 5891.90

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2014—Contd.

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.
Rapeseed	Canola	Canada	Winni-peg	Can Dollar/M.T	423.80 2366.92	415.50 2316.83
	U.K. delivered rapeseed, delivered	U.K.	—	Pound/M.T. Rs./Qtl.	278.00 2857.84	304.00 3147.01
Rapeseed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs/Qtl.	668.0 6867.4	681.00 7049.71
Soyabean Meal	U.K. produced 49% oil & protein	U.K.	— Rs./Qtl.	Pound/M.T. 3762.48	366.00 4244.32	410.00
Soyabean Oil		U.S.A.	—	C/lbs Rs./Qtl.	37.10 5094.99	41.20 5631.71
	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs/Qtl.	652.00 6702.56	695.00 7194.64
Soyabeans	U.S. No. 2 yellow	Nether-lands	Chicago	Dollar/M.T. Rs./Qtl	563.90 3513.66	492.20 3052.62
		U.S.A.	–	C/60 labs Rs./Qtl	1269.25 2902.49	1407.25 3203.09
Sunflower Seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs./Qtl	710.00 7298.80	732.00 7577.66
Tallow	High grade delivered	U.K.	Lon-don	Pound/M.T. Rs./Qtl	465.00 4780.20	445.00 4606.64
Turmeric	Madras finger spot/cif	India	—	Dollar/M.T. Rs./Qtl	850.00 5296.35	850.00 5271.70
Walnuts	Indian light halves	U.K.	—	Pound/M.T. Rs./Qtl	8130.00 83576.40	8130.00 84161.76
Wheat		U.S.A.	Chic-ago	C/60 lbs Rs../Qtl	551.50 1261.16	600.00 1365.68

Source : Public Ledger.

Exchange Rate

	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug.	Sep.
US Dollar	62.31	62.02							
CAN Dollar	55.85	55.76							
UK Pound	102.80	103.52							

4. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING APRIL, 2014

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

(K)-Kharif (R)-Rabi.

METRIC WEIGHTS AND MEASURES

SIMPLE CONVERSION TABLES

I. WEIGHTS

Tons to metric Tonnes

Tons	1	2	3	4	5	6	7	8	9	10
Metric tonnes	1.02	2.03	3.05	4.07	5.08	6.10	7.11	8.13	9.14	10.16

Pounds (av.) to Kilograms

Pounds	1	2	3	4	5	6	7	8	9	10
Kilograms	0.45	0.91	1.36	1.81	2.27	2.72	3.18	3.63	4.08	4.54

Tolas to grams

Tolas	1	2	3	4	5	6	7	8	9	10
Grams	11.66	23.33	34.99	46.66	58.32	69.98	81.65	93.31	104.97	116.64

Seers to Kilograms

Seers	1	2	3	4	5	6	7	8	9	10
Kilograms	0.93	1.87	2.80	3.73	4.67	5.60	6.53	7.46	8.40	9.33

Maunds to Quintals

Maunds	1	2	3	4	5	6	7	8	9	10
Quintals	0.37	0.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73

II. LENGTHS

Miles to Kilometres

Miles	1	2	3	4	5	6	7	8	9	10
Kilometres	1.61	3.22	4.83	6.44	8.05	9.66	11.27	12.87	14.47	16.09

Yards to Metres

Yards	1	2	3	4	5	6	7	8	9	10
Metres	0.91	1.83	2.74	3.66	4.57	5.49	6.40	7.32	8.23	9.14

Inches to Millimetres

Inches	1	2	3	4	5	6	7	8	9	10	11	12
Millimetres	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40	304.80

III. AREA

Acres to Hectares

Acres	1	2	3	4	5	6	7	8	9	10
Hectares	0.40	0.81	1.21	1.61	2.02	2.43	2.83	3.24	3.64	4.04

Square Yards to Square Metres

Square Yards	1	2	3	4	5	6	7	8	9	10
Square Metres	0.84	1.67	2.51	3.34	4.18	5.02	5.85	6.69	7.53	8.36

IV. CAPACITY

Gallons (Imperial) to Litres

Gallons	1	2	3	4	5	6	7	8	9	10
Litres	4.55	9.09	13.64	15.14	22.73	27.28	31.82	36.37	40.91	45.44

MGIPRRND—2356 Agri./2014—600