

AGRICULTURAL SITUATION IN INDIA

FEBRUARY, 2014



**PUBLICATION DIVISION
DIRECTORATE OF ECONOMICS AND STATISTICS
DEPARTMENT OF AGRICULTURE AND CO-OPERATION
MINISTRY OF AGRICULTURE
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Subscription

	Inland	Foreign
Single Copy	: Rs.40.00	£ 2.9 or \$ 4.5
Annual	: Rs.400.00	£ 29 or \$ 45

Available from :

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

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Agricultural Situation in India

VOL. LXX

FEBRUARY, 2014

No. 11

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D. K. Gaur—*Technical Asstt.*

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

NOTE TO CONTRIBUTORS

Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Cooperation monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. The articles 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.

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An honorarium of Rs. 2000 per article of atleast 2000 words for the regular issue and Rs. 2500 per article of at least 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.

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Abbreviations used

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

A. General Survey

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 – 12.03.2014, has been 23.1 mm as against the normal at 10.7 mm. Rainfall has been in excess (that is, +20% or more) in 26 sub divisions as compared to 7 during the corresponding period last year. The meeting

of Crop Weather Watch Group (CWWG) held on 14.03. 2014, in the Ministry of Agriculture, India Meteorological Department (IMD) has mentioned that it is too early to predict whether it is El Nino situation prevalent and its possible impacts.

All India production of food grains: As per the 2nd advance estimates released by Ministry of Agriculture on 14.02.2014, production of total food grains during 2013-14 is estimated at 263.20 million tonnes as 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 Food grains	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

Procurement: Procurement of rice as on 18.03.2014 was 25.42 million tonnes and wheat

procurement was 25.09 million tonnes during 2013-14.

Table 2 : Procurement in Million Tonnes

Crop	2010-11	2011-12	2012-13	2013-14
Rice	34.20	35.04	34.04	25.42#
Wheat	22.51	28.34	38.15	25.09
Total	56.71	63.38	72.19	50.51
# Position as on 18.3.2014				

Off-take: Off-take of rice during the month of January, 2014 was 25.19 lakh tonnes. This comprises 20.35 lakh tonnes under TPDS and 4.84 lakh tonnes under other welfare schemes. In respect of wheat, the total off take was 36.29 lakh tonnes comprising of 16.94 lakh tonnes under TPDS and 19.35 lakh tonnes under other

welfare schemes.

Stocks: Stocks of food-grains (rice and wheat) held by FCI as on February 1, 2014 were 55.91 million tonnes, which is lower by 15.5 per cent compared to the level of 66.19 million tonnes as on February 1, 2013.

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

Crop	Off-take			Stocks	
	2011-12	2012-13	2013-14 (Up to Jan., 2014)	Feb 1, 2013	Feb 1, 2014
Rice	32.12	32.64	24.21	35.38	16.94
Unmilled Paddy in terms of Rice					14.77#
Wheat	24.26	33.21	23.79	30.81	24.20
Total	56.38	65.85	48.00	66.19	55.91

Note: Buffer Norms for Rice and Wheat are 13.80 Million Tonnes and 11.20 Million Tonnes respectively as on 1.1.2014.

Since September, 2013, FCI gives separate figures for rice and unmilled paddy lying with FCI & state agencies in terms of rice.

Growth of Economy :

As per the Advance Estimates of the Central Statistics Office (CSO), the growth in Gross Domestic Product (GDP) at factor cost at constant (2004-05 prices) is estimated at 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: Advanced Estimates.

Source: CSO

Table 5: Quarterly Growth Estimate of GDP (Year-on-year in per cent)

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	11.0	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.												

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B. Articles

Temporal and Spatial variations of Land Usage pattern in the country

Radha R Ashrit*

Introduction: Agriculture holds a vital role in the food and nutrition security of the country in addition to overall development. Due to structural changes in the economy though the contribution of agriculture to the total economy has shown a declining trend, (latest reports released by Central Statistics Office) it is a normal phenomena for a developing country. Having said this, in our country agriculture still remains a major contributor of livelihood of one third of the population (Census, 2011) in addition to food and nutritional security to the whole population.

Land is an important input for the agriculture sector. Hence, any change or changes in the land use pattern and diversification of area cropped has a significant implication in the food security of the country. Due to urbanization, increase in population and fragmentation of land holdings land use pattern has been undergoing changes over years. With a view to prevent soil erosion, land degradation & to maintain balance in various type of land usages, Government of India, is implementing various programmes. These are National Watershed Development Project for Rainfed Areas, Soil Conservation in Catchments of River Valley Project and Flood Prone River, Reclamation and Development of Alkali & Acid Soils, Desert Development Programme, Drought Prone Area Programme, Integrated Wastelands Development Project and Integrated Watershed Management Programme in the country. Parts of such developed degraded lands are put to cultivation. This has lead to net sown area remaining largely unchanged in last two decades (Annual Report 2013, Ministry of Agriculture).

State level Land Use Statistics (LUS) involving

nine fold classifications are studied to understand the spatial and temporal variations of land usage in India. Further, an effort is also made to identify the categories of land use that have undergone significant change and plausible causes.

Data Sources and methodology:

Land Use Statistics in the country at State/ district levels are captured as part of collecting agricultural statistics in the country. Land Use Statistics are built as part of the land records/ revenue records as maintained by the Revenue Agencies in most of the States.

Under the system of Land Use Statistics, data is collected at the State and district level in four groups namely nine fold Land Use Classification, Source-wise Irrigated Area, Crop-wise Irrigated Area and Area under Crops (both Irrigated as well as Non-Irrigated). The nine fold land use pattern can be further categorised as Forest area, Area under Non Agricultural Use, Barren and Unculturable Land, Permanent Pasture and other Grazing Land, Land under Miscellaneous Tree Crops, etc, Culturable Waste Land, Fallow Lands Other than Current Fallows, Current Fallows and Net Area Sown.

Agricultural land consists of Net Area Sown, Current Fallows, Fallow Lands Other than Current Fallows, Land under Miscellaneous Tree Crops and Culturable Waste Land. Accordingly non agricultural land includes, Forest area, Area under Non Agricultural Use, Barren & Unculturable Land and Permanent Pasture & other Grazing Land.

As per the LUS data published by Ministry of Agriculture, one can observe that land usage

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pattern has gone under tremendous change in the last 20 years, hence in the present study, various reports on State level Land Use Statistics data released by the Directorate of Economics and Statistics, Ministry of Agriculture from 1990-91 to 2010-11 were analysed.

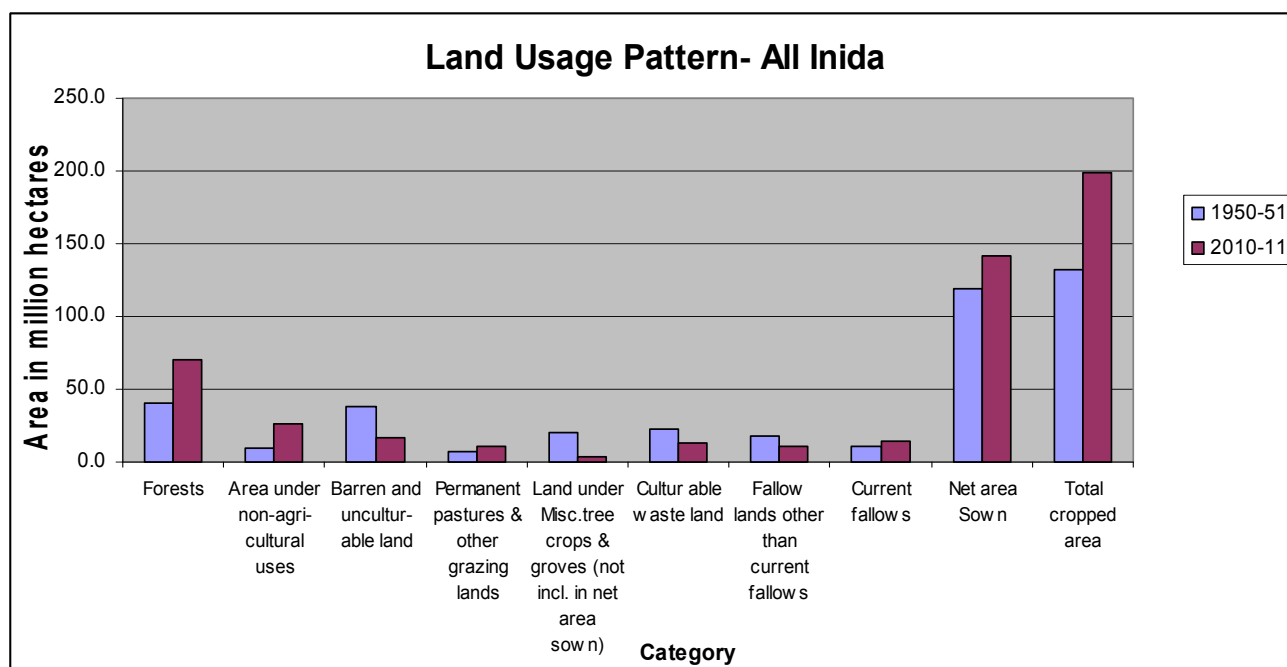
In the current study the following points are studied:

1. Pattern of spatial and temporal land usage in the selected states and All India during 1990-91 to 2010-11. Though we may not be able to exactly pin down the category of land utilisation for reduction/increase for the other land usage, but one can identify the categories of land usage under which significant changes have occurred in the selected states and possible reasons for the changes under these land usage.
2. Categorisation of States based on changes in important land usage and to identify the top 5 states for each important parameters of land

usage pattern.

Current Scenario of LUS at All India level

As per the latest report on Land Use Statistics, released by Directorate of Economics and Statistics (DES) Ministry of Agriculture Government of India, the forest cover, land has increased from 40.5 million hectares in 1950-51 to 70.0 million hectares in 2010-11. Urbanisation is taking place at a rapid pace as the same can be evident from the increase in area under non-agricultural uses from 9.4 million hectares in 1950-51 to 26.4 million hectares in 2010-11. Net area sown has increased from 118.7 million hectares in 1950-51 to 141.6 million hectares in 2010-11 and 1960's onwards net area sown has remained at about 140 million hectares. However, during the same period cropping intensity has increased from 111.1% to 140.5% due to technological interventions. Similarly total cropped area has also substantially increased from 131.9 million hectares in 1950-51 to 199.0 million hectares in 2010-11. The above details is indicated in the figure below:



A. Data analysis & Discussions - Land Usage Pattern

States accounting for 94.43 % of the total

reporting area in the country have selected for the analysis as given in the table below:

Table 1 : Selected States for the study

Sl.No.	States	Cumulative Share of the total Reporting area (%)
1	Rajasthan	11.2
2	Maharashtra	10.1
3	Madhya Pradesh	10.1
4	Andhra Pradesh	9.0
5	Uttar Pradesh	7.9
6	Gujarat	6.2
7	Karnataka	6.2
8	Odisha	5.1
9	Chhattisgarh	4.5
10	Tamil Nadu	4.3
11	Bihar	3.1
12	West Bengal	2.8
13	Jharkhand	2.6
14	Assam	2.6
15	Uttarakhand	1.9
16	Punjab	1.6
17	Himachal Pradesh	1.5
18	Haryana	1.4
19	Kerala	1.3
20	Jammu & Kashmir	1.2

Forest cover

At, All India level merely we could add 3.4% of forests cover since 1990s. Major States show increase in forest cover since 1990's include Punjab by 32.3%, Rajasthan by 16.5%, West Bengal by 7.5%, Himachal Pradesh(HP) by 6.2% and Odisha by 6.2%. On the other hand, an alarming reduction in forest area can be noticed in States like Haryana by 77.4%, Bihar by 61%, Madhya Pradesh(MP) by 60.8% and Uttar Pradesh(UP) by 60.8%, Jammu & Kashmir by 26.4% etc.

Urbanisation

The analysis has found that urbanisation is happening in a rigorous manner across the selected states. An indicator for the urbanisation i.e area under non-agricultural uses has increased across the states with HP tops the list by 142.1% followed by Odisha by 67.2%, Kerala by 64.8% and Haryana by 63.1% . On the other hand minimum urbanisation has been observed in Jammu Kashmir by 3.4%, Gujarat by 4.4% followed by West Bengal by 11.9% and Tamil Nadu by 19.6%. Remaining States show a moderate increasing trend.

Barren and Unculturable land

Though at All India level there is a decline of 12.6% under Barren and Unculturable land category, States like HP by 255.8%, Odisha by 106.8% show a dramatic increase under this category.

Permanent pastures & and other grazing lands

Land Usage under Permanent pastures & and other grazing lands also shows a declining trend by 9.7% at all India level , with Kerala by 91.9%, Bihar by 6.8%, MP by 73.6%, UP by 73.6% and Punjab by 64.2%.

Land under Misc.tree crops & groves (not incl. in net area sown)

Under this land usage category, major States show increase since 1990's include Haryana by 219.2%, Bihar by 55.6%, Uttarakhand by 52.8%, HP by 40.6% and West Bengal by 15.4%. On the other hand, reduction in this land usage can be noticed in States like Kerala by 89.3%, Punjab by 70% UP by 20.8% , Assam by 20.7% etc.

Culturable waste land

Most of the selected States show a declining trend for land usage under the category of culturable waste land except Haryana by 28.7%, Jharkhand by 22.4% and Tamil Nadu by 13.9%.

Fallow lands

Though there is a small increase under fallow lands at All India level, Odisha by 165% and Kerala by 96% show a higher increase as indicated. Though Jammu & Kashmir also shows a very high percentage of increase, in this category, the nature of terrain may be one of the major reasons for this feature.

Total cropped Area

Finally, total cropped area in the country has also increased during 1990-91 to 2010-11 to the tune of 7.1% at All India level with exception of States like Odisha by 43.4% and Jharkhand by 39.2% showing a declining trend. Also, a feature of registering a decline by 13.3% total

cropped area with some what peculiar trend of increase of 15.7% in total irrigated area in the State of Tamil Nadu has also been observed.

The above mentioned observations are tabulated in the **Table 2**.

State specific issues for concern and need for further analysis

In case of Haryana, the data suggest that urbanisation has led to drastic cutting down of the forests in the state. By reducing fallow lands in the state total cropped area has increased marginally. From the table one can also notice that there is a considerable increase in land under misc. tree crops & groves in the states.

In case of Odisha, data suggest that there is an increase in barren and unculturable land which needs further analysis. Also, due to high level of urbanisation and keeping agricultural land under fallows category has resulted in a considerable amount of decrease in total cropped area in the state. These finding may also be influenced by the data reported by two different agencies in the State of Odisha.

In the State of Kerala, high level of urbanisation has led to reduction in land under Permanent Pasture and other Grazing Land and Land under Miscellaneous Tree Crops, etc. Further, keeping more agricultural land as fallow lands have resulted in reduction in total cropped area and there is a high probability that these fallow lands may also be utilized for urbanisation in the coming years.

For States, like Punjab, Rajasthan and West Bengal , it may be noted that though urbanisation is happening but forest cover has increased along with increase in total cropped area with notable reduction in culturable wasteland and fallow lands. In case of Gujarat, though forest cover is declined marginally, the total cropped area has been increasing due to reduction in fallow lands.

In case of Tamil Nadu though urbanisation is

Table 2 : Changes in (%) - Land Usage Pattern during 1990-91 to 2010-11

State	Forests	Not available for cultivation		Other uncultivated land excluding Fallow lands					Fallow Lands		Net area Sown	T o t a l Cropped Area	G r o s s Irrigated Area
		Area under non-agri-cultural uses	Barren & unculturable land	P e r m a n e n t & other grazing lands	Land under misc. tree crops & groves (not incl. in net area sown)	C u l t u r a b l e waste land	Fallow other than current fallows	C u r r e n t fallows					
AP	-0.6	24.5	-3.3	-34.2	10.8	-19.8	8.2	-10.3	1.5	10.0	33.2		
ASSAM	-6.6	33.2	-8.6	-13.2	-20.7	-26.0	-40.8	-11.1	3.9	9.3	-70.3		
BIHAR	-61.0	49.2	-21.3	-76.8	55.6	-77.4	-77.4	-3.5	26.4	27.1	96.5		
CHHATTISGARH	0.5	5.0	-11.0	0.3	-21.6	5.6	19.9	-9.7	-1.4	6.5	53.9		
GUJARAT	-2.7	4.4	-2.2	0.7	-10.0	-0.5	-68.9	-63.5	10.8	15.8	93.0		
HARYANA	-77.4	63.1	5.5	15.7	219.2	28.7		-27.7	-1.6	9.9	30.8		
HP	6.2	142.1	255.8	32.4	40.6	7.9	29.1	32.6	-7.4	-3.5	15.3		
J&K	-26.4	3.4	-6.1	-6.1	-9.8	-1.4	302.9	4.2	0.1	7.0	9.8		
JHARKHAND	-4.0	-3.6	-0.8	25.2	-17.7	22.4	33.5	38.9	-38.7	-39.2	-31.6		
KARNATAKA	-0.1	20.3	-1.5	-16.9	-9.7	-7.1	-6.7	-7.0	1.4	11.1	64.7		
KERALA	0.0	64.8	-66.4	-91.9	-89.3	-3.1	96.0	72.4	-7.8	-12.3	22.0		
M A D H Y A PRADESH	-60.8	41.3	-42.8	-73.6	-20.8	-49.7	-25.8	36.7	17.0	21.5	60.0		
MAHARASHTRA	1.7	32.8	6.7	10.4	-16.8	-4.8	10.9	52.1	-6.2	10.1	46.1		
ODISHA	6.2	67.2	106.8	-29.3	-74.4	-12.9	165.0	637.0	-25.7	-43.4	-33.5		
PUNJAB	32.3	48.3	-70.1	-64.2	-70.0	-87.7	-87.5	-59.6	-1.4	5.1	9.5		
RAJASTHAN	16.5	26.7	-14.7	-11.4	-5.0	-24.0	-10.4	-31.9	12.0	34.2	78.9		
TAMIL NADU	-1.4	19.6	-3.9	-11.4	7.7	13.9	51.4	-19.7	-11.2	-13.3	15.7		
UTTARAKHAND	0.6	43.0	-27.6	-13.5	52.8	-19.4	22.5	12.5	-6.1	-4.6	4.5		
UP	-60.8	41.3	-42.8	-73.6	-20.8	-49.7	-25.8	36.7	17.0	21.5	60.0		
WEST BENGAL	7.5	11.9	-90.8	-27.7	15.4	-73.0	-64.5	45.5	-6.4	10.4	123.2		
ALL INDIA	3.4	24.9	-12.6	-9.7	-15.9	-15.6	6.8	3.1	-0.9	7.1	41.4		

Source: DES, Ministry of Agriculture Note: For uniformity, data for States Uttar Pradesh, Madhya Pradesh, and Bihar have been appropriately modified to study the changes. For the States, Uttarakhand, Chhattisgarh and Jharkhand data from 2000-01 to 2010-11 were used for the study.

happening at a slow but steady pace, decrease in forest cover though marginal and reduction in total cropped area along with increase in culturable waste land and fallow lands is a matter of concern.

In the recently formed States of Jharkhand, Uttarakhand and Chhattisgarh, Uttarakhand shows an increase of urbanisation in a small span of 10 years with a miniscule increase in forest cover. It is a matter of grave concern in the wake of recently occurred natural calamity in this small ecologically fragile Himalayan State. Further, keeping considerable agricultural land as fallow lands contributed to decrease in the total cropped area in this State. In Jharkhand State data suggest that decrease in forest cover might have resulted in increase in Permanent Pasture and other Grazing Land and increase in culturable waste land and fallow lands have resulted in decreasing total cropped area in the state. The State of Chhattisgarh shows a marginal increase in forest cover along with increase in total cropped area. The State of Jharkhand shows a decline in forest cover which needs to be investigated further. Maharashtra also shows the same pattern as Chhattisgarh.

States like, Andhra Pradesh, Assam and Karnataka show that moderate levels of urbanisation has contributed in reduction of forest cover. However, in these states total cropped area has increased due to reduction in culturable waste land and fallow lands.

In the geographically large States like Uttar Pradesh, Madhya Pradesh and Bihar, high levels of urbanisation has led to drastic decline in forest cover. However, total cropped area

in these states has increased with considerable reduction in culturable waste lands and fallow lands.

In the State of J&K one can notice that there is a decline of forest cover and urbanisation is happening very slowly compared to other states. Area under fallow lands has also increased dramatically, this may be due to nature of the terrain in that state.

The State of Himachal Pradesh shows a worrying picture of highest level of urbanisation and reduced total cropped area. Reasons for dramatic increase under the category of barren land needs further investigation.

These results suggest that barring few states namely Himachal Pradesh, Jharkhand, Kerala, Odisha, Tamil Nadu and Uttarakhand all other states have increased their total cropped area. Urbanisation is a reality and judicious use of land under various categories needs attention and practise from all the stake holders to maintain the balance of land use in the country.

B. Categorisation of the Selected States

In the following table the selected States have been categorised based on the changes in important parameters of land usage occurred during 1990-91 to 2010-11. The top five states have been identified where maximum changes have taken place under the important parameters such as forest cover, urbanisation, Barren and Unculturable lands, Culturable waste land, fallow lands and total cropped area. Exact reasons for these changes may be identified through state specific further detailed studies.

Table 3 Changes in land Usage in top 5 states

Trend On Land Usage Parameter	Name Of The Top Five States	
	Increasing (%)	Decreasing (%)
Forest Cover	Punjab 32.3 Rajasthan 16.5 West Bengal 7.5 Odisha 6.2 Himachal Pradesh 6.2	Haryana -77.4 Bihar -61.0 Madhya Pradesh -60.8 Uttar Pradesh -60.8 Jammu & Kashmir -26.4
Urbanisation/ Area Put To Non-Agricultural Purposes	Himachal Pradesh 142.1 Odisha 67.2 Kerala 64.8 Haryana 63.1 Bihar 49.2 Punjab 48.3 Uttarakhand 43.0 Madhya Pradesh 41.3 Uttar Pradesh 41.3 Assam 33.2	
Barren And Unculturable Lands	Himachal Pradesh 255.8 Odisha 106.8 Maharashtra 6.7 Haryana 5.5 Jharkhand -0.8	West Bengal -90.8 Punjab -70.1 Kerala -66.4 Madhya Pradesh -42.8 Uttar Pradesh -42.8
Culturable Waste Land	Haryana 28.7 Jharkhand 22.4 Tamil Nadu 13.9 Himachal Pradesh 7.9 Chhattisgarh 5.6	Punjab -87.7 Bihar -77.4 West Bengal -73.0 Uttar Pradesh -49.7 Madhya Pradesh -49.7
Fallow Lands	Jammu & Kashmir 302.9 Odisha 165.0 Kerala 96.0 Tamil Nadu 51.4 Jharkhand 33.5	Punjab -87.5 Bihar -77.4 Gujarat -68.9 West Bengal -64.5 Assam -40.8
Total Cropped Area	Rajasthan 34.2 Bihar 27.1 Uttar Pradesh 21.5 Madhya Pradesh 21.5 Gujarat 15.8	Odisha -43.4 Jharkhand -39.2 Tamil Nadu -13.3 Kerala -12.3 Uttarakhand -4.6

Definitions of important terms used

1. Forest Area: This includes all land classified either as forest under any legal enactment, or administered as forest, whether State-owned or private, and whether wooded or maintained as potential forest land. The area of crops raised in the forest and grazing lands or areas open for grazing within the forests remain included under the “forest area”.

2. Area under Non-agricultural Uses: This includes all land occupied by buildings, roads and railways or under water, e.g. rivers and canals, and other land put to uses other than agriculture.

3. Barren and Un-culturable Land: This includes all land covered by mountains, deserts, etc. Land, which cannot be brought under cultivation except at an exorbitant cost is classified as unculturable whether such land is in isolated blocks or within cultivated holdings.

4. Permanent Pasture and other Grazing Land: This includes all grazing land whether it is permanent pasture/meadows or not. Village common grazing land is included under this category.

5. Land under Miscellaneous Tree Crops, etc.: This includes all cultivable land, which is not included in ‘Net area sown’ but is put to some agricultural use. Land under casuring trees, thatching grasses, bamboo bushes and other groves for fuel, etc. which are not included under ‘Orchards’ are classified under this category.

6. Culturable Waste Land: This includes land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession including the current year for some reason or the other. Such land may be either fallow or covered with shrubs and jungles, which are not put to any use. They may be accessible or inaccessible and may lie in isolated blocks or within cultivated holdings.

7. Fallow Lands other than Current Fallows: This includes all land, which was taken up for cultivation but is temporarily out of cultivation for a period of not less than one year and not more than five years.

8. Current Fallows: This represents cropped area, which is kept fallow during the current year.

9. Net Area Sown: This represents the total area sown with crops and orchards. Area sown more than once in the same year is counted only once.

10. Reporting Area for Land Utilisation Statistics: The Reporting area stands for the area for which data on land use classification is available. In areas where land utilization figures are based on land records, reporting area is the area according to village papers, i.e. the papers prepared by the village accountants. In some cases, the village papers may not be maintained in respect of the entire area of the State. For example, village papers are not prepared for the forest areas but the magnitude of such area is known. Also there are tracts in many States for which no village paper exists. In such cases, estimates of classification of area from agricultural census, 2000-01 and 2005-06 are adopted to complete the coverage.

11. Total/Gross Cropped Area: This represents the total area sown once and/or more than once in a particular year, i.e. the area is counted as many times as there are sowings in a year. This total area is also known as total cropped area or total area sown.

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Dynamics of Diversification in Hill Agriculture – A case study of Village Kot, Hamirpur, Himachal Pradesh

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The hill agriculture in Himachal Pradesh is characterized by mounting natural resource depletion and scarcity, low and stagnant crop productivity and unsuitability of traditional technologies etc. which are also the factors contributing to worsening situation of dry land agriculture in the country. Nevertheless, long-term demographic, social, economic and agrarian changes and transformation have had marked impact on the rain fed hill agricultural economy. The problems are compounded by the natural factor endowments such as only 20 percent cropped area having irrigation facilities and total non-availability of irrigation in certain areas. Crop diversification, fillip to non-farm income activities and organic farming etc. are the buzzwords to boost farm economy in order to rejuvenate agriculture. Village studies at micro level on socio-economic changes and agrarian transformation both have been undertaken by various scholars. The investigation by Bliss and Stern (1982) of Village Palanpur in district Moradabad (UP), of Village Walidpur, Meerut district by Tyagi (1988) covering 1963-64 to 1983-84 are relevant and useful but do not reflect the agricultural situation prevalent in the rain fed hill agriculture. Swarup et al (1984) reported the average annual income of Rs. 6681 per household of tribal village Maingal, Chamba district (H.P.), out of which 71 per cent was earned through rearing livestock and 25 per cent through agriculture. Swarup and Singh (1988) in the study of social economy of tribal village Chhitkul in Kinnaur district of Himachal Pradesh worked out average holding size of 1.29 hectares. Nearly 43 per cent of total household income of Rs. 13886 was contributed by sheep and goat rearing followed by service (34 per cent), agriculture (13 per cent) and other livestock (7 per cent). Small millets dominated

the cropping pattern. In the case of village study of Purava Dharoor, Jammu Region, non-farm activities contributed about 72 per cent of total income of Rs. 7299 per household. On the contrary, Singh and Sikka (1992) reported that the production of traditional crops like maize, wheat, barley and millets in village Malana, Kullu district (H.P.) was not profitable due to peculiar natural endowments. On the other hand, socio-economic survey (Sikka and Saraswat 1993) of an affluent village Kiari, Shimla district (H.P.) revealed that apple cultivation was the main occupation of the farm households, earning Rs. 87252 from fruit cultivation. Average holding size was 1.19 hectares and entire land was covered by orchard. Vaidya and Sharma (1993) conducted socio-economic study of village Kibber in Lahaul-Spiti district of Himachal Pradesh and reported that the main source of income was service (43 per cent), followed by wage labour (37 per cent) and agriculture (16 per cent). In a recent paper, the author (Saraswat 2012) proposed a new paradigm shift in the context of diversification of Hill agriculture towards selective high value cash crops including fruits and off- season vegetables. None of the studies under review have undertaken the investigation into socio-economic changes and diversification of agricultural transformation in rain fed hill agriculture over long period of time. Recently a case study (Arya, Yadav and Singh 2012) appeared in which diversification of small farms, particularly the crop pattern and income sources and their growth are explained in terms of diversification indices, in Shivalik foothills of Haryana. The village Kot study conducted in 1959-60, 1989-90 and 2004-05 assumes added significance in the longer perspective.

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Methodology

The agricultural Economics Research Centre, University of Delhi initiated a series of 'village surveys' in Kangra district (then in the Punjab State) in the late fifties. The socio-economic survey of village Kot located in Hamirpur tehsil (then in Kangra district) was conducted during November 1960 to March 1961. The agriculture year of 1959-60 was the reference period of the survey and census method of inquiry was adopted for collecting the data on pre-structured schedules through personal interview from all the 124 households in the village. It was hypothesised that "poor agricultural resources and increasing pressure on land have given rise to migration of large number of persons from rural area of Kangra district". The survey thus aimed at studying the impact of migration on the socio-economic structure of the village. .

After thirty years, another survey of the village was undertaken by one of the authors (SPS) during 1991 and the reference year for this was 1989-90. Again the census method of investigation was followed and the data from all the 221 households were collected on pre-structured schedule through personal interview method. The data relating to family profile, land holdings, cropping pattern, labour use in the farm sector and non- farm sector, wage rate in different occupations, income from different occupations etc were collected.

Then after 15 years in 2005 a third survey of the village was conducted by the institute of integrated Himalayan Studies (UGC Centre of Excellence), Himachal Pradesh University Shimla. Here also the census method of investigation was followed, and the data from all the 338 households were collected on pre-structured schedule through personal interview method. All the important information and data collected during earlier surveys of 1959-60 and 1989-90 were collected during the survey with 2004- 2005 as reference period..

During all the three periods of survey of the village, a complete census of all the households

was carried out for collecting the information on land and other resources. On the basis of above information, all the households were classified in five categories i.e. (i) landless having no land, (2) marginal farmers having land up to 1 ha. (3) small farmers having 1 to 2 hectare land, (4) medium farmers having land 2-4 hectare and large farmers having more than 4 hectares of land. Thus the study covered 124 households during 1959-60, 221 households during 1989-90 and 338 households during 2004-05. The respective breakup was 23 land less, 16 marginal, 26 small, 22 medium and 37 large farmers during 1959-60; 32 land less, 158 marginal, 22 small, 6 medium and 3 large during 1989-90 and 68 landless, 217 marginal, 44 small and medium and one large during 2004-05.

The present study is based on the cropping pattern of the village during 1959-60, 1989-90 and 2004-05 and what type of socio-economic changes and diversification has taken place in the village. In the process village we utilized a variety of measures for crop diversification, which can reveal the extent of dispersion and concentration of activities at a given time and space by single quantitative indicator. Out of several measures the only five measures of crop diversification namely Herfindhal Index (H.I.), Ogive Index (O.I.), Entropy Index (E.I.), Modified Entropy Index (M.E.I.) and Composite Entropy Index (C.E.I.) have been used to analysis the data on different farm sizes as given below..

(a) Herfindhal Index (H.I.): Herfindhal Index is defined as:

$$H.I. = \frac{1}{N} \sum_{i=1}^N P_i^2$$

Where N is total number of crops and P_i

represents acreage proportion of the i^{th} crop in total cropped area.

(b) Ogive Index (O.I.): This index was first used by Tress (1938) to measure industrial diversity. It measures deviations from benchmark given by equal proportion of each crop. For example, if there are N crops, the norm used for measuring deviations is $1/N$. The formula of computing Ogive Index is as follows:

$$\text{O.I.} = \sum_{i=1}^N \{P_i - (1/N)\}^2 / (1/N)$$

c) Entropy Index (E.I.): Entropy based Index is regarded as an inverse measure of concentration having logarithmic character. This index has been widely used by many research workers to measure diversification. Entropy Index is specified as:

$$\text{E.I.} = \sum_{i=1}^N P_i \log P_i$$

or

$$\text{E.I.} = \sum_{i=1}^N P_i \log (1/P_i)$$

(d) Modified Entropy Index (M.E.I.): Modified entropy Index is used to overcome the limitation of entropy Index by using variable base of logarithm instead of fixed base of logarithm. It may be expressed as:

$$\text{M.E.I.} = - \sum_{i=1}^N P_i \log_N P_i$$

The M.E.I., however, is equal to $EI/\log N$. It is worth mentioning that the base of logarithm is shifted to 'N' number of crops. This index has a lower limit equal to zero when there is complete concentration, and it assumes upper limit of one in case of perfect dispersion, i.e. it is bounded by zero and one.

Maximum M.E.I. (when P_i approaches $1/N$)

$$= \sum I / N \cdot \log N, \quad N = \sum I / N = 1$$

(e) Composite entropy Index (C.E.I.): This index possesses all desirable properties of Modified Entropy Index, and is used to compare diversification across situations having different and large number of activities since it gives due weight to the number of activities. The formula of calculating C.E.I. is given by:

$$\text{C.E.I.} = - \left[\sum_{i=1}^N P_i \log_N P_i \right] \cdot \{1 - (1/N)\}$$

Results and Discussion :

Socio-economic changes in Village Kot: The village Kot is part of revenue village Tika Darogan, Hamirpur district of Himachal Pradesh where the net area sown decreased from 41 per cent of total geographical area (1960-61) to 33.4 per cent in 2004-05. Socio-economic analysis of sampled households presented in Table-1 revealed average family size stabilized at about 5 (1959-60 to 2004-05) where availability of labour force declined from 34 per cent to 30 per cent over the corresponding period. Literacy rate both for males and females registered markedly very significant improvement being 35 and 94 per cent for males, 10 and 80 per cent for females in the base year and during third survey year. Average operational holding size decreased significantly from 1.58 hectare in 1959-60 to 0.72 ha in 1989-90 and further to 0.40 ha in 2004-05. However, the large size farmers registered significant increase in operational

Table: 1 Salient Socio- economic Features of Sampled Households in Kot village in Hamirpur District of Himachal Pradesh.

Item	Unit	1959-60						1989-90						2004-05					
		Landless	Marginal	Small	Medium	Large	Total	Landless	Marginal	Small	Medium	Large	Total	Landless	Marginal	Small	Medium	Large	Total
Sample size	No.	23	16	26	22	37	124	32	158	22	6	3	221	68	217	44	8	1	338
Average family size	No.	5.04	5.18	4.58	4.68	6.40	5.31	5.12	6.54	7.68	10.33	12.00	6.62	4.19	5.36	6.15	4.87	5.00	5.22
Labour force	% of Pop.	25.99	32.62	42.57	40.81	30.00	33.52	39.45	30.73	30.72	17.81	22.16	29.60	24.10	31.71	29.91	35.93	60.00	30.26
Literacy	Percent	13.68	18.84	21.78	26.08	25.74	22.18	46.35	64.29	59.35	65.45	82.35	62.16	85.65	86.99	90.72	92.10	100.00	87.46
Male literacy	Percent	20.45	31.42	31.25	45.24	39.81	35.01	63.75	79.75	78.75	86.20	94.44	78.45	93.02	94.43	94.57	100.00	100.00	94.41
Female literacy	Percent	7.84	5.88	13.20	10.00	9.57	9.57	26.76	46.51	38.67	42.31	68.75	43.69	78.29	78.90	86.55	80.00	100.00	79.94
% of land holding	Percent	0.00	2.84	12.70	21.83	62.63	100.00	0.00	51.00	16.08	8.42	24.50	100.00	0.00	49.10	35.95	10.91	4.04	100.00
Total land	Ha.	0.00	8.36	37.40	64.28	184.43	294.47	0.00	133.20	41.99	21.99	63.99	261.17	0.00	85.63	62.70	19.03	7.05	174.41
Average holding size	Ha.	0.00	0.52	1.44	2.92	4.98	2.92	0.00	0.84	1.90	3.66	21.00	1.38	0.00	0.36	1.43	2.72	10.08	0.65
Average operational holding	Ha.	0.00	0.32	0.86	1.27	2.82	1.58	0.00	0.46	1.34	2.53	6.06	0.72	0.00	0.25	0.88	1.48	6.08	0.40
Non Rajput holding land	No.	0.00	5	3	-	-	8	0.00	58	5	2	-	65	0.00	100	6	1	-	107
Cultivating owner		0.00	7	11	11	23	56	0.00	150	21	6	3	180	0.00	202	42	8	1	253
Tenant	No.	0.00	7	6	1	1	14	0.00	7	-	-	-	7	0.00	9	-	-	-	9
Owner cum tenant	Percent	0.00	2	9	10	13	31	0.00	1	1	-	-	2	0.00	6	2	-	-	8
Cultivating household		0.00	16	26	22	37	101	-	158	22	6	3	189	0.00	217	44	8	1	270
Average no. of livestock	Per house hold	1.22	4.00	4.73	5.59	8.16	5.16	0.78	3.97	4.77	8.83	9.00	3.79	0.28	1.94	2.25	3.25	3.00	1.67
Standard animal unit	Per house hold	0.70	2.86	3.15	3.65	4.95	3.29	0.68	2.62	3.48	5.57	4.87	2.54	0.16	1.39	1.71	2.16	3.00	1.21
Proportion of farm employment	%	21.92	39.38	76.74	91.63	91.55	72.21	19.13	40.60	43.26	67.21	100.00	40.40	8.66	26.39	43.04	37.93	54.51	29.54
Farm Income	%	16.16	40.39	63.21	45.51	64.17	52.02	10.32	24.73	32.37	34.71	48.93	25.22	8.67	28.66	27.71	38.40	58.26	27.16

holding size from 2.82 ha to 6.08 ha during the study period. While the state reported 20 per cent of total cropped area under irrigation, the village Kot farming is done under rain fed conditions, the average rainfall in Hamirpur district being almost at par with state average rainfall of 1100 to 1500 mm (1990-91 to 2000-01). The decreasing land holdings and natural grazing fields have impacted adversely the village households maintaining 3.29 standard animal units (1959-60), 2.54 (1989-90) and 1.21 (2004-05). The dependency of sampled households on farm employment decreased very significantly from 72 per cent (1959-60), 40 per cent (1989-90) and 30 per cent (2004-05) implying diversified occupational structure and shift of work force to non-farm occupations. Accordingly, the share of farm income in total households income decreased from 52 per cent (1989-90), 25 per cent (1989-90) with slight improvement in 2004-05 being 27 per cent. Only large farm households still received 58 per cent share from agriculture in total income.

Herfindhal Index (H.I.):

The value of Herfindhal Index on different size of farm in different study period is given on Table 2. With the increase in diversification, the Herfindhal Index would decrease. This index takes a value one when there is a complete specialization and approaches zero as diversification increases. However, the major limitation of the index is that it cannot assume the theoretical minimum. Since the Herfindhal Index is a measure of concentration, it can be transformed by subtracting it from one, i.e. 1-H.I. The transformed value of H.I. will avoid confusion to compare it with other indices.

Herfindhal Index for all the sizes reveals that over all there's an increase in Herfindhal Index in all the sizes except in one case i.e. marginal in the year 2004-05. It may be attributed to decreased average gross cropped area per farmer. The increase in Herfindhal Index indicates about the decrease in the diversification. It may be remembered that

Herfindhal Index varies between one and zero corresponding to 'no diversification' to 'complete diversification'. HI is found to increase from 0.2582 in 1959- 60 to 0.4939 in 2004- 05 on all farms showing transformation towards specialization. This holds true for other sizes of farms as well..

Table: 2 Herfindhal Index on Different size of Farms in Kot village during

Different Study period.

Size of Farm	1959-60	1989-90	2004-05
Marginal	0.4368	0.5000	0.4990
Small	0.2800	0.3377	0.4893
Medium	0.2332	0.2952	0.5007
Large	0.2554	0.2790	0.4552
All farms (over all)	0.2582	0.4048	0.4939

Ogive Index (O.I.): The value of Ogive Index on different size of farms in different study period is given on Table 3. Like H.I. the Ogive Index is also a measure of concentration. Hence, it was transformed as 1-O.I. The major limitation of this index is that the upper bound tends to approach zero in case of perfect concentration, i.e. $N \rightarrow 1$, since $P_i \rightarrow$ and $(1/N) \rightarrow 1$. Thus it implies that the index approaches zero in extreme cases of perfect concentration as well as perfect diversification.

The basic feature of Ogive Index is that it is zero on both the extremes and in between, somewhere, with respect of number of crops it takes a maximum value than on either side of the maximum it would show decline which may be difficult to predict as such. However, it has certain correlation with average gross cropped area per farmer. The O.I. has been decreased significantly from 1.8402 in 1959-60 to 0.4816 on all farms, indicating transformation in hill agriculture for diversification towards concentration/ specialization. Other size of farms exhibited the same pattern of long term changes.

Table: 3 Ogive Index on Different size of Farms in Kot village during

Different Study period.

Size of Farm	1959-60	1989-90	2004-05
Marginal	2.4951	0.3028	0.4371
Small	1.2392	1.7019	0.4678
Medium	0.8662	1.3622	0.0015
Large	1.8099	1.2323	0.3656
All farms (over all)	1.8402	2.2386	0.4816

Entropy Index (E.I.): The value of Entropy Index on different size of farms in different study periods is given in Table .4. The index would increase with the increase in diversification and it approaches zero when there is perfect concentration, i.e., when P_i equals one. The upper bound of the index is $\log N$. However, the upper limit of entropy Index is determined by the base chosen for taking logarithms and the number of crops. The upper value of the index can exceed one, when the number of total crops is higher than the value of the logarithm's base, and it can be less than one when the number of crops is lower than the base of logarithm. Thus the major limitation of entropy Index is that it does not give standard scale for assessing the degree of diversification. Entropy Index is found to decrease with time, in all sizes, except the marginal size in 2004-05 over 1989-90. This may again be interpreted in terms of less average area in that year. The table reveals that the E.I. declined on all size of farms over the study period, and decreased from 0.7039 in 1959-60 to 0.3159 in 2004-05, implying that hill agriculture transformed from diversification to specialization.

Table: 4 Entropy Index on Different size of Farm in Kot village during

Different Study period.

Size of Farm	1959-60	1989-90	2004-05
Marginal	0.4332	0.3012	0.3045
Small	0.6497	0.5848	0.3239
Medium	0.7091	0.6489	0.3007
Large	0.7077	0.6831	0.3719
All farms (over all)	0.7039	0.4909	0.3159

Modified Entropy Index (M.E.I.): The value of modified Entropy Index on different size of farms in different study periods is given in Table 5. The Modified entropy Index imparts uniformity and fixity to the scale used as norm to examine the extent of diversification. This index is, therefore, quite useful as compared to the Entropy Index which does not have a fixed upper value. However, its limitation is that it measures the deviations from equal distribution among existing activities, i.e., number of crops only, and does not incorporate the number of activities in it. This index measures diversification given the number of crops, and the index is not sensitive to the change in the number of crops. The M.E.I. has two components, viz., distribution and number of crops, or diversity. The value of Composite entropy Index increases with the decrease in concentration and rises with the number of crops/activities. Both the components of index are bounded by zero and one and thus the value of M.E.I. ranges between zero and one. Since the index uses $-\log_N P$ as weights, it assigns more weight to lower quantity and less weight to higher quantity. It may be observed that the Modified Entropy Index depends on n explicitly, if n is small this MEI increases, and it varies between zero and one. The value near one corresponds to maximum diversification. At the same time it seems to have correlation

with average cropped area per farmer. The Table 5 reveals no transformation in hill crop diversification over the study period except in case of marginal and medium farms.

Table:5 Modified Entropy Index on Different size of Farm in Kot village during

Different Study period.

Size of Farm	1959-60	1989-90	2004-05
Marginal	0.4789	0.9998	0.6382
Small	0.7194	0.6476	0.6789
Medium	0.7852	0.7186	0.9989
Large	0.6796	0.7564	0.7794
All farms (over all)	0.6759	0.5436	0.6620

Composite Entropy Index (C.E.I): The value of Composite Entropy Index on different size of farms in different study periods is given in Table.6. The C.E.I. has two components, viz, distribution and number of crop (diversity). The value of Composite Entropy Index increases with the decrease in concentration and rises with the number of crops/ activities. Both the components of index are bounded by zero and one and thus the value of C.E.I. ranges between zero and one since the index uses $-\log_N P$, as weight, if assigns more weight to lower quantity and less weight to higher quantity. It may be stated that C.E.I depends on N explicitly, and over all it seems to decrease in value in all the sizes with time .

The exception, however, is in the marginal case where the index increases from 0.4187 (in 1959-60) to 0.4999 (in 1989- 90) and then decreases to 0.4254 in 2004-05. The other exception is the 'large size' showing a trend similar to the marginal case..

Table: 6 Composite Entropy Index on Different size of Farm in Kot village

during Different Study period.

Size of Farm	1959-60	1989-90	2004-05
Marginal	0.4187	0.4999	0.4254
Small	0.6295	0.5667	0.4527
Medium	0.6671	0.6287	0.4994
Large	0.6178	0.6619	0.5196
All farms (over all)	0.6144	0.4756	0.4413

Conclusion and policy implications: The study has revealed that agriculture is no more the mainstay of village economy as a source of livelihood since it was the main occupation of 53.2 per cent in 1959-60 which decreased to 16.7 per cent in 1989-90 and further to 4.4 per cent in 2004-05. Significant changes in demographic and occupational structure showed that service sector and non-farm employment have acquired economic ascendancy due to factors such as decreasing land resources, higher educational levels and openings available in other sectors of economy and availability of other non-farm avenues of employment. The share of farm income in total household income decreased from 52.02 per cent in 1959-60 to 25.2 per cent in 1989-90 and 27.6 per cent in 2004-05 and the proportion of farm employment also decreased significantly from 72.21 per cent during 1959-60 to 40.40 per cent during 1989-90 and further to 29.54 per cent in 2004-05. The livestock sector also shrunk as the average standard animal units decreased from 3.29 per cent in 1959-60 to 2.54 per cent during 1989-90 and further to 1.21 per cent in 2004-05.

All the indices used in this article indicated more or less similar trend in diversification of agriculture with different values. However, the entropy based indices are found to be more reliable in predicting the diversification.

The area under irrigation has a significant influence on crop diversification in favour of high value commodity. Assured irrigation avoid uncertainty of output and thus reduces production risk (Kumar, Kumar and Sharma 2012). The agriculture in Village Kot is fully rain fed and hence cultivation of high value crops is ruled out. The cropping pattern indicated significant shift from diversified farming towards maize and wheat cultivation. The cultivation of pulses, fodder crops and other crops had been given up causing set back to livestock sector, food and nutritional security. Improvement of infrastructure, enhancement in non-farm sector, and cooperative dairy sector in the village, supported by a positive price policy for pulses alone can ensure diversification in the farm sector and village economy.

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A Gender Perspective on Land Holdings in India

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The economic reforms from 1991 along with the two and a half decades of liberalization have transformed the character of the economy. There has been a progressive decline in the share of agriculture in the GDP. However, the corresponding decline in the workforce engaged in agriculture has been

much slower. At the start of the reforms in 1990-91, agriculture contributed a quarter of GDP of the economy which has since declined in share to 15.6 percent in 2010-11. Even with the decline in share in GDP, agriculture continues to account for 55 percent in employment¹ (Table1).

Table1 : Share of Agriculture in Employment and in GDP

Year	% Share in employment	% Share in GDP
1990-91	67.1	24.65
2000-01	58.2	19.13
2010-11	55.0	15.58

Source: Registrar General of India and Central Statistical Office

The number of women employed in agriculture rose from 91.3 million in 2001 to 97.5 million in 2011. An important dimension of this workforce is that in 2011, two in three females (as compared to one in two males) were engaged in agricultural activities which gives an indication that not only has it been difficult for the work force in general and women in particular to move out of agriculture.

The presence of women in the agriculture workforce is, as such, not new. Women have always contributed to production on the family farm through multifarious activities. Various activities in the agriculture and allied sector such as transplanting paddy, weeding and poultry, to name a few, have been predominantly done by women. Women have been also playing a pivotal role in agriculture as wage labour, as farmers, as co farmers and as unpaid family labour (Krishnaraj M and Kanchi A, 2008 pp 40).

What is relatively new is that, several farm

activities traditionally carried out by men are increasingly being undertaken by women especially as men shift out to higher paying wage employment leading to feminization of Agriculture (Ministry of Agriculture, 2005). There has also been a relative increase in women operated holdings compared to men. Given the importance of agriculture in the economy, this change in the gender composition in the agriculture sector deserves greater scrutiny and analysis.

This paper has the objective of bringing out the relative changes that have taken place from a gender perspective at the ground level in the agriculture sector during the post reform period. To that end, we analyze the data on operational holdings in agriculture.

Data from the Agriculture Census: The Agriculture Census provides gender disaggregated data on the number and area of holdings from 1995-96. This valuable source

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of data has not been adequately examined to understand the nature of feminization taking place in the post reform period. Most studies on feminization have used data from National Sample Survey Organization where information is collected at the household level (eg. Krishnaraj, M and Shah, A 2004 and Krishnaraj, M and Kanchi, A 2008). It is therefore of interest to see whether data collected in the Agriculture Census also points to feminization.

Agriculture Census has been held in India from the nineteen seventies at intervals of five years. The Census provide data on the number and area of operational holdings across various size classes and types of holding. In the post reform period, data from the Census has been used by scholars for State level studies and also for the study of productivity of small farms (Deshpande, R. S 2008, Dev S. M 2012). From the year 1995-96, gender disaggregated data on certain aspects have been made available. This paper is restricted to aspects on which data is available for women operated holdings.

The unit of data collection in the Agriculture Census is an 'operational holding'. An operational holding is managed as a single unit. An operational holding is defined as "all land which is used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others without regard to title, legal form, size or location" (Ministry of Agriculture: 2012). Within an operational holding, the entire land may not be placed under cultivation, and some part may be kept fallow, left as culturable waste or put to non agricultural use. The reference period of the Census is the agricultural year from July to June.

The Agriculture Census defines an "operational holder" as the person who actually operates the land. In case the land has been partitioned among various owners and is cultivated independently, they are recorded as separate holdings. In cases where the owner leases out

land to another cultivator, the survey numbers are shown with the name of the tenant who is actually operating the land and has taken the land on lease. Exogenous factors including government programmes and schemes can influence the short and medium term utilization of land and also the crops grown.

An operational holding is distinct from the ownership of holding. The Census collects data on operational holdings which reflects the de facto position on the ground as compared with ownership of holdings which reflects the de jure position. Records on land titles in many States have not been updated regularly and transfer of ownership has not been captured. The ownership of holdings and land rights assigned therein indicate the distribution of wealth.

The operational holding, as defined in agriculture census is effectively an economic unit, regardless of who actually owns the land. An operational holder in this sense exercises managerial control on cultivation of land. Therefore, analysis of operational holding provides a picture of the actual conduct of the economic activity on the ground and is relevant from a policy perspective.

The Agriculture Census collects data through a combination of census and survey methods. For collecting data, States are divided into two categories: the land record States and non-land record States. The rationale for this categorization is a matter of historical legacy.

In land record States there has been a practice of maintaining comprehensive land records covering land utilization and cropping pattern. The non-land record States include those where the British Government long before Independence had granted the permanent settlement of land. The non-land record States and Union Territories (UT) are Kerala, Orissa, West Bengal, Goa, the North Eastern States of Assam, Meghalaya, Manipur, Nagaland, Tripura, Sikkim, Arunachal Pradesh, Mizoram

and UTs such as Daman & Diu, Lakshadweep. In the case of Punjab where land records have been maintained, the procedure adopted is however the same as in a non land record State. In land record States the census method is followed in data collection. Data for each unit of operational holding is recorded by pooling all the parcels of land under common management irrespective of their location with the outer limit for pooling taken as a taluka.

For non-land record States, data is collected through a sample survey following a household enquiry approach in 20 percent of villages in each block. The selected villages also correspond to those chosen under the Government Scheme for the Establishment of an Agency for Reporting of Agricultural Statistics (EARAS) in the reference year of the Census.

The data collected at the operational holding is aggregated at various levels moving up from village to taluka, district, State and finally at all India level.

The Census classifies operational holders into three categories: individual, joint and institutional. The definitions are as follows:-

i) Individual: where the holding is operated either by one person or by a group of persons

who are members of the same household, the holding is shown as an individual holding.

ii) Joint: If two or more persons who belong to different households but share jointly as partners the economic and technical responsibility for the operation of an agricultural holding, the holding is classified as a joint holding

iii) Institutional: government farms, farms operated by sugarcane factories, cooperative society farm lands, farms managed by temple trusts which may be cultivated using hired labour are classified as institutional holdings. In case, the land is leased out to an individual it is then classified as an individual holding.

Gender disaggregated data on the State wise number and area and size of holdings has been made available from 1995-96. Data across land use aspects such as tenancy status, irrigation facilities, and crops grown are not available at the gender disaggregated level. In view of data availability, an analysis of the number and area and of women operated holdings has been carried out in the paper.

All India trends: Following the Green Revolution, the operated area in the country expanded for two decades. The operated area rose from 162.3 million hectares in 1970-71 to 165.5 million hectares to 1990-91 leading to an increase of 3.2 million hectares (Table2).

Table 2: Number of holdings, operated area and average size of holdings All Social Groups

	Operated Area	Number of holdings	Average Size
	Million hectares	million	Hectares
1970-71	162.3	71.0	2.28
1976-77	163.3	81.6	2.00
1980-81	163.8	88.9	1.84
1985-86	164.6	97.1	1.69
1990-91	165.5	106.6	1.55
1995-96	163.4	115.4	1.43

2000-01*	159.4	119.9	1.33
2005-06*	158.3	129.2	1.23
2010-11	159.6	138.3	1.16
*excludes Jharkhand			

With the introduction of economic reforms in 1990-91 the next two decades witnessed a contraction in area by five million hectares to 159.6 million hectares.

While the area has declined, the number of holdings continuously increased to reach 138.3 million holdings. Consequently, there has been a continual declining trend in the average size of holding from 2.28 hectares in 1970-71 to 1.55 hectares in 1990-91 and further down to 1.16 hectares in 2010-11 (Figure 1).

The reasons given for the increase in the number of holdings during the pre and post reform period are somewhat different. In the pre reform period, the growth in the number of holdings was due to the combined effect of institutional reforms (land reforms) coupled with legislations on land ceiling, new agricultural technology with its high profitability and demographic factors (AERC – Visvabharati 1996). At the same time, since the demand for land came for placing it under cultivation, the net result was an increase in operated area.

During the post reform period, the decline in operated area and increase in number of holdings has been attributed by the

Ministry of Agriculture to increasing demand for industrialization, urbanization, housing and infrastructure which has been forcing conversion of agricultural land to non – agricultural uses with the scope for expansion of the area available for cultivation being limited (Ministry of Agriculture 2013 p11). Furthermore, Government policies were revised to allow diversion of land for nonagricultural purposes such as housing² and infrastructure projects. The pressure on land for use in non agricultural purposes resulted in a decline in the total operated area.

Number of holdings and area cultivated by women: From 1995-96 to 2010-11 in a time span of fifteen years, the total number of holdings has risen from 115.4 million in 1995-96 to 138.3 million (Table3). Whereas the number of male operated holdings increased by 15.4 percent to reach 120.4 million holdings, the number of female operated holdings jumped by 61 percent (albeit from a lower base), to reach 17.7 million. Every five years there has been an addition of over 2 million in number of women operated holdings. The share of women operated holdings in total holdings went up from 9.5 to 12.8 percent

Table 3 : Breakup of Male and Female Operated Holdings

	No of holdings (million)			Area million hectares		
	Male	Female	Total	Male	Female	Total
1995-96	104.3	11.0	115.4	150.2	11.7	163.4
2000-01	106.7	13.0	119.9	144.3	13.4	159.4
2005-06	113.8	15.1	129.2	141.9	15.0	158.3
2010-11	120.4	17.7	138.3	141.5	16.5	159.6
Note in 2000-01 and in 2005-06 census was not carried out in Jharkhand						
Source: Agriculture census						

In one and a half decades, the overall area operated diminished from 163.4 million hectares to 159.6 million hectares in 2010-11. The area operated by males declined from 150.2 million hectares to 141.5 hectares whereas the area operated by women expanded from 11.7 million hectares to reach 16.5 million hectares. The situation where both the number and area of women operated holdings have been increasing, even as, the overall area operated has been contracting is a sign of feminization of agriculture.

At the aggregate level the number of holdings grew at 1.2 percent per annum while the area operated declined at the rate of 0.17 percent per annum. In comparison, the number of female

operated holdings accelerated at the rate of 3.2 percent per annum and the area operated by women grew at 2.3 percent per annum.

Ninety percent of female operated holdings are individually operated. The tiny size of holding coupled with the fact that they are individually operated by members of the same family with the women at the helm, suggests the fragmentation of holdings in the post reform period was due to economic conditions. This is in contrast to the argument given in the pre reform period where subdivision and fragmentation of holdings was also ascribed to ceiling limitations. Joint operated holdings which possibly include women's groups account for ten percent of female holdings (Table 4).

Table 4 : Individual and joint operated holdings by women

'million in number 'million hectares				
Item	Individual Number	Individual Area	Joint Number	Joint Area
1995-96	10.2	10.4	0.8	1.3
2000-01	12.1	12.0	0.9	1.4
2005-06	13.8	12.9	1.3	1.8
2010-11	15.9	14.3	1.7	2.2

Source; Agriculture census

Size of holding: The average size of woman operated holding has historically been less than that of male operated holding. The

average size of woman operated holding has steadily declined from 1.06 in 1995-96 hectares to 0.94 hectare in 2010-11 (Table 5).

Table 5 : Average Size of holding by Gender (Ha)

	1995-96	2000-01	2005-06	2010-11
Male	1.44	1.32	1.24	1.18
Female	1.06	1.03	0.98	0.94
Average	1.43	1.33	1.23	1.16

Source; Agriculture census

Size class of holdings: There has been a growing concentration of marginal holdings (<1ha) which was more accentuated in the case of women operated holdings. The number of marginal holdings among women has risen from 69 percent in 1995-96 to 72 percent in 2010-11. Within marginal holdings, those which are less than 0.5 hectare predominate accounting for about 50 percent of the female operated holdings in 2010- 2011.

The share of small holdings (1 to 2ha) has remained the same at 17 percent over the fifteen year time period ending 2010-11 in the case of women operated holdings. The share of semi medium (2 to 4ha) together with medium (4 to 10 ha) have gone down from 14 to 11 percent. Large holdings (10ha >) where mean size was 16 hectares have a share of less than 1 percent.

According to the Agriculture Census 2010-11, marginal holdings (<1ha) account for 28 percent of area, small (1 to 2ha) 25 percent, semi medium (2 to 4ha) 23 percent medium (4 to 10 ha) 17 percent and large holdings (10ha >) 7 percent of the total operated area. Holdings which were less than 2 hectares accounted for as much as 89 per cent of the total operational holdings and 53 per cent of the women operated area. Over time, the share of marginal and small holdings has risen with corresponding decline of semi medium, medium and large holdings. Another interesting point is that

within each size class (small & marginal, medium and large), the mean size of holding also continually declined.

In a study of holdings in Karnataka, Deshpande (2008) found that the density of small and marginal farmers has been increasing. The process of fragmentation is taking place not only at the medium and large holdings but it has also not spared the small and marginal holdings. He observes that the final culmination is a steep trend in the process of marginalization which pushes a large number of marginal and small holdings into an economically non viable class (Deshpande 2008 p977). The trend is similar for female operated holdings in the country. There has been a shift downwards from large holdings to medium, medium to semi medium, semi medium to small and small to marginal.

Social categories: The average size of holding of Scheduled Caste women is lower than that for all social groups together. The average size of holding of Scheduled Tribes is however higher than for all social groups mainly because of higher concentration in North Eastern States, Madhya Pradesh and Chhattisgarh where holding sizes are relatively larger. Over time, the average size of holding has been shrinking across social categories as well (Table 6).

Table 6 : Average size of holding for social groups (Females)

Figures in Hectare

	1995-96	2000-01	2005-06	2010-11
SC	0.71	0.71	0.69	0.68
ST	1.62	1.53	1.45	1.35
All Social groups	1.06	1.03	0.98	0.94

Source; Agriculture census

State level situation: State data is not comparable before 2000 because of changes in boundaries. We therefore focus only on the period from 2001 to 2011 to ensure coverage of all States in the analysis.

The maximum increase in the decade from 2000-01 to 2010-11 in the number of female operated households has been in Bihar (1.1 million) followed by Andhra Pradesh (1 million), Madhya Pradesh, Karnataka, Rajasthan, Uttar Pradesh and Gujarat. During the decade the States which recorded substantial increase in area of women operated holdings were Arunachal Pradesh, Andhra Pradesh, Gujarat, Maharashtra and Rajasthan. These states have significantly contributed to the feminization of land holdings in the post reform period.

Female operated holdings are smaller than corresponding male holdings for all States with the exception of Assam³. The interstate disparities in average size of holding follow a similar pattern for both men and women. In States where holdings are above the national average namely Gujarat, Haryana Jharkhand, Madhya Pradesh, Nagaland, Punjab, Rajasthan both men and women have above average size of holding in their category. Similar situation prevails in States with lower than average size of holding. Each and every State has witnessed shrinkage in the average size of holdings overtime. The interstate ranking in terms of size has remained almost the same in the decade 2001 to 2011 which indicates that the initial conditions dominate and that there has been a continual decline across States Viability of holdings: Due to the predominance of marginal and small holdings, two issues arise, namely, whether the holdings are viable and whether they generate sufficient income for a family?

The National Commission for Enterprises in the Unorganized Sector (NCEUS) calculated that in the case of marginal farmers, the consumption expenditure exceeds their estimated income by 56 percent and small farmers by 21 percent

and the deficit would have to be plugged by borrowing and other means (NCEUS 2008 p12). Applying this criterion, about 89 percent of women operated holdings would require income to be supplemented to stay out of debt. Semi medium operated holdings which constitute about 8 of women operated holdings would be able to break even. Only 7 percent of women operated holdings which are placed in the medium and large category would enjoy income which will exceed consumption expenditure by NCEUS criterion.

Ramesh Chand et al. (2011) have calculated that tiny holdings below 0.8 ha do not generate enough income to keep a farm family out of poverty despite high productivity. It would follow that close to 72 percent of women holdings which are operated by marginal farmers can be considered to fall below the poverty line.

Given the above situation, it could be said that almost 72 percent of the female operated holdings who constitute marginal holders would find their holdings inadequate to maintain a family. A large proportion of the semi landless and marginal landholders join the landless to work as casual agricultural labourers and in government employment programmes. The Population Census vindicates this grim reality since there has been an addition by 12 million female agricultural labourers from 2001 to 2011 to reach 61.1 million.

Factors behind feminization: It has been argued that farming has become an unattractive occupation because agriculture provides uncertain and dwindling incomes. This position was brought out by the Situation Assessment Survey of Farmers (NSSO, 2005). Farmers have attempted to move out of agriculture in search of employment elsewhere. The distress in agriculture has been acute in some States. A spate of suicides by farmers was witnessed across the States of Andhra Pradesh, Maharashtra, Karnataka

and Kerala which also left many households headed by women¹. More families have come to depend on women is clear from the increase in women headed households from 10.4 in 2001 to 11 percent 2011 according to the Population Census.

The feminization taking place over the last twenty five years needs to be paid greater attention because it has emanated from lack of choice and under duress. The Twelfth Five Year Plan (2012-17) observes that women's role as agricultural workers, especially their work on family farms is increasing thanks to the process of feminization of agriculture, this process reflects the fact that small and fragmented holdings do not allow for the generation of sufficient household income leading to migration of male members into other sectors, leaving the family farms to be tended largely by women and children (Planning Commission 2013, 12 FYP Vol3, pp 167). Women farmers with little wherewithal and additional responsibilities placed on them also face uncertain conditions in the external environment outside their farm. Land ownership titles are more often in men's name than that of women.

The National Commission for Farmers has emphasized that the feminisation of agriculture, due to male out-migration, needs specific attention with reference to gender-sensitive farm and credit policies. All research, development and extension programmes in agriculture, and all services must be engendered. (NCF 2006, pp 27). Subsequently, the National Policy on Farmers (2007) has stated that when women work in fields and forests the whole day they need support services like crèches, child care and nutrition. The various policy pronouncements indicate the Government has recognized some of the problems,

Way Forward: Land provides a sense of identity and rootedness in the village. Often land has durability and permanence in people's

minds which no other asset has (Selvadurai quoted in Agarwal 2004 p 17). Government policies which allow land to be taken away from peasants need to take cognizance of the reality that monetary compensation does not make up for loss of identity. The rights of women on land need to be reinforced. The welfare case for women's land rights stands even if the plot is too small to be economically viable on its own. Avenues for incomes so that land based production is an element in a diversified livelihood system need to in place (p32 Agarwal).

The Committee of State Agrarian Relations on the Unfinished Task of Land Reforms in 2008, recommended mandatory joint entitlement and ownership rights to homestead lands, and government should make provision for equal availability of agriculture inputs to women farmers (Ministry of Rural Development, 2008). Subsequently, the draft land reforms policy prepared by the Ministry has incorporated most of the suggestions of the Committee and has stated that whenever land is allotted, assigned distributed, it shall be made in the name of the woman member of the family (Ministry of Rural Development, 2013). Dev has pointed out that protecting women's rights in land, enhancing infrastructure support to women farmers will facilitate recognition for women as farmers and enable them to access credit, inputs, and marketing outlets (Dev S M 2008, pp8). These recommendations assume greater relevance with the increasing number and share of women held holdings.

In a changing economy, women in agriculture are caught in the trap of reduced resources within households and inferior opportunities outside (Krishnaraj M and Shah A, 2004 pp 37). Seventy two percent of women operated holdings are marginal and would not generate enough income for a family and the numbers are likely to rise. The trends in number and area of women operated holdings accompanied by the economic conditions in the economy would seem to indicate that feminization

¹More than one quarter million farmers committed suicide between 1995 and 2010 according to reports of National Crime Records Bureau. Women farmers have also committed suicide and in 2012 out of 13727 farmer suicides 1803 were women.

of agriculture is indeed a reality. While the scope for expansion of the area available for cultivation may be limited, productivity needs to be raised as well as opportunities for non farm employment for women.

Haque has pointed out that deteriorating conditions of workers in agriculture is a reminder of the need for appropriate land use planning which is sustainable and, economically viable and socially acceptable (Haque, T: 1997). In this scenario, the challenge is to make production possible in an environment of inclusiveness which is sustainable. Vyas suggests that policies, programmes and delivery systems need to be geared towards the reality of a small farm dominated agrarian structure on the one hand and changing demand pattern for agricultural produce on the other. Then alone we will be able to face the challenge of transforming a stagnant and impoverishing agriculture to a just, efficient and dynamic sector (Vyas: 2012, pp 304). Again these recommendations become even more relevant in the context of women operated holdings.

The 11th Five Year Plan (2007-2012) recognized the above issues and stated, "Agricultural strategy must focus on 85% of farmers who are small and marginal, increasingly female, and who find it difficult to access inputs, credit and extension or to market their output. While some of these farmers may ultimately exit from farming, the overwhelming majority will continue to remain in the sector and the objective of inclusiveness requires that their needs are attended to" (Planning Commission 2008 p.8, Vol.3). However, this recognition needs to be transformed into policies and actual implementation.

In essence, agricultural policies need to be engendered so that productivity is enhanced. Farm equipment and implements need to be designed for use by women. Agriculture extension services need to be adjusted to suit the time disposition of women. Opportunities

for non farm employment need to have to have synergy with farm employment so that women in agriculture can have a decent life and not be mired in poverty. The underlying message from this analysis is that policies need to be reoriented to improve productivity and incomes keeping in view that an increasing share of marginal and small holdings that are now being operated by women.

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End Note :

The population census follows the fourfold classification of workers –cultivators, agricultural labourers, working in household industry and other workers. The cultivators and agricultural labourers broadly show the workers engaged in the agricultural sector except those engaged in plantation activities which over the censuses have been considered part of other workers.

The realty sector has become influential in the 21st century and has lobbied for changes in legislation, for example, the Haryana Ceiling on Landholdings Act 1972 had placed ceiling limits at 54.5 acres of "C" land, 27.25 acres "B" land, 22.71 acres AA land and 18.17 acres of A land. The Act was drastically amended in 2011 allowing ownership of any amount of land (both urban and agricultural) to corporate bodies and effective retrospectively from 1975 (Bhupal pp 25).

Average size of holdings in 2005-06 and 2010-11 in Assam for females was recorded at 1.31 and 1. 23 hectares respectively as against 1 hectare for males in both years.

Spread of New Varieties of Hybrid Rice and their Impact on the Overall Production and Productivity in Uttar Pradesh*

Background of the Study

Rice is the main staple food of 60 per cent of the total population, while paddy is cultivated only in 33 per cent of the total cultivated area of India. In terms of area under paddy India ranks first but in terms of production of paddy China ranks first in the world. The average productivity of hybrid paddy has been estimated at 72 to 75 quintals per hectare, while the average productivity of inbred paddy has been estimated at 20 to 30 quintals per hectare in the country as a whole. In 1904 Kano in Japan started paddy breeding by hybridization and by the year 1913 twenty new varieties generated through crossing were in the hands of farmers. Since then the hybridization has been used successfully by investigators in many countries of the world. Hybridization for the purpose of producing new and improved varieties of paddy involves a delicate technique and many investigators have involved their own technique of emasculation for paddy hybridization.

Father Henry De Louleni in the year 1983 evolved system of Rice Intensification (S.R.I.) in Madagascar. From using this system the productivity of paddy i.e. 7 to 15 tonnes per hectare was achieved while the national productivity of paddy was only 2 tonnes per hectare. Many specific technologies were developed under S.R.I. whose area wise tests were suggested essential. Under this system with the minimum use of land, labour, capital and water from 50 to 300 per cent more production can be achieved. This system was quite appropriate for poor farmers, eco-friendly and sustainable production of paddy. Also seeing the success of hybridization in increasing production and productivity of paddy in China, the I.C.A.R., New Delhi launched a National Programme for adoption of hybrid paddy on large scale in the country during December, 1989. This programme was implemented through a network comprising

research, extension and seed production.

The research network on hybrid paddy consisted 11 research centres and many other voluntary centres across the country. The extension network consisted S.D.A. (State Department of Agriculture), extension wings of S.A.U.s. (State Agricultural Universities), KVKs (Krishi Vigyan Kendras) and the NGOs. The seed production network consisted of public sector seed production agencies such as N.S.C. (National Seeds Corporation), State Farms Corporation of India and State Seed Development Corporation in addition to many private seed companies. The entire programme was coordinated and implemented by the Directorate of Rice Research (DRR) Hyderabad. The programme initiated by the I.C.A.R. was strengthened by the technical support from IRRI (Philippines), F.A.O., U.N.D.P., M.R.F. (Mahyco Research Foundation), N.A.T.P. (National Agricultural Technology Project) funded by World Bank and IRRI/ADB project on Hybrid paddy. Since more than 80 per cent of the total area under hybrid paddy falls in Eastern India, hence much emphasis is being given to adopt new varieties of hybrid paddy under BGREI programme by the Government of India to extend new green revolution in Eastern India.

Keeping the above cited facts in view this study entitled "Spread of New Varieties of Hybrid Rice and their Impact on the overall Production and Productivity" was conducted with the following main objectives:-

Objective of the Study:-

To indicate the extent of adoption and the level of participation by the different categories of farmers in the cultivation of hybrid rice;

To assess the overall impact on production and productivity of hybrid rice;

To study the economics of cultivation of hybrid

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rice varieties vis-à-vis inbred varieties;

To identify factors determining the adoption of hybrid rice varieties;

To address various constraints and outline the prospects for increasing hybrid rice cultivation; and

To suggest policy measures for expansion of hybrid rice cultivation.

Data-Base and Research Methodology:-

Data-Base:

The present study was based on both secondary as well as primary data. The secondary data pertaining to area, production and productivity of total paddy, hybrid paddy and HYV paddy including aromatic paddy were collected from the farms and seeds sections of the Directorate of Agriculture of the State of Uttar Pradesh, Lucknow for the years from 1984-85 to 2009-10 to estimate the compound growth rates and coefficient of variation in the area, production and yield of the respective types of paddy growth in the state as a whole. The primary data pertaining to all aspects of paddy cultivation by the sample farmers both adopters as well as non-adopters of hybrid paddy were collected through the specially prepared schedules and questionnaires for the reference years 2009-10 and 2010-11.

Research Methodology:-

The study was confined to the NFSM (National Food Security Mission) Paddy districts of the state of Uttar Pradesh. From the total 26 NFSM paddy districts two districts namely Azamgarh and Ballia having relatively higher concentration of hybrid paddy seeds cultivation within the groups of NFSM districts were undertaken for the present study at the first stage of sampling. At the second stage of sampling two blocks from each selected district i.e. (1) Jahanaganj and (2) Martinganj from Azamgarh and (1) Garwar and (2) Nagra from Ballia district were chosen on the same criteria. At the third stage of sampling from each of the selected block two villages making 8 villages namely (1) Kolhukhor, (2) Kanaila, (3) Lilai and (4) Trikalpur from Azamgarh

and (1) Raghunathpur, (2) Kakari, (3) Shahpur and (4) Bairi from Ballia district were chosen randomly. At the fourth and final stage of sampling lists of hybrid and inbred paddy growers were undertaken and categorized into 4 standard size-groups as (1) Marginal (upto 1 ha.), (2) Small (1.01 to 2 ha), (3) Medium (2.01 to 4 ha) and (4) Large (above 4 ha). Thereafter, 40 hybrid paddy growers were undertaken randomly according to their proportion in the total such farmers from each of the selected district. In addition 10 inbred paddy growers as non-adopters of hybrid paddy were selected randomly making a total of 50 paddy growers from each selected districts and overall 100 paddy growers from the whole state for in-depth study.

Major Findings:-

The study reveals that more than 99 percent of the total area under paddy was cultivated during kharif season the less than 0.5 percent was cultivated during zaid season. During rabi season paddy was not at all cultivated in the whole state of Uttar Pradesh.

As regards the trend, the yield of total paddy during kharif season had increased considerably after the introduction of hybrid paddy cultivation in the state of Uttar Pradesh. The trend of yield in case of zaid paddy was quite zig-zag and as such the effect of hybrid seeds introduction was not so much effective in terms of coverage or in terms of production and yield during the span of 1984-85 to 2009-10 in the state of Uttar Pradesh.

The area under HYV paddy in the state as a whole had decreased considerably after the introduction of hybrid paddy cultivation in the state. But the production as well as yield of HYV paddy had been continuously increasing and there was favourable effect of hybrid paddy cultivation on the yield of HYV paddy in the state of Uttar Pradesh.

Regarding trend of hybrid paddy it was estimated for the data available only for the years from 2005-06 to 2009-10 in Directorate of Agriculture, Uttar Pradesh where in the effect of hybrid seeds cultivation on the coverage under hybrid paddy was of paramount importance in

the cropping pattern as the area had shifted to hybrid paddy considerably. Accordingly the production as well as yield of hybrid paddy had increased tremendously during the same span of period. Thus it is safely concluded that hybrid paddy cultivation had boosted the total paddy production in the state of Uttar Pradesh.

It is obviously clear that the share of HYVs in terms of area as well as production in the total paddy cultivation has decreased considerably till the year 2009-10. Accordingly the share in terms of production had also increased continuously which confirms that share of area and production of hybrid paddy in the total cultivation had increased considerably during 2005-06 to 2009-10 in the state. Regarding growth the compound growth the compound growth rates in the area, production and productivity of total paddy in the state on an aggregate level had decreased considerably.

The coefficient of variation in the area, production and yield of total paddy during the span of 1984-85 to 2009-10 had varied in the mixed direction showing a decreasing trend on an overall in the state of Uttar Pradesh.

The compound growth rates in case of HYV paddy indicates that the growth in area was nominal. While the growth of production was negative @ of - 29.29 during the same span of period showing a tremendous decrease. But the growth in yield of HYV paddy was in increasing direction in the state as a whole.

The coefficient of variation in the area, production and productivity of HYV paddy in the state shows that in the area there was constant variation in the production there was larger variation and in the yield of HYV paddy there was narrow variation in the state as a whole.

The compound growth rates of area, production and yield of Hybrid paddy show a considerable growth in area, production and yield in the whole state of U.P. during the year from 2005-06 to 2009-10.

The coefficient of variation in area, production and productivity of hybrid paddy shows that

area of hybrid paddy had varied largely. The larger variation in production indicates that the production of hybrid had increased tremendously. The narrow variation in yield clarifies that the productivity of hybrid paddy had increased with a slow pace in the state during the same span of period.

The distribution of sample farmers according to their farm size shows that majority of sample hybrid adopters were marginal farmers. The percentage of large farmers was quite low i.e. 10 percent. Among non-adopters of hybrids also about 60 per cent were marginal farmers against only 5 percent large farmers. Thus, there was preponderance of marginal farmers in the area under study.

Regarding age of sample hybrid adopters on an aggregate level 70 percent were of the 18-60 years age group and 30 percent were of above 60 years age group.

As regards the literacy about 14 percent of the total samples were illiterates which were slightly higher among the non-adopters. Among the literates the majority of sample paddy growers i.e. 53 percent were up to secondary level of education. On an overall the level of education was comparatively better among the non-adopters of hybrid paddy.

About castes, there was preponderance of general castes and among the adopters it was comparatively higher which clarifies that hybrid paddy cultivation has been adopted maximum by the farmers of general castes in the state of Uttar Pradesh.

The main occupation of the sample paddy growers was only farming in the area under study.

The average size of owned holdings was 1.69 hectares and almost the total area was operated. The pattern of holdings in respect of size and cropping pattern among the adopters and non-adopters was quite similar in the area under study.

The cropping pattern shows that during the year 2010-11 the area from sugarcane and other crops was shifted to paddy which proves that hybrid paddy adoption had increased during

2010-11 over the 2009-10.

Among the non-adopters too paddy was the main kharif crops. There was shift from wheat to Gram and other crops during 2010-11 over the year 2009-10.

About access to hybrid rice technology, the majority i.e. 96 percent of sample hybrid adopters reported the extension workers of S.D.A. as their main source of information on hybrid rice technology against the minimum sample adopters who reported the inputs dealers as their main source of information on hybrid rice technology.

Regarding extent of adoption of hybrid rice, the percentage of area under hybrid rice was 43.83 percent and under HYVs it was 56.17 percent in the area under study which very well shows that the adoption of hybrid rice at the farm level was encouraging.

As regards the determinants of participation in hybrid rice cultivation, the majority i.e. 96.25 percent of the sample farmers had reported the quality of information to be satisfactory by the extension workers of S.D.A. in the area under study.

About recommended package of practices in the rice cultivation the majority i.e. 96.25 percent of sample hybrid adopters had adopted the recommended package of practices in hybrids and 60 percent of farmers had adopted practices in HYVs. Among non-adopters 25 percent had adopted practices in HYV rice cultivation in the area under study.

In case of the source of seeds of hybrid rice cultivation the majority of hybrid adopters had reported to receive hybrid seeds from public stores on partial subsidy.

The percentage difference in the mean yield of hybrid rice and HYVs of rice was 54 percent which varied clearly and shows that mean yield of hybrid rice was much higher on an overall average in the area under study and was found increasing with the increase in the size of farms.

About yield gain from hybrid rice over inbred

rice was found increasing with the increase in the size of farms with significant quantity. The yield gain on marginal farms was 22.49 qtls per hectare and on large farms it was 33.51 qtls per hectare during the year 2009-10.

While during the year 2010-11 the yield gain was comparatively higher being 24.65 qtls per hectare on an overall average in the area under study.

About the factors affecting the yield of hybrid and inbred rice the majority of farmers i.e. 77 out of 80 reported the inadequate irrigation as the main factor affecting the yield most 73 reported costly inputs and erratic rains, 70 reported the lack of good seeds and 69 reported the lack of credit and information during both the years.

Regarding input use pattern the charges of seeds and irrigation were higher on inbred rice on the farms of hybrids adopters, while the charges of manures, fertilizers and human labours were comparatively higher on hybrid rice on the farms of hybrid adopters. In case of non-adopters the charges were higher on seeds, irrigation, human labour and fertilizers.

The hybrid cultivation was much profitable as the cost benefit ratio was 1: 2.18 in case of hybrid rice. While the cultivation of HYVs by the hybrid adopters was also considerable as the cost benefit ratio in case of HYVs was 1: 1.5. On the other hand cultivation of HYVs by non-adopters was comparatively more profitable.

The volume of marketing indicates that in case of Hybrid adopters the cultivation of HYVs rice was comparatively better in terms of output as well as price received.

The percentage of output sold i.e. 72.13 percent was comparatively higher in case of non-adopters although the average price received was comparatively lower in case of non-adopters of hybrids. The HYVs paddy was comparatively more productive than hybrid paddy in case of hybrid adopters during 2010-11. The output of hybrid adopters was increasing with the increase in the size of farms. Thus, it is obvious that the cultivation

of hybrid paddy was not profitable.

Selling of husked paddy rice was practiced only by a few hybrid adopters and the total (100%) paddy rice was sold. Unhusked paddy was sold in December only during both the years under reference.

The awareness about hybrid rice technology was extremely poor in the area under study and as a result the adoption of hybrid paddy was also poor in the whole area of study.

Regarding access to seed input 100 percent of farmers reported that the adoption of hybrid prevented traditional practice of saving and exchanging of seeds as they replace hybrid seed varieties every alternate year.

The response relating to access to fertilizer and its use was very discouraging as it was not available easily and timely at reasonable price.

The access of hybrid adopting farmers to pesticide input and its use was absolutely Nil in the area under study as 100 percent of the farmers reported that they do not know the correct way of using and doses of pesticides.

The access to credit needs by the hybrid adopting farmers was quite negative in the area under study as 100 percent of farmers reported that they do not get the required credit from the cooperative credit society or any other institutional sources. They also said that due to high interest rate and more formalities in getting credit were the other reasons for not taking credit.

The perception of hybrid adopting farmers about marketing of hybrid rice was very discouraging for the future of hybrid rice cultivation in the area under study because of low price and poor cooking as well as keeping quality and lower head recovery of hybrid rice.

The overall perception of hybrid adopting farmers was that due to high yield the production of hybrids was profitable but due to poor quality they were expecting better quality hybrid seeds.

95 percent of sample non-adopters had agreed

that they will grow the hybrid variety of rice next year. The reasons for not using the hybrid varieties of rice during the current year were that firstly they were quite ignorant about hybrids, seeds were not available at all, seeds were costly and they were not convinced that hybrid seed is of high quality.

The main reasons for non-adoption of hybrid rice were poor extension by the government and the quality of hybrid seeds as well as grain too apart from high price and unavailability of seeds in the area under study.

Policy Implications:

Based on the main findings of this study the following suggestions are being given for the policy implications:

Paddy is not at all cultivated during Rabi and Zaid seasons in almost all the regions of Uttar Pradesh state, hence, some suitable varieties of hybrid paddy must be generated and supplied to the needy hybrid-adopters.

For boosting the total paddy production in the state of Uttar Pradesh more and more area under hybrid rice cultivation must be shifted from other economically unviable crops during all the three seasons.

The growth rates in area, production and productivity of total paddy in the state on an aggregate level had decreased considerably, therefore, along with more coverage under paddy area the level of production must also be increased with suitable and timely application of all the inputs.

The narrow variation in the productivity of hybrid paddy clarifies that increase in the yield of hybrids was slow, therefore, the yield of hybrids must be increased with a high speed/pace in the state of Uttar Pradesh.

Medium and large farmers must also be given incentives and lures to adopt hybrid rice as there was preponderance of marginal and small farmers among the hybrid paddy adopters in the area under study.

The adopters must be taken care as it was

found comparatively better among the non-adopters of hybrid paddy.

Regarding cropping pattern the shift from sugarcane to paddy was there during kharif but in rabi it was from wheat to gram, therefore, the shift must be to paddy in rabi and zaid too.

The access to hybrid rice technology was poor because only extension workers of S.D.A. were source of information, therefore, other Government Agencies must be involved for more extension.

Since the yield gains from hybrids over inbreds was higher on large farms, therefore, more and more large farmers must be encouraged to adopt hybrid paddy cultivation.

Regarding inputs seeds and irrigation charges were the inputs affecting the yield most. Fertilizer and human labours were found affecting hybrids most, therefore, maximum care must be taken for supply of these 4 inputs.

The price received was better in case of HYVs than hybrids, therefore, the price of hybrids must be remunerated in case of hybrid-adopter to encourage them.

Hybrid adopters must be encouraged to process and sell husked paddy to make it more profitable.

The awareness about hybrid technology must be expanded on larger scale through all the possible ways and means.

Access to almost all the major inputs must be made easy and cheaper to all the needy hybrid adopting farmers in the whole state of Uttar Pradesh.

To attract the market the quality of hybrid in terms of price, cooking, keeping and low head rice-recovery (percentage of clean rice after milling) must be increased and improved.

D. Commodity Reviews

(i) Foodgrains

During the month of January, 2014, the Wholesale Price Index (Base 2004-05+100) of pulses, foodgrains and cereals declined by 0.13, 0.17% and 0.22% respectively over the previous month.

All India Index Number of Wholesale Prices

Base: 2004-2005=100

Commodity	Weight	WPI for the Month of January 2014	WPI for the month of December 2013	WPI A year ago	Percentage change during	
					A month	A year
1	2	3	4	5	6	7
Rice	1.793	229.9	230.3	202.0	-0.17	13.81
Wheat	1.116	220.9	220.5	205.4	0.18	7.55
Jowar	0.096	253.1	252.7	231.9	0.16	9.14
Bajra	0.115	255.2	252.5	256.0	1.07	-0.31
Maize	0.217	246.1	252.9	248.1	-2.69	-0.81
Barley	0.017	221.1	221.2	213.7	-0.05	3.46
Ragi	0.019	321.6	326.8	317.1	-1.59	1.42
Cereals	3.373	229.9	230.4	209.5	-0.22	9.74
Pulses	0.717	229.4	229.7	246.4	-0.13	-6.90
Foodgrains	4.09	229.9	230.3	215.9	-0.17	6.48

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

Behaviour of Wholesale Prices

The following Table indicates the State wise

trend of Wholesale Prices of Cereals during the month of January, 2014:

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

Procurement of Rice

5.40 million tones of Rice(including paddy converted into rice) was procured during January 2014 as against 6.78 million tones of rice(including paddy converted into rice)procured during January

2013 The total procurement of Rice in the current marketing season i.e 2013-2014, up to 31.01.2014 stood at 20.97 million tones, as against 22.75 million tones 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		Corresponding period of last year		Marketing Year (October-September)			
	(Upto 31.01.2014)		2012-13		2012-13		2011-12	
	Procure-ment	%age to Total	Procure-ment	%age to Total	Procure-ment	%age to Total	Procure-ment	%age to Total
1	2	3	4	5	6	7	8	9
Andhra Pradesh	2367	11.29	2752	12.09	6464	19.00	7548	21.53
Chhatisgarh	4250	20.27	3765	16.55	4804	14.12	4115	11.74
Haryana	2396	11.43	2589	11.38	2609	7.67	2007	5.72
Maharashtra	90	0.43	127	0.56	192	0.56	190	0.54
Punjab	8106	38.65	8558	37.62	8558	25.16	7731	22.05
Tamil Nadu	203	0.97	9	0.04	481	1.41	1596	4.55
Uttar Pradesh	671	3.19	1357	5.96	2286	6.72	3357	9.58
Uttarakhand	221	1.05	254	1.12	497	1.46	378	1.08
Others	2667	12.72	3339	14.68	8129	23.89	8138	23.21
Total	20971	100.00	22750	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 tones against

a total of 38.11 million tones 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		Corresponding period of last year		Marketing Year (April-March)			
	(Upto 01.08.2013)		2012-13		2012-13		2011-12	
	Procure-ment	%age to Total	Procure-ment	%age to Total	Procure-ment	%age to Total	Procure-ment	%age 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 & Public Distribution

(ii) Commercial Crops

Oilseeds And Edible Oils: The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 202.2 in January, 2014 showing a fall of 0.6 percent and 2.6 percent over the previous month and over the previous year. The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Copra (3.6 percent) and Sunflower (0.3 percent) increased over the previous month. However, the WPI of Groundnut seed (0.2 percent), Niger seed (0.3 percent), Cotton Seed (1.2 percent), Rape & Mustard Seed (1.4 percent), Soyabean (1.5 percent), Safflower Seed (1.9 percent) and Gingelly seed (2.8 percent) decreased over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 147.1 in January, 2014 showing a fall of 0.8 percent and 1.7 percent over the previous month and over the previous year. The WPI of Sunflower Oil (0.2 percent), Soyabean Oil (0.5 percent), Gingelly oil (1.1 percent), Copra oil (1.1 percent) and Groundnut Oil (2.4 percent) decreased over the previous month. However, the WPI of Mustard Oil (1.9 percent) and Cottonseed oil (1.7 percent) increased over the previous month.

Fruits & Vegetable: The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 209.0 in January, 2014 showing a fall of 11.8 percent over the previous month. However, it increased by 9.8 percent over the previous year.

Potato: The Wholesale Price Index (WPI) of Potato stood at 198.6 in January, 2014 showing a fall of 25.8 percent over the previous month. However, it increased by 16.0 percent over the previous year.

Onion: The Wholesale Price Index (WPI) of Onion stood 341.6 in January, 2014 showing a fall of 20.6 percent over the previous month. However, it increased by 0.5 percent over the previous year.

Condiments & Spices: The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 265.7 in January, 2014 showing an increase of 0.9 percent and 22.0 percent over the previous month and over the previous year. The WPI of Black Pepper and Chillies (Dry) increased by 1.1 percent and 3.6 percent over the previous month. However, the WPI of Turmeric remained unchanged over the previous month.

Raw Cotton: The Wholesale Price Index (WPI) of Raw Cotton stood at 242.3 in January, 2014 showing an increase of 5.8 percent and 21.6 percent over the previous month and over the previous year.

Raw Jute: The Wholesale Price Index (WPI) of Raw Jute stood at 273.6 in January, 2014 showing an increase of 0.7 percent and 10.9 percent over the previous month and over the previous year.

Wholesale Price Index Of Commercial Crops For The Month Of January, 2014

(Base Year: 2004-05=100)

Commodity	Latest Jan,14	Month Dec,13	Year Jan,13	Percentage Variation Over	
				A Month	A Year
OIL SEEDS	202.2	203.5	207.6	-0.6	-2.6
Groundnut Seed	193.7	194.1	272.5	-0.2	-28.9
Rape & Mustard Seed	192.7	195.5	215.8	-1.4	-10.7
Cotton Seed	175.8	178.0	160.7	-1.2	9.4
Copra (Coconut)	138.4	133.6	97.8	3.6	41.5
Gingelly Seed (Sesamum)	473.0	486.8	392.4	-2.8	20.5
Niger Seed	177.8	178.4	182.4	-0.3	-2.5
Safflower (Kardi Seed)	153.5	156.4	150.4	-1.9	2.1
Sunflower	196.5	196.0	179.7	0.3	9.3
Soyabean	220.5	223.8	200.3	-1.5	10.1
EDIBLE OILS	147.1	148.3	149.7	-0.8	-1.7
Groundnut Oil	173.0	177.3	198.7	-2.4	-12.9
Cotton Seed Oil	184.2	181.2	180.4	1.7	2.1
Mustard & Rapeseed Oil	159.2	156.2	155.3	1.9	2.5
Soyabean Oil	158.6	159.4	164.1	-0.5	-3.4
Copra Oil	124.2	125.6	114.8	-1.1	8.2
Sunflower Oil	128.2	128.5	139.7	-0.2	-8.2
Gingelly Oil	188.2	190.3	190.7	-1.1	-1.3
FRUITS & VEGETABLES	209.0	237.0	190.4	-11.8	9.8
Potato	198.6	267.5	171.2	-25.8	16.0
Onion	341.6	430.4	340.0	-20.6	0.5
CONDIMENTS & SPICES	265.7	263.3	217.8	0.9	22.0
Black Pepper	603.5	596.8	533.7	1.1	13.1
Chillies(Dry)	301.4	290.9	246.5	3.6	22.3
Turmeric	213.1	213.1	175.5	0.0	21.4
Raw Cotton	242.3	229.1	199.2	5.8	21.6
Raw Jute	273.6	271.6	246.6	0.7	10.9

Part II - Statistical Tables

A. Wages

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

(in Rs.)

State	District	Centre	Moth & Year	Daily Normal Working Hour	Field Labour		Other Agri. Labour Carpenter		Herdsman Black Smith Cobbler		Skilled Labour		
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	May,13	8	250	150	NA	NA	NA	NA	NA	NA	NA
	Guntur	Tadikonda	May,13	8	NA	NA	NA	NA	200	NA	NA	NA	NA
	Rangareddy	Arutala	May,13	8	225	175	NA	NA	NA	NA	NA	NA	NA
Karnataka	Bangalore	Harisandra	Sep,13	8	250	200	200	175	200	180	350	250	NA
	Tumkur	Gidlahali	Sep,13	8	170	160	175	165	175	165	200	190	NA
Maharashtra	Nagpur	Mauda	Feb,12	8	100	100	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Feb,12	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalood	April,12	8	100	100	NA	90	90	NA	58	58	NA

1.1 Daily Agricultural Wages In Some States (Operation-Wise)

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Assam	Barpeta	Loharapara	March,12	M	8	180	180	180	180	180		180	180	180
				W	8	NA	NA	160	160	160	NA	NA	NA	NA
Bihar	Muzaffarpur	Bhalui Rasul	April to June,12	M	8	130	120	80	130	150	120	200	180	250
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Shekhpura	Kutaut	May & June,12	M	8	NA	NA	185	NA	185	NA	245	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihaba	Oct,13	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,13	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,13	M	8	100	100	100	100	100	NA	200	144	150
				W	8	NA	100	100	100	100	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	March,13	M	8	180	180	180	200	180	NA	400	400	NA
				W	8	NA	150	150	180	150	NA	NA	NA	NA

1.1 Daily Agricultural Wages In Some States (Operation-Wise)-Contd

(In Rupees)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
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	
Kerala	Kozhikode	Koduvally	Sep,13	M	4-8	920	550		550	710	650	NA	NA	NA
				W	4-8	NA	NA	450	450	500	NA	NA	NA	NA
	Palakkad	Elappally	Sep,13	M	4-8	400	350	NA	400	400	500	NA	NA	NA
				W	4-8	NA	NA	250	300	250	NA	NA	NA	NA
Madhya	Hosangabad	Sangarkhera	Oct,13	M	8	150	130	150	150	125	100	300	300	NA
				W	8	NA	130	150	150	125	100	NA	NA	NA
	Satna	Kotar	Oct,13	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Shyopurkala	Vijaypur	Oct,13	M	8	NA	200	200	250	NA	150	250	250	NA
				W	8	NA	200	200	250	NA	NA	NA	NA	NA
Odisha	Bhadrak	Chandbali	July,13	M	8	NA	NA	NA	160	175	NA	NA	NA	NA
				W	8	NA	NA	NA	120	140	NA	NA	NA	NA
	Ganjam	Aska	July,13	M	8	200	150	150	NA	225	100	300	300	200
				W	8	NA	100	100	NA	110	100	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	June,08	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	June,13	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Jalore	Panwa	June,13	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	Sep,13	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	Sep,13	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		March,12	M	8	238	201	203	209	207	199	253	235	240
				W	8	NA	154	152	154	154	149	NA	NA	NA
Uttar Pradesh*	Meerut	Ganeshpur	Jan,13	M	8	205	207	206	204	206	NA	320	NA	NA
				W	8	NA	180	180	180	180	NA	NA	NA	NA
	Auraiya	Auraiya	Jan,13	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,13	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

NR- Not Reported

NA- Not Available

* States reported district average daily wages

B. Prices

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

(Month end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Jan-14	Dec-13	Jan-13
Wheat	PBW 343	Quintal	Punjab	Amritsar	-	-	1500
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1630	1600	1480
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1823	1750	1550
Jowar	-	Quintal	Maharashtra	Mumbai	2600	2550	2200
Gram	No III	Quintal	Madhya Pradesh	Sehore	2440	2400	-
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1400	1425	1350
Gram Split	-	Quintal	Bihar	Patna	4615	4670	5500
Gram Split	-	Quintal	Maharashtra	Mumbai	4800	5000	7000
Arhar Split	-	Quintal	Bihar	Patna	6650	6740	5800
Arhar Split	-	Quintal	Maharashtra	Mumbai	6800	6800	6550
Arhar Split	-	Quintal	NCT of Delhi	Delhi	6340	6355	6000
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	6400	6400	5550
Gur	-	Quintal	Maharashtra	Mumbai	3500	3400	3450
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4200	4300	3200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2285	2375	2450
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3340	3300	4000
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3550	3900	4650
Mustard Seed	-	Quintal	West Bengal	Kolkata	3200	4200	4200
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4140	4160	4315
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	3685	3670	3680
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1650	1500	1400
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	1550	1550	1550
Castor Seed	-	Quintal	Andhra Pradesh	Hyderabad	3600	3600	3200
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	5720	5680	5800
Copra	FAQ	Quintal	Kerala	Alleppey	8000	7300	4850
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	3800	3800	3850
Groundnut	-	Quintal	Maharashtra	Mumbai	6300	6400	8400
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1241	1230	1380
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1230	1275	1410
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1200	1230	1920
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1230	1260	1920
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1332	1290	1328

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

(Month end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Jan-14	Dec-13	Jan-13
Castor Oil	-	15 Kg.	Andhra Pradesh	Hyderabad	1230	1245	1148
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1335	1375	1800
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	3000	3075	2925
Coconut Oil	-	15 Kg.	Kerala	Cochin	1718	1553	1065
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	1930	1850	2060
Groundnut Cake	-	Quintal	Andhra Pradesh	Hyderabad	2600	2571	3214
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	4600	4300	3850
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	-	-	3666
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	2850	2900	2520
Jute Raw	W 5	Quintal	West Bengal	Kolkata	2800	2850	2520
Oranges	-	100 No	NCT of Delhi	Delhi	NA	458	483
Oranges	Big	100 No	Tamil Nadu	Chennai	460	480	480
Oranges	Nagpuri	100 No	West Bengal	Kolkata	-	-	-
Banana	-	100 No.	NCT of Delhi	Delhi	250	250	167
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	458	445	345
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	55000	57000	50000
Almonds	-	Quintal	Maharashtra	Mumbai	61000	60000	46000
Walnuts	-	Quintal	Maharashtra	Mumbai	64000	65000	62500
Kishmish	-	Quintal	Maharashtra	Mumbai	13000	13000	12000
Peas Green	-	Quintal	Maharashtra	Mumbai	4600	4500	3250
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	880	1600	650
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2600	2600	2500
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1000	1300	1300
Potatoes	Red	Quintal	Bihar	Patna	1000	1280	770
Potatoes	Desi	Quintal	West Bengal	Kolkata	700	1460	700
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	2333	2815	2474
Onions	Pole	Quintal	Maharashtra	Nashik	950	1250	1200
Turmeric	Nadan	Quintal	Kerala	Cochin	10000	10000	8000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	9500	9400	7200
Chillies	-	Quintal	Bihar	Patna	9200	8000	7600
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	49500	49000	37500
Ginger	Dry	Quintal	Kerala	Cochin	20000	19500	14000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	125000	125000	72500
Cardamom	Small	Quintal	West Bengal	Kolkata	95000	95000	98000
Milk	Cow	100 Liters	NCT of Delhi	Delhi	-	-	3600
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3200

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

(Month end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Jan-14	Dec-13	Jan-13
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	28681	28681	28348
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	30500	30500	25500
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	30460	30600	28200
Fish	Rohu	Quintal	NCT of Delhi	Delhi	10000	10000	8000
Fish	Pom-phrets	Quintal	Tamil Nadu	Chennai	32000	30000	26500
Eggs	Madras	1000 No.	West Bengal	Kolkata	4700	4500	3800
Tea	-	Quintal	Bihar	Patna	20000	20000	19800
Tea	Atti Kun-na	Quintal	Tamil Nadu	Coimbatore	13000	13000	9000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26000	26000	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	14000	14000	14000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2950	2870	2775
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2850	2800	2650
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3700	3700	4000
Rubber	-	Quintal	Kerala	Kottayam	13500	15000	14800
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29500	29000	28000

3. Month-end Wholesale Prices of some Important Agricultural Commodities in International Markets during the Year, 2014

Commodity	Variety	Country	Centre	Unit	January
CARDAMOM	Guatamala Bold Green	U.K.		Dollar/M.T. Rs./Qtl	9000.00 56079.00
CASHEW KERNELS	Spot U.K. 320s	U.K.		Dollar/lbs Rs. /Qtl	3.46 47156.61
	Spot U.K. 320s	U.K.		Dollar/M.T. Rs./Qtl	7648.65 47658.74
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands		Dollar/M.T. Rs./Qtl	1600.00 9969.60
CELERY SEED	ASTA cif	India		Dollar/M.T. Rs./Qtl	1500.00 9346.50
CHILLIES	Birds eye 2005 crop	Africa		Dollar/M.T. Rs./Qtl	4100.00 25547.10
CINNAMON BARK		Madagascar		Dollar/M.T. Rs./Qtl	1100.00 6854.10
CLOVES	Singapore	Madagascar		Dollar/M.T. Rs./Qtl	13250.00 82560.75
COCONUT OIL	Crude Phillipine/Indonesia	Netherlands		Dollar/M.T. Rs./Qtl	1280.00 7975.68
COPRA	Phillipines cif Rotterdam	Phillipine		Dollar/M.T. Rs./Qtl	806.50 5025.30
CORRIANDER		India		Dollar/M.T. Rs./Qtl	1500.00 9346.50
CUMMIN SEED		India		Dollar/M.T. Rs./Qtl	2250.00 14019.75
FENNEL SEED		India		Dollar/M.T. Rs./Qtl	2600.00 16200.00
GINGER	Split	Nigeria		Dollar/M.T. Rs./Qtl	1800.00 11215.80
GROUNDNUT KERNELS	US 2005,40/50	European ports		Dollar/M.T. Rs./Qtl	1250.00 7788.75
GROUNDNUT OIL	Crude any origin cif Rotterdam	U.K.		Dollar/M.T. Rs./Qtl	1500.00 9346.50
LENTILS	Turkish red split crop 1+1 water	U.K.		Pound/M.T. Rs./Qtl	606.12 6230.91

3. Month-end Wholesale Prices of some Important Agricultural Commodities in International Markets during the Year, 2014-*contd*

Commodity	Variety	Country	Centre	Unit	January
MAIZE		U.S.A.	Chikago	C/56 lbs Rs./Qtl	427.50 1046.85
OATS		Canada	Winnipeg	Dollar/M.T. Rs./Qtl	465.48 2900.41
PALM KERNAL OIL	Crude Malaysia/ Indonesia	Netherlands		Dollar/M.T. Rs./Qtl	1170.00 7290.27
PALM OIL	Crude Malaysian/ Sumatra	Netherlands		Dollar/M.T. Rs./Qtl	855.00 5327.51
RAPESEED	Canola	Canada	Winnipeg	Can Dollar/M.T.	423.80 2366.92
RAPESEED	UK delivered rapeseed , delivered	U.K.		Pound/M.T. Rs./Qtl	278.00 2857.84
RAPESEED OIL	Refined bleached and deodorised	U.K.		Pound/M.T. Rs./Qtl	668.00 6867.04
SOYABEAN MEAL	UK produced 49% oil & Protein	U.K.		Pound/M.T. Rs./Qtl	366.00 3762.48
SOYABEAN OIL		U.S.A.		C/lbs Rs./Qtl	37.10 5094.99
	Refined bleached and deodorised	U.K.		Pound/M.T. Rs./Qtl	652.00 6702.56
SOYABEANS	US No. 2 Yellow	Netherlands	Chicago	Dollar/M.T. Rs./Qtl	563.90 3513.66
		U.S.A		C/60 lbs Rs./Qtl	1269.25 2902.49
SUNFLOWER SEED OIL	Refined bleached and deodorised	U.K.		Pound/M.T. Rs./Qtl	710.00 7298.80
TALLOW	High grade delivered	U.K.	London	Pound/M.T. Rs./Qtl	465.00 4780.20
TURMERIC	Madras finger spot/ cif	India		Dollar/M.T. Rs./Qtl	850.00 5296.35
WALNUTS	Indian light halves	U.K.		Pound/M.T. Rs./Qtl	8130.00 83576.40
WHEAT		U.S.A.	Chicago	C/60 lbs Rs./Qtl	551.50 1261.16

Source: Public Ledger

Exchange rate

	Jan
US Dollar	62.31
CAN Dollar	55.85
UK Pound	102.80

C. Crop Production

4. Sowing and Harvesting operations normally in progress during March, 2014

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

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