सत्यमेव जयते

AGRICULTURAL SITUATION IN INDIA

NOVEMBER, 2015

GENERAL SURVEY OF AGRICULTURE

FARM SECTOR NEWS

ARTICLES

Economic Analysis of women Employment in Agriculture

Growth Pattern and Profitability of Sugarcane Cultivation in India: An Analysis of Maharashtra, Karnataka and utter Pradesh States

An Economic Analysis of Pattern of Physical Input Use under Organic and Inorganic farming in: Nagapattinam of Tamil Nadu

AGRO ECONOMIC RESEARCH

HYBRID RICE: Spread of new Varieties and their Impact on the Overall Production and Productivity in Andhra Pradesh

Possibilities and Constraints in Adoption of Alternative Crops to Paddy in Haryana

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Commercial Crops

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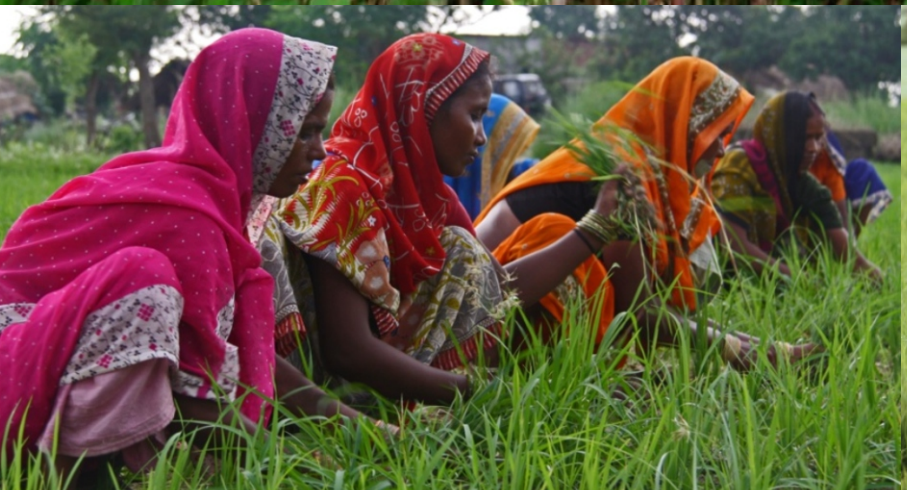

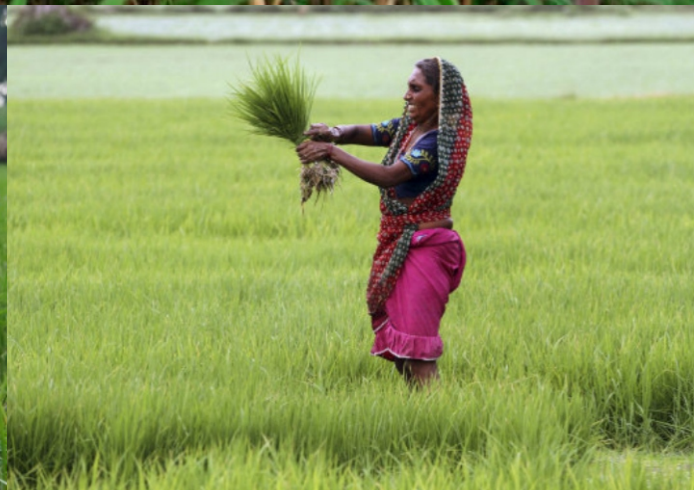

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Subscription

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

Available from

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Ministry of Urban Development,
Deptt. of Publications,
Publications Complex (Behind Old Secretariat),
Civil Lines, Delhi-110 054.
Phone : 23817823, 23819689, 23813761,
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Agricultural Situation in India

VOL. LXXII November, 2015 No. 8

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The Journal is brought out by the Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, 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.

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Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture, Cooperation & Farmers Welfare's monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. Good articles in Hard Copy as well as Soft Copy (agri.situation@gmail.com) in MS Word, not exceeding five thounsand words, may be sent in duplicate, typed in double space on one side of foolscap paper in Times New Roman font size 12, addressed to the Editor, Publication Division, Directorate of Economics and Statistics, M/o Agriculture & Farmers Welfare, C-1, Hutments Dalhousie Road, New Delhi-110 011 along with 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.

Soft copy of the journal may be seen in PDF at the following URL : eands.dacnet.nic.in/publication.htm

General Survey of Agriculture

Trends in Foodgrain Prices

During the month of September, 2015 the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains increased by 0.80 percent from 249.4 in August, 2015 to 251.4 in September, 2015.

The Wholesale Price Index (WPI) Number of Cereals increased by 0.30 percent from 233.1 to 233.8 and WPI of Pulses increased by 2.39 percent from 326.0 to 333.8 during the same period.

The Wholesale Price Index Number of Wheat increased by 1.07 percent from 214.5 to 216.8 while that of Rice increased by 0.04 percent from 238.2 to 238.3 during the same period.

Weather, Rainfall and Reservoir situation during October, 2015

Rainfall Situation

Cumulative Rainfall for the country as a whole during 1st October to 28th October, 2015 was 52% lower than Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period was lower by 73% in Central India, 63% in East & North East India, 38% in South Peninsula and 24% in North West India. Out of 36 met sub-divisions, 06 met sub-divisions have received excess/normal rainfall, and 30 met sub-divisions received deficient/Scanty rainfall.

Water Storage in Major Reservoirs

Central Water Commission monitors 91 major reservoirs in the country which have a total live capacity of 157.80 BCM at Full Reservoir Level (FRL). Live storage in these reservoirs as on 29th October, 2015 has been 88.27 BCM as against 117.15 BCM on 29.10.2014 (last year) and 119.12 BCM of normal storage (average storage of the last 10 years). Current year's storage as on 29.10.2015 has been 25% lower than last year's and 26% lower than the normal storage.

ECONOMIC GROWTH*

As per the quarterly estimates of Gross Domestic Product (GDP) released by the Central Statistics Office (CSO) on 31st August 2015, the growth rate of GDP at constant (2011-12) market prices for the first quarter (Q1) (April-June) of 2015-16 is estimated at 7.0 per cent as compared to the growth of 6.7 per cent in Q1, and 7.5 per cent in Q4 of 2014-15.

The growth of Gross Value Added (GVA) at constant (2011-12) basic prices for agriculture & allied sectors, industry sector and services sector are estimated at 1.9 per cent, 6.5 per cent and 8.9 per cent respectively in Q1 of 2015-16 as compared to the corresponding rates of 2.6 per cent, 7.7 per cent and 8.7 per cent respectively in Q1 of 2014-15 (Table 2).

The private final consumption expenditure as a percentage of GDP increased from 60.7 per cent in Q1 of 2014-15 to 61.3 per cent in Q1 of 2015-16. Gross fixed capital formation (GFCF) as a percentage of GDP declined from 29.2 per cent in Q1 of 2014-15 to 27.8 per cent in Q1 of 2015-16.

The growth rate of Gross Domestic Product (GDP) at constant (2011-12) market prices was estimated at 7.3 per cent in 2014-15 (full year; provisional estimates), as compared to 6.9 per cent and 5.1 per cent in 2013-14 and 2012-13 respectively (Table 1).

There was a decline in the rate of gross domestic saving from 33.9 per cent of the GDP in 2011-12 to 31.8 per cent in 2012-13 and further to 30.6 per cent in 2013-14. This was caused mainly by the sharp decline in the rate of household physical savings.

AGRICULTURE AND FOOD MANAGEMENT

Rainfall

During the South West Monsoon season (1st June - 23rd September) of 2015, the cumulative rainfall has been 12 per cent below normal. The actual rainfall received during the Monsoon season 2015, as on 23.09.2015, has been 747.9 mm as against the normal at 853.9 mm. Out of the total 36 meteorological subdivisions, 1 subdivision received excess season rainfall, 19 sub-divisions received normal season rainfall and the remaining 16 sub-divisions received deficient season rainfall.

All India production of foodgrains

As per the 1st advance estimates released by Ministry of Agriculture on 16.09.2015, production of kharif foodgrains during 2015-16 is estimated at 124.1 million tonnes compared to 120.3 million tonnes in 2014-15 (1st AE) (Table 3).

Procurement

Procurement of rice as on 15.09.2015 was 32.0 million tonnes during Kharif Marketing Season 2014-15 (which

* Source: www.finmin.nic.in

runs from October to September) and procurement of wheat as on 15.09.2015 was 28.1 million tonnes during Rabi Marketing Season 2015-16 (which runs from April to March) (Table 4).

Off-take

Off-take of rice during the month of June 2015 was 25.6 lakh tonnes. This comprises 20.8 lakh tonnes under TPDS/ NFSA (off-take against the allocation for the month of July 2015) and 4.9 lakh tonnes under other schemes. In respect of wheat, the total off-take was 20.3 lakh tonnes comprising 17.7 lakh tonnes under TPDS/NFSA (off-take against the allocation for the month of July, 2015) and 2.6 lakh tonnes under other schemes.

Stocks

Stocks of foodgrains (rice and wheat) held by FCI as on September 1, 2015 were 50.8 million tonnes, compared to 57.3 million tonnes as on September 1, 2014 (Table 5).

TABLE 1: Growth of GVA at Basic Prices by Economic Activity (at 2011-12 Prices) (in per cent)

Sector	Growth			Share in GVA		
	2012-13	2013-14	2014-15 (PE)	2012-13	2013-14	2014-15 (PE)
Agriculture, forestry & fishing	**1.2**	**3.7**	**0.2**	**17.7**	**17.2**	**16.1**
Industry	**2.4**	**4.5**	**6.1**	**32.3**	**31.7**	**31.4**
Mining & quarrying	-0.2	5.4	2.4	3.0	3.0	2.9
Manufacturing	6.2	5.3	7.1	18.3	18.1	18.1
Electricity, gas ,water supply & other utility services	4.0	4.8	7.9	2.4	2.3	2.3
Construction	-4.3	2.5	4.8	8.6	8.3	8.1
Services	**8.0**	**9.1**	**10.2**	**50.0**	**51.1**	**52.5**
Trade, hotels, transport, communication and services related to broadcasting	9.6	11.1	10.7	18	18.8	19.4
Financial, real estate & professional services	8.8	7.9	11.5	19.5	19.7	20.5
Public administration, defence and Other Services	4.7	7.9	7.2	12.5	12.6	12.6
GVA at basic prices	**4.9**	**6.6**	**7.2**	**100.0**	**100.0**	**100.0**
GDP at market prices	**5.1**	**6.9**	**7.3**	**---**	**---**	**---**

Source: Central Statistics Office (CSO). PE: Provisional Estimates.

TABLE 2: Quarter-wise Growth of GVA at Constant (2011-12) Basic Prices (per cent)

Sectors	2013-14				2014-15				2015-16
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Agriculture, forestry & fishing	2.7	3.6	3.8	4.4	2.6	2.1	-1.1	-1.4	1.9
Industry	4.8	4.0	5.0	4.3	7.7	7.6	3.6	5.6	6.5
Mining & quarrying	0.8	4.5	4.2	11.5	4.3	1.4	1.5	2.3	4.0
Manufacturing	7.2	3.8	5.9	4.4	8.4	7.9	3.6	8.4	7.2
Electricity, gas ,water supply & other utility services	2.8	6.5	3.9	5.9	10.1	8.7	8.7	4.2	3.2
Construction	1.5	3.5	3.8	1.2	6.5	8.7	3.1	1.4	6.9
Services	10.2	10.6	9.1	6.4	8.7	10.4	12.5	9.2	8.9
Trade, hotels, transport, communication and services related to broadcasting	10.3	11.9	12.4	9.9	12.1	8.9	7.4	14.1	12.8
Financial, real estate & professional services	7.7	11.9	5.7	5.5	9.3	13.5	13.3	10.2	8.9
Public administration, defence and Other Services	14.4	6.9	9.1	2.4	2.8	7.1	19.7	0.1	2.7
GVA at basic prices	**7.2**	**7.5**	**6.6**	**5.3**	**7.4**	**8.4**	**6.8**	**6.1**	**7.1**
GDP at market prices	**7.0**	**7.5**	**6.4**	**6.7**	**6.7**	**8.4**	**6.6**	**7.5**	**7.0**

Source: Central Statistics Office (CSO)

TABLE 3: Production of Major Agricultural Crops (1st Adv. Est.)

Crops	Production (in Million Tonnes)			
	2012-13 (Final)	2013-14 (Final)	2014-15 (4th AE)	2015-16$ (1st AE)
Total Foodgrains	257.1	265.0	252.7	124.1
Rice	105.2	106.7	104.8	90.6
Wheat	93.5	95.9	88.9	-
Total Coarse Cereals	40.0	43.3	41.8	27.9
Total Pulses	18.3	19.3	17.2	5.6
Total Oilseeds	30.9	32.8	26.7	19.9
Sugarcane	341.2	352.1	359.3	341.4
Cotton	34.2	35.9	35.5	33.5

$: Covers only Kharif Crops.

TABLE 4: Procurement of Crops in Million Tonnes

Crops	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Rice#	34.2	35.0	34.0	31.8	32.0[P]	--
Wheat@	22.5	28.3	38.2	25.1	28.0	28.1[P]
Total	56.7	63.4	72.2	56.9	60.0	28.1

[#]Kharip Marketing Season (October-September), [@]Rabi Marketing Season (April-March), [P]Position as on 15.09.2015.

TABLE 5: Off-Take and Stocks of Food Grains (Million Tonnes)

Crops	Off-take			Stocks		
	2012-13	2013-14	2014-15	2014-15 (Till August)	September 1, 2014	September 1, 2015
Rice	32.6	29.2	30.7	15.3	17.3	13.9
Unmilled Paddy[#]					6.7	3.6
Converted Unmilled Paddy in terms of Rice					4.5	2.4
Wheat	33.2	30.6	25.2	36.8	35.5	34.5
Total (Rice & Wheat)(1+3+4)	65.9	59.8	55.9	52.1	57.3	50.8

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

Farm Sector News

Kharif Crop Sowing Crosses 1038 Lakh Hectares

The total area sown under kharif crops as on 16th October, 2015, has reached to 1038.81 lakh hectares as compared to 1025.85 lakh hectare last year at this time.

Rice has been sown/transplanted in 378.24 lakh hectares, pulses in 115.62 lakh hectares, coarse cereals in 186.07 lakh hectares, oilseeds in 185.15 lakh hectares, sugarcane in 48.84 lakh hectares and cotton in 117.09 lakh hectares.

The details of the area covered so far and that covered during the last year this time given as follows:

(Lakh hectare)

Crop	Area sown in 2015-16	Area sown in 2014-15
Rice	378.24	379.67
Pulses	115.62	102.89
Coarse Cereals	186.07	181.87
Oilseeds	185.15	177.98
Sugarcane	48.84	48.74
Jute & Mesta	7.80	8.16
Cotton	117.09	126.55
Total	1038.81	1025.85

Rabi Crops Sowing Crosses 58 Lakh Hectares

As per preliminary reports on the sowing of crops, sowing of rabi crops has started in some parts of the country.

The total area sown under Rabi crops as on 30th October, 2015 has 58.34 lakh hectares as compared to 58.48 lakh hectare last year at this time.

Wheat has been sown/transplanted in 1.20 lakh hectares, pulses in 20.65 lakh hectare coarse, cereals in 27.04 lakh hectares, oilseeds in 9.43 lakh hectares and Rice in 0.02 lakh hectares.

The details of the area covered so far and that covered during the last year this time given as follows:

(Lakh hectare)

Crop	Area sown in 2015-16	Area sown in 2014-15
Wheat	1.20	2.06
Pulses	20.65	21.31
Coarse Cereals	27.04	14.29
Oilseeds	9.43	20.83
Rice	0.02	0.00
Total	58.34	58.48

Measures Undertaken by Government for Judicious and Proper Use of Pesticides "Grow Safe Food" Campaign Initiated to Create Awareness

Government of India has taken several measures for proper use of pesticides by the farmers in the country. The pesticide residue data generated under the "Monitoring of Pesticide Residues at National Level" are shared with State Governments and concerned Ministries/Organizations to initiate the corrective action for judicious and proper use of pesticides on crops with an Integrated Pest Management approach and to generate awareness amongst farmers.

Department of Agriculture, Co-Operation & Farmers Welfare (DAC&FW) emphasizes Integrated Pest Management (IPM) which promotes biological, cultural and mechanical methods of pest and advocates need based, judicious use of pesticides. DAC&FW implement a scheme "Strengthening and Modernization of Pest Management Approach in India" to promote Integrated Pest Management (IPM) which is an environment friendly broad ecological approach for managing pest problems. It encompasses pest control techniques such as cultural, mechanical and biological with minimum dependence on chemical pesticides. Human Resource Development in IPM is done by imparting training to Agriculture / Horticulture Extension Officers and farmers at Grass Root Level by organizing Farmers Fields Schools (FFSs) and Seasonal Long Training Programmes (SLTPs). The DAC & FW has established 35 Central IPM centers in different states to promote IPM Strategies. Grant-in-aid is also provided to the States for establishment /strengthening of State Bio-control Laboratories. A total of 313 SBCLs have been established across India.

"Grow Safe food" Campaign has been initiated to create awareness about the safe and judicious use of pesticides among the various stakeholders. In addition to the above, DAC&FW has revised 68 Integrated Pest Management (IPM) Packages of Practices for major crops giving impetus to ecological and cultural techniques of pest management. Under the Insecticide Act 1968, insecticides are registered after evaluating the safety of the product with respect to human health. The terms of registration also include instructions for farmers and users of pesticides on label and leaflets of containers on safe use of pesticides. If the pesticide is used as per the instructions on labels and leaflets, they are unlikely to leave behind unwanted residues in the agri-produce.

India and Lithuania agree to intensify agricultural cooperation

Minister of State for Agriculture, Mr Mohanbhai Kundariya, held bilateral talks in Vilnius with Lithuanian vice Minister for Agriculture Mr.Vilius Martusevicius. In delegation level talks on October 01, both sides agreed that there was significant potential for intensifying bilateral cooperation in agriculture, particularly in sectors like food and dairy processing. Mr.Kundaria was accompanied by Ambassador Ajay Bisaria, First Secretary Meena, Honorary Consul, Wing Commander Rajinder Chaudhary and senior officers of India's Ministry of Agriculture. Heads of Departments of the Agriculture Ministry of Lithuania attended the meeting from Lithuanian side. Mr.Kundaria briefed the Lithuanian side on the latest agricultural initiatives in India including soil health cards to be given to 140 million farmers and special irrigation schemes The sides agreed to collaborate in research and agricultural technology. It was agreed that a Lithuanian delegation comprising of senior executives of the Ministry, scientists and business representatives would visit India to take forward the conversations. A bilateral agreement on agricultural cooperation will also be signed during the visit.

The bilateral meeting was preceded by a visit by the Indian delegation to Kaunas Agricultural University where they were shown research facilities available for Lithuanian and foreign students in the well-equipped laboratories of the University. The Rector of the University offered to share research with Indian agriculture research institutes in fields of the soil-tests, organic and digital farming.

The Indian delegation also met with agricultural enterprises in Kaunas who showed willingness to work with Indian companies under Make in India scheme. Ambassador Ajay Bisaria highlighted the favorable factors available in India for manufacturing companies under the 'Make-in-India' campaign. Ambassador invited Lithuanian companies as partners in India's new economic growth story, as India gears up for a phase of active and focused engagement with Central Europe.

Dr.Sanjeev Kumar Balyan Launched KISAN Project and Hailstorm App.

Minister of State for Agriculture & Farmers' Welfare, Dr.Sanjeev Kumar Balyan launched KISAN Project [C(K)rop Insurance using Space technology And geoiNformatics] of Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture and Farmers Welfare on 5th October, 2015.. The project envisages use of Space Technology and geoinformatics (GIS, GPS and Smartphone) technology along with high resolution data from UAV/Drone based imaging for improvement in yield estimation and better planning of Crop Cutting Experiments (CCEs), needed for crop insurance programme.

The Pilot Study is proposed to be launched in one District each of Haryana, Karnataka, Madhya Pradesh and Maharashtra during Kharif season of 2015 and two Districts each of these States during Rabi season of 2015-16. While launching the project Hon'bleMoS informed that once the Pilot Study is successful, it will be extended to the other parts of the country. The KISAN project will be implemented by Mahalanobis National Crop Forecast Centre (MNCFC), an attached Office of Department of Agriculture, Cooperation & FW, in collaboration with ISRO Centres (Space Applications Centre, Ahmedabad & National Remote Sensing Centre, Hyderabad), India Meteorological Department, CCAFS, State Agriculture Departments and State Remote Sensing Centres.

Dr.Balyan also launched an Android an App., designed by National Remote Sensing Centre, Hyderabad, of ISRO. This App will help real time data collection about hailstorm occurrences along with photographs and geographical coordinates (longitude and latitude). The Minister informed that App will help Government to get real time data about the Hailstorms which will be collected through the Agriculture Department officials of different States. This will support in deciding the crop loss more objectively and in a very fast manner.

Articles

Economic Analysis of Women Employment in Agriculture

N.V. Shende* and A.M. Parkhi**

Abstract

Increasing participation of women in the labour market in the developed and developing countries has brought out the issue of gender differentials in earnings and employment opportunities into sharp focus. The women in India, especially in rural sector are discriminated and disadvantaged in many aspects of employment such as employment diversification, quality of employment and wage earnings. Keeping these issues in view, an attempt is made to study the extent of unemployment of women labour during off-season and identify the non-farm employment opportunities. The study is based on primary data collected from women labour in the vicinity of Nagpur district during 2013-14. The study revealed that season wise unemployment of farmer as a labour for 194 days was maximum as compared to landless labour which was 171.39 days. During summer season, farmer as a labour were maximally unemployed for 89.08 days as compared to landless labour for 84.86 days. Women labourers have limited alternative sources of employment like MNAREGA, domestic work, construction and bricks making. The seasonal unemployment also resulted in migration of labourers to other places and to non-agricultural activities. The seasonal unemployment of women labourers has severe negative impact on their income, consumption expenditure and savings. The debt position of the labourers also worsened. So steps should be taken to provide sufficient alternative employment sources for the labourers so that they can earn good income during off-season. The women labourers had many suggestions to overcome the problem of unemployment during off-season like proper implementation of employment guarantee programmes, higher wages in agriculture, training to improve skill and for starting entrepreneurship activities and provide loans without much formalities with low interest rate. The suggestions are to be considered and suitable policies are to be formulated to provide the women labourers with wages on par with their male counterparts. Loans should be disbursed quickly and at lower interest rates, sufficient alternative employment sources should be provided in their village itself and skill development programmes should be initiated.

Keywords: Women labour, Employment diversification, wage earnings, landless labour, lower interest rates.

Introduction

Unlike industrial labour, agricultural labour is difficult to define. The reason is that unless capitalism develops fully in agriculture, a separate class of workers depending wholly on wages does not come up. According to the National Commission on Labour "an agricultural labourer is one who is basically unskilled and unorganized and has little for livelihood, other than personal labour." Thus, persons whose main source of income is wage, employment fall in this category. Agricultural labourers are those persons who derive a major part of their income as payment for work performed on the farms of others can be designated as agricultural workers. For a major part of the year they should work on the land of the others on wages.

When we talk about agricultural labour, woman labour has a special significance. Women are a vital part of Indian economy. Over the years, there is a gradual realization of the key role of women in agricultural development and their vital contribution in the field of agriculture, Traditionally, women have always played an important role in agriculture - as farmers, co -farmers, family labourer, wage labourers and managers of farms. Women have been putting in the labour not only in terms of physical output but also in terms of quality and efficiency. Women play a significant and crucial role in agricultural operations including different crop production activities, post-harvest activities etc. Rural women have primary responsibility of running household, sharing fuel, fodder, water, care of children and other family members. Women are also used as unskilled labourers. They are devoting many hours in the field but their work is not given due credit. The role of women in agricultural operation is generally under-estimated and under-valued. While being an integral and crucial part of agricultural system, women do not have an access to new technologies that could save their tremendous amount of time and back breaking labour.

Increasing participation of women in the labour market in the developed and developing countries has brought out the issue of gender differentials in earnings and employment opportunities into sharp focus. The women in India, especially in rural sector are discriminated and disadvantaged in many aspects of employment such as employment diversification, quality of employment and

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wage earnings. Keeping these issues in view, an attempt is made to study the extent of unemployment of women labour during off-season and identified the non-farm employment opportunities.

Methodology

Multi-stage random sampling technique has been adopted for the selection of the district, talukas, villages and women agricultural labourers. In the first stage, Nagpur district was selected. In the second stage, three talukas were selected. In the third stage, from these selected talukas, four villages from each taluka were randomly selected for the study. In all, twelve villages were selected for the study. In the fourth stage, ten women agricultural labourers from each of the twelve chosen village were selected randomly. Thus, a total of 120 women agricultural labourers i.e., 60 farmers as labourers and 60 landless labourers were selected for collecting the required information for the study. The selected farmer families and list of landless labourers from each village were selected through random procedure. For evaluating the specific objectives of the study, necessary primary data were obtained from the selected women agricultural labourers, through personal interviews with the help of a pre-tested and structured schedule. The data so collected for a period of one year 2013-2014.The data collected from the respondents included general information, extent of unemployment of women labour during offseason and their non-farm employment opportunities. The method of personal interview was adopted to ensure that the data obtained from the selected women agricultural labourers were relevant, comprehensive and reasonably correct and precise. Simple tabular method with averages and percentages was employed for calculating the extent of unemployment during off-season and their alternate sources of employment.

Results and Discussion

Economic characteristics of the women labourers in agriculture

The general characteristics of women agricultural labourers are presented in Table 1. The study covered in two categories i.e. 60 farmers as a labourer and 60 landless labourers spread over twelve villages in three talukas from Nagpur district.

It is evident from the table 1 that the farmer as a labourer and landless labourer categories, majority of the women labourers 75 and 80 percent belonged to the middle age group (30-50 years). About 13.33 and 6.67 percent were in the young age group (15-29 years) and 11.67 and 13.33 percent were in old age group (above 50 years) respectively.

Education is an important tool for social development. The higher level of literacy especially among women is an important parameter in vidharbha's development paradigm. The table 1 observed that majority had only lower primary education in their villages and were mostly middle aged group. The educational level of farmer as a labour and landless labour categories showed that 46.67 and 51.67 percent of the labourers had lower primary education, 31.67 and 25 percent of the labourers had middle primary education, 11.67 and 10 percent of the labourers had high school education. However, 10 and 13.33 percent of the labourers were illiterate in farmer as a labourer and landless labourer categories respectively.

It is observed from the table 1 that 91-95 percent of women labourers were married. So they had their family responsibilities. In most of the cases, their spouses were also agricultural labourers. So their involvement in agricultural activities was essential to suggest their family, Among the farmer as a labourer 8.33 percent cases were widows, however, it was 5 percent in landless labourer categories.

Family sizes are the functions of economic and social characteristics. The family size of women labourers plays an important role in deciding that they will work as a labourer or not. It is observed from table 5.1 that in farmer as a labourer and landless labourer categories, 58.34 and 63.33 percent had come under small family (up to 4 members) whereas 38.33 and 35 percent was under medium family (5 to 8 members) and 3.33 and 1.67 percent was under in large family (above 8 members).

It is observed from table 1 that in farmer as a labourer and landless labourer categories, 96.67 and 98.33 percent of the women labourers belonged to nuclear family whereas 3.33 and 1.67 percent of women labourers belonged to Joint family system in the study area.

It is evident from table 1 that 91.67 per cent of the farmers as labourers and 95 percent landless labourers belonged to male headed households and 8.33 and 5 percent belonged to female headed households. The reason might be widowhood.

In the study area, majority of the farmers as labourers and landless labourers belonged to backward caste category which formed 41.67 and 46.67 percent followed by scheduled tribe category which formed 33.33 and 30 percent. In Scheduled caste category 21.67 and 18.33 percent and in general category which formed 3.33 percent and 5 percent. Mostly, lower caste people performed agricultural activities.

Table 1 revealed that in the study area, 100 percent farmers as labourers worked as cultivator-cum-casual labourers and there was no cultivator-cum-casual labourer in landless labourer, 97.5 per cent labourers worked as casual labourers. About 66.67 percent landless labourers worked as casual labourers and also 33.33 percent landless labourers worked as permanent labourers in agriculture in the region.

The women labourers were not technically skilled. They were involved in activities performed mainly by hand and carried operations in the traditional way. Men labourer did all machine operation works and those operations require technical skill. Since the women labourers were unskilled, their wage rate was also low compared to men.

From table 1, it is evident that 18 farmers as labourers (30 percent) and 25 landless labourers (41.67 per cent) were technically skilled. These skilled labourers performed activities like puddling, paddy cultivation whereas 42 farmers as labourers (70 percent) and 35 landless labourers (58.33 percent) were involved in unskilled works. They worked for 8 hours a day.

It is observed from the table 1 that the women labourers had participation in organizations and unions. Among the farmer as a labour, 10 labourers (16.67 percent) were members of co-operative society, 5 labourers (8.33 per cent) had membership in religious unions and 15 labourers (25 percent) were members of self-help groups. About 20 labourers (33.33 percent) were members of labour unions, 32 labourers (53.33 percent) were members of MNREGA whereas in landless labourer 8 labourers (13.33 percent) were members of cooperative society, 3 labourers (5 percent) had membership in religious unions and 13 labourers (21.66 per cent) were members of self-help groups. About 15 labourers (25 percent) were members of labour unions and 40 labourers (66.67 percent) were members of MNREGA.

From the table 1 it is evident that 100 percent farmers as labourers and 90 percent landless labourers possessed Ration card as they had to depend on the public distribution system for their basic necessities like food and fuel whereas 100 percent farmers as labourers and 80 percent landless labourers possessed voter ID card followed by 90 percent farmers as labourers and 60 percent landless labourers possessed Aadhar card.

Table 1 revealed that the annual average family income of the farmers as labourers was Rs.124483.33 whereas the income of the landless labourers was Rs.91466.67. Their family members had different sources of income, like wage earnings in agriculture, from self farming, as skilled labour etc. Some worked in workshops, some were auto drivers, some worked in construction sites etc.

The average land holding size of the farmer as a labourer was 0.88 ha.

TABLE 1 General Characteristic of the Women Labourers in Agriculture

Sr. No.	Category	Women labourers	
		Farmer as a Labour Frequency (n=60)	Landless Labour Frequency (n=60)
1	2	3	4
1.	Age		
	a) Young (15-29 years)	8 (13.33)	4 (6.67)
	b) Middle (30-50 years)	45 (75.00)	48 (80.00)
	c) Old (above 50 years)	7 (11.67)	8 (13.33)
2.	Education qualification		
	a) Illiterate (cannot read and write)	6 (10.00)	8 (13.33)
	b) Middle primary (5th to 7th)	19 (31.67)	15 (25.00)
	c) High school (8th to 10th)	7 (11.67)	6 (10.00)
3.	Marital status		
	a) Married	55 (91.67)	57 (95.00)
	b) Widow	5 (8.33)	3 (5.00)
	c) Divorced	0 (0.00)	0 (0.00)
	d) Separated	0 (0.00)	0 (0.00)
4.	Family size		
	a) Small (up to 4)	35 (58.34)	38 (63.33)
	b) Medium (5 to 8)	23 (38.33)	21 (35.00)
	c) Large (above 8)	2 (3.33)	1 (1.67)

TABLE 1: General Characteristic of the Women Labourers in Agriculture—*Contd.*

1	2	3	4
5.	Type of family		
	a) Joint family	2 (3.33)	1 (1.67)
	b) Nuclear family	58 (96.67)	59 (98.33)
6.	Female headed		
	a) Yes	5 (8.33)	3 (5.00)
	b) No	55 (91.67)	57 (95.00)
7.	Caste		
	a) SC	13 (21.67)	11 (18.33)
	b) ST	20 (33.33)	18 (30.00)
	c) OBC	25 (41.67)	28 (46.67)
	d) General	2 (3.33)	3 (5.00)
8.	Type of Labour		
	a) Permanent labour	0 (0.00)	20 (33.33)
	b) Casual labour	0 (0.00)	40 (66.67)
	c) Cultivator cum casual labour	60 (100.00)	0 (0.00)
9.	Type of work		
	A. A. a) Skilled	18 (30.00)	25 (41.67)
	b)Unskilled	42 (70.00)	35 (58.35)
	B. Hours of work per day (8 hours)	60 (100.00)	60 (100.00)
10.	Social participation		
	a) Members of co- operatives	10 (16.67)	8 (13.33)
	b) Members of religious union	5 (8.33)	3 (5.00)
	c) Members of SHG's	15 (25.00)	13 (21.66)
	d) Member of labour union	20 (33.33)	15 (25.00)
	e) Member of MNREGA	32 (53.33)	40 (66.67)
11.	Person possessing		
	a) Ration card	60 (100.00)	54 (90.00)
	b) Voters ID card	60 (100.00)	48 (80.00)
	c) Aadhar card	54 (90.00)	36 (60.00)
12.	Average family income per annum	124483.33	91466.67
13.	Average land holding size	0.88 ha.	0.00

(Note : Figures in parenthesis indicates percentage to total)

Land utilization pattern of selected women labourer (Farmer as a labourer)

Land utilization indicates the area of land actually utilized in different purpose like crop production, irrigated, unirrigated etc.

The details about the land utilization pattern of selected women labourers (Farmer as a labourer) is given in Table 2.

TABLE 2: Land Utilization Pattern of Selected Women Labourers (Farmer as a Labourer)

(Area in Ha.)

Sr. No.	Particulars	Farmer as a labour
1.	Total land holding	0.88 (100.00)
2.	Fallow land	0.00 (0.00)
3.	Net cultivated area	0.88 (100.00)
4.	Area sown more than once	0.42 (47.72)
5.	Irrigated areas	0.44 (50.00)
6.	Grossed cropped area	1.30
7.	Cropping intensity (%)	147

(Note : Figures in parenthesis indicates percentage to total)

Table 2 revealed that in farmer as a labourer, average land holding was 0.88 hectares and the gross cropped area was 1.30 hectares. Net cultivated area was 0.88 hectares and the area sown more than once was 0.42 hectares and irrigated area was 0.44 hectares. The cropping intensity was 147 percent though women labourers (i.e. farmer as a labourer) go to as a labour because of their marginal size of land holding.

Cropping pattern of selected women labourers (Farmer as a labourer)

Cropping pattern gives an idea about the proportion of area allocated to different crops grown in kharif as well as rabi season. The percentage area allocated to different crops with reference to grossed cropped area by the selected women labourers (farmer as a labourer) has been presented in Table 3.

TABLE 3: Cropping Pattern of Selected Women Labourers (Farmer as a Labourer)

(Area in Ha.)

Sr. No.	Particulars	Farmer as a labour
A.	Kharif crops	
1.	Soybean	0.34 (26.15)
2.	Cotton	0.39 (30.00)
3.	Paddy	0.15 (11.54)
	Total	0.88 (67.69)
B.	Rabi crops	
1.	Gram	0.21 (16.15)
2.	Wheat	0.21 (16.15)
	Total	0.42 (32.31)
	Gross cropped area	1.30 (100.00)

(Note : Figures in parenthesis indicates percentage to total)

Information presented in table 3 revealed that the grossed cropped area was 1.30 hectares which consists of 67.69 percent area under kharif crops and 32.31 percent area under rabi crops.

Among the kharif season, highest proportion of area was observed under sown under cotton crops i.e. 30.00 per cent fallowed by soybean crops i.e. 26.15 percent then paddy crops i.e. 11.54 percent.

In rabi season, gram and wheat were important crops grown by the selected women labour (farmer as a labour). It was observed that the area under gram with respect to grossed cropped area 16.15 percent and similarly for wheat.

Extent of unemployment of women labourers during off-season

Unemployment is the major problem faced by the agricultural women labourers. An attempt was, therefore, made in present study to examine the extent of unemployment. The details of unemployment days during off-season of selected women labourers are given in Table 4.

TABLE 4: Season wise Unemployment of Women Labourers in Agriculture

Season	Women labourers			
	Farmer as a labourer		Landless labourer	
	Unemployment days per worker		Unemployment days per worker	
	Days (Average)	Percentage	Days (Average)	Percentage
Kharif	42.05	21.65	31.03	18.11
Rabi	63.11	32.49	55.50	32.38
Summer	89.08	45.86	84.86	49.51
Total	194.24	100.00	171.39	100.00

Information presented in table 4 revealed that the three main agricultural seasons in the study area are Kharif, Rabi and Summer. In kharif season, farmer as a labourer were maximum unemployed for 42.05 days as compared to landless labourer for 31.03 days. In rabi season, farmer as a labourer were maximum unemployed for 63.11 days as compared to landless labourer for 55.50 days and in summer season, farmer as a labourer were maximum unemployed for 89.08 days as compared to landless labourer for 84.86 days.

It is concluded from the above result that the season-wise unemployment of farmer as a labourer and landless labourer was maximum unemployed during summer season as compared to kharif and rabi season. It was found that farmer as a labourer was unemployed for a maximum period of 194.24 days as compared to landless labourer which was unemployed for 171.39 days per annum.

Kharif season

The Unemployment of women labourers in agriculture during kharif season are presented in Table 5.

TABLE 5: Unemployment of Women Labourers in Agriculture During Kharif Season

Month	Women labourers			
	Farmer as a labourer Unemployment days per worker		Landless labourer Unemployment days per worker	
	Days (Average)	Percentage	Days (Average)	Percentage
June	7.50	17.83	4.35	14.02
July	12.37	29.42	9.88	31.84
August	14.33	34.08	11.68	37.64
September	7.85	18.67	5.12	16.50
Total	42.05	100.00	31.03	100.00

Information presented in table 5 revealed that during kharif season, the unemployed days of farmer as a labourer and landless labourer were maximum during August which was 14.33 and 11.68 days respectively followed by the month of July where it was 12.17 days and 9.88 days respectively. The unemployment days in June were about 7.50 and 4.35 days respectively and September which was 7.85 and 5.12 days respectively.

It is concluded that in the entire kharif season, farmer as a labourer and landless labourer were unemployed for a maximum period of 42.05 days as compared to landless labourer which was unemployed for 31.03 days in agriculture in a year.

Rabi season

The unemployment of women labourers in agriculture during rabi season are presented in table 6.

TABLE 6: Unemployment of Women Labourers in Agriculture During Rabi Season

Months	Women labourers			
	Farmer as a labourer Unemployment days per worker		Landless labourer Unemployment days per worker	
	Days (Average)	Percentage	Days (Average)	Percentage
October	11.36	18.00	9.31	16.77
November	16.18	25.64	14.48	26.09
December	20.57	32.59	18.58	33.48
January	15.00	23.77	13.13	23.66
Total	63.11	100.00	55.50	100.00

Information presented in table 6 revealed that during rabi season, the unemployed days of farmer as a labourer and landless labourer were maximum during December which was 20.57 and 18.58 days, in the month of November 16.18 days and 14.48 days, in January 15.00 days and 13.13 days and the unemployment days were less in October which was 11.36 and 9.31 days. In this season, farmer as a labourer were unemployed for a maximum period of 63.11 days as compared to landless labourer which was unemployed 55.50 days in agriculture in a year.

Summer season

The Unemployment of women labourers in agriculture during summer season are presented in Table 7.

TABLE 7: Unemployment of Women Labourers in Agriculture During Summer Season

Months	Women labourers			
	Farmer as a labourer Unemployment days per worker		Landless labourer Unemployment days per worker	
	Days (Average)	Percentage	Days (Average)	Percentage
February	23.10	25.93	21.96	25.88
March	20.86	23.42	19.75	23.27
April	18.15	20.37	16.37	19.29
May	26.97	30.28	26.78	31.56
Total	89.08	100.00	84.86	100.00

Table 7 reveals that summer season is the off-season for agriculture in the study area. The unemployed days of farmer as a labourer and landless labourer were maximum during the month of May which was 26.97 and 26.78 days, in the month of February 23.10 days and 21.96 days, in March 20.86 days and 19.75 days and the unemployment days was less in April i.e. 18.15 days and 16.37 days for farmer as a labourer and landless labourer respectively. In this season, farmer as a labourer were unemployed for a maximum period of 89.08 days as compared to landless labourer unemployed for 84.86 days of the total unemployment in agriculture in a year.

Identification of alternate sources of employment

Due the off-season in summer for agricultural activities, women labourers could not find any job in agriculture. As a result the women labourers had to find alternate sources of employment given in Table 8.

TABLE 8: Alternative Sources of Employment for Women Labourers in Agriculture

Sr. No.	Sources	Farmer as a Labourer				Landless Labourer				Total Labourers involved
		No. of labourers involved	Months	Average no. of days	Wage rate (Rs. Per days)	No. of labourers involved	Months	Average no. of days	Wage rate (Rs. Per days)	
1.	NREGA	32	February, March, April, May	50-60	180	40	February, March, April, May	60-80	180	72
2.	Domestic work	10	February, March & April	40-50	50-60	8	February, March & April	55-60	50-60	18
3.	Construction	8	March, April	20-25	100-150	10	March, April	25	100-150	18
4.	Bricks making	5	February	10	100	2	February	15	100	7
	Total	55				60				115
	Labourers not moved to other job	5				0				5
	Total Labourer	60				60				120

From table 8, it was revealed that in farmer as labourers, 91.67 percent labourers involved in other activities during off season. About 53.33 percent labourers got employment through Mahatma Gandhi National Rural Employment Guarantee scheme (MNREGA). They got employment for 50-60 days at a wage rate of Rs.168/day and in landless labourers, 100 percent labourers involved in other activities during off-season. About 66.67 percent labourers got employment through Mahatma Gandhi National Rural Employment Guarantee scheme (MNREGA). They got employment for 60-80 days at a wage rate of Rs.168/day. They were employed during the months of February, March, April and May.

This scheme has been a great boon for the poor labourers. They did activities like roads construction, cleaning ponds, making canals, making farm pond etc. Both male and female labourers received the same wages at the rate of Rs.168 per day which is the minimum wage prescribed under minimum wages act. The Mahatma Gandhi National Rural Employment Guarantee Act(MNREGA) launched by the Government of India on February 2, 2006 has become boon to the rural labour community. The MNREGA works with the theory of equal wages for equal work. This programme was launched to provide 100 days of guaranteed employment (unskilled manual work) to every rural household. One third days in the total employment days are reserved for women labourers and it aims at eliminating the exploitation of women labourers by providing them with labour opportunities and thereby increasing their social status and provide them social justice.

The labourers i.e. farmer as a labourer and landless labourer also worked as domestic workers. In farmer as a labourer about 16.67 percent labourers were involved. They worked for 40-50 days and landless labourers about 13.33 percent labourers were involved. They worked for 55-60 days having wage rate was Rs.50-60 per day in the month of February, March and April.

The labourers also worked on construction. The share of farmer as construction labourer about 13.33 percent labourers involved. They worked for 20-25 days and in landless labourers about 16.67 percent labourers involved. They worked for 25 days earned Rs.100-150 per day as wages in the months of March and April.

The labourers also got employment in bricks making. The farmer as a labourer about 8.33 percent labourers and landless labourers about 3.33 percent labourers were involved in the month of February. They worked for 10-15 days and earned wages at the rate of Rs.100 per day.

About 5 labourers (8.33 percent) did not migrate to other activities or other places, in the category of farmer as a labourer. Lack of other employment opportunity in the vicinity might be the reason for their non-migration. But some of them did not seek any alternative employment as their family members had good source of income.

Migration of women labourers

The seasonal unemployment also resulted in migration of labourers to other places and to non-agricultural activities. The nature of migration is presented in Table 9.

TABLE 9: Migration of Women Labourers

Sr. No.	Migration	Women labourers			
		Farmer as a labourer		Landless labourer	
		Frequency (n=60)	No. of days	Frequency (n=60)	No. of days
1.	To nearby villages				
	a) In Agricultural activities	-	-	-	-
	b) In non-agricultural activities	49 (81.67)	60-70 days	55 (91.67)	80-90 days
2.	To nearby districts				
	a) In agricultural activities	-	-	-	-
	b) In non-agricultural activities	6 (10.00)	25-30 days	5 (8.33)	25-30 days
3.	To other state	-	-	-	-
4.	Labourers not migrated	5 (8.33)	-	-	-
	Total	60	-	60	-

Table 9 revealed that during summer i.e. off-season in agriculture, the labourers migrated to other jobs or other places due to unemployment in agriculture. In the study area, majority of the farmer as labourers (81.67 percent) and landless labourers (91.67 percent) sought non-farm employment to nearby village. Farmer as a labourer got employment for 60-70 days whereas landless labourer got employment for 80-90 days. They were involved in employment guarantee programmes, some of them were involved in domestic work, construction and bricks making.

About 10 percent farmer as labourers and 8.33 percent landless labourers were migrated to nearby districts. They were involved in non-agricultural activities like construction and bricks making.

In the present study, the labourers were not migrating to other states. However, 8.33 percent farmer as labourers did not show any sort of migration. They did not find it necessary to seek other employment as their family members had good earnings.

Conclusion

The study revealed that season-wise unemployment of farmer as a labourer was for maximum for about 194 days as compared to landless labour which was unemployed for 171.39 days. During summer season, farmer as labourers were maximum unemployed for 89.08 days as compared to landless labourers for 84.86 days. Women labourers have limited alternative sources of employment like MNREGA, domestic work, construction and bricks making. The seasonal unemployment also resulted in migration of labourers to other places and to non-agricultural activities.

Policy Implications

1. The seasonal unemployment of women labourers has severe negative impact on their income, consumption expenditure and savings. The debt position of the labourers also worsened. So steps should be taken to provide sufficient alternative employment sources for the labourers so that they can earn good income during off season.
2. The women labourers had many suggestions to overcome the problem of unemployment during off-season like proper implementation of employment guarantee programmes, higher wages in agriculture, training to improve skills and for starting entrepreneurship activities and provision of loans without much formalities with low interest rate. The suggestions are to be considered and suitable policies are to be formulated to provide the women labourers with wages on par with their male counterparts. Loans should be disbursed quickly and at lower interest rates, sufficient alternative employment sources should be provided in their village itself and skill development programmes should be initiated.

Growth Pattern and Profitability of Sugarcane Cultivation in India: An Analysis of Maharashtra, Karnataka and Uttar Pradesh States

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Abstract

After the independence, sugarcane crop has become a very prominent cash crop in India, especially in Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh states, etc. The contribution of sugarcane crop is significant in national as well as states' economies and overall development of sugarcane growing regions. This paper investigates the growth trend pattern by using the growth and decomposition analysis model and estimates the profitability of sugarcane cultivation for major three sugarcane growing states, namely, Maharashtra, Karnataka and Uttar Pradesh.The growth model and decomposition model suggest that for sugarcane crop, positive growth rate and area effect were the major sources of the expansion of sugarcane production in the Maharashtra and Karnataka states after the period 1981-82, whereas, the yield effect was the major source in Uttar Pradesh till 2000-01. Due to the influence of some government policies and programs, Karnataka state has recorded higher actual price received by the farmers and profitability compared to Maharashtra and Uttar Pradesh states. Among the operation cost items, the cost of machine labour and irrigation recorded high in Maharashtra state compared to Karnataka and Uttar Pradesh states. Finally, to reduce operational cost, this study suggests the harvesting of sugarcane crop should be done within the appropriate time and also there is a need to adopt multi-cropping system by growers along with sugarcane crop.

Key words: Sugarcane, Profitability, Farm Income, Sugarcane Prices, Decomposition Analysis.

Introduction

India has made lots of progress in agriculture since independence in terms of growth in the area, production, and productivity under many cash crops, especially sugarcane crop. Today, India is the largest producer of sugar in the world. The India's share in world sugar production has risen from 5 percent to 15 percent in the last five decades. Sugarcane is one of the important cash crops grown in India, which provide direct or indirect employment to around 7.5 percent of the rural population. Over 6 million agricultural and 0.5 million skilled and unskilled industrial workers are engaged in the sugar industry (Directorate of Sugar, 2013) and contributing to the growth of the vital rural economy. Though sugarcane is grown only in 2.57 percent of the gross cropped area, its contribution to the total value of agriculture output is 6 percent in 2013-14 (CACP Report, 2014). Moreover, the sugarcane growers and sugar mills are the significant contributors to the economy through various taxes across the value chain.

There are two major agro-climatic regions where sugarcane is grown in India, namely, tropical region and sub-tropical region. For this analysis, among the sub-tropical region states Uttar Pradesh was selected and Maharashtra and Karnataka states were selected from the tropical region.Because of these all three states are the leading states in sugarcane production in India. Uttar Pradesh state has about 37 percent share in India's sugarcane production, whereas Maharashtra and Karnataka states together have around 35 percent share in India's sugarcane production during the TE 2011-12. Moreover, Karnataka and Maharashtra states have more or less same climatic conditions which are promoted to growsugarcane crop. However, there is a growing concern about the increasing input prices and reducing profitability of sugarcane production in sugar sector in India.The farmers' side argument claims the cost of inputs like fertilizer, irrigation, labour, etc., has increased more than doubled, but the price of sugarcane has not increased proportionately.The contradictory to this argument sugar mills side is that of the sugar mill side which claims that the sugarcane price have increased over the years thus it is not possible to pay higher prices due to increased cost of sugar production and low price of sugar in the global market. Keeping thesein view, the present study analyses the growth, trend and profitability of three selected states, viz., Maharashtra, Karnataka and Uttar Pradesh.

Objectives

- To analyze the growth trends in area, production and yield and contribution of area, yield and their inter-action effect towards increasing the sugarcane production in Maharashtra, Karnataka and Uttar Pradesh states for the different periods.
- To estimate the profitability of sugarcane cultivation for Maharashtra,Karnataka and Uttar Pradesh states.

Data and Method

Toanalyze the growth trends, this study utilized the time series secondary data which is latest available on area,

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production and productivity(1971-72 to 2011-12) of sugarcane was collected from the Directorate of Economics and Statistics (DES), MoA, GOI.The analysis periods have been classified into five sub-periods to determine the growth pattern of sugarcane production as follows:

Period I (1971-72 to 1980-81)	: Introduction of sugarcane price policies and spread of sugar mills period.
Period II (1981-82 to 1990-91)	: Technology dissemination and sugarcane development plan period.
Period III 1991-92 to 2000-01)	: Early economic reform and delicensing and decontrol of sugar sector period.
Period IV (2001-02 to 2011-12)	: Mature economic reform and Sustainable Development Based Cropping System (SUBACS).
Period V (1971-72 to 2011-12)	: Overall Period.

For the estimation of profitability, cost of cultivation survey data was collected from the Directorate of Economics and Statistics (DES), Ministry of Agriculture(GOI), whose latest published data is available for the period 2004-05 to 2011-12. The estimation of farm income level is the most appropriate measure of farmers' well-being. However, there is no appropriate estimate of farm income available in most countries, including India (Chand et al, 2015). For the calculation of profitability in order to examine the economic viability of sugarcane cultivation, this analysis has examined the net income [value of output (main + by-product) - total cost (Cost C2)], farm business income [value of output (main + by- product) - paid out cost (Cost A2)]concepts which were given in Sen and Bhatia (2004) and family labour income [value of output (main + by- product) -Cost B2] which was given in Singh and Dhillon (2015). Cost concepts were used as per the guidelines of CACP. The prices realized by farmers were estimated to examine the actual price received by a farmer for his/her produce at the farm gate. Price realized by farmers is the ratio of output value of main product per hectare to the yield per hectare.

The growth rate is estimated by using the following semi-log form equation (1).

$$\ln Y = a + bt \quad \text{..... (1)}$$

Where, Y defines the time series data on area, production and yield of sugarcane crop, 't' is the time trend term, 'a' is the constant coefficient and, 'b' is the slope coefficient. If we multiply the slope coefficient by 100, we will get growth rate.To measure the relative percentage contribution of area and yield towards the total sugarcane output change, composition analysis was used. The change in sugarcane production any time period was decomposed into different components in the following manner which was introduced by Minhas and Vaidhyanath (1965); VidyaSagar(1977) and used by Allauddin and Tisdell (1986); Devraj (2006):

$$\text{Production} = \text{Area} * \text{Yield}$$

$$Po = Ao*Yo;\ Pn = An*Yn$$

$$Pn = (Ao+\Delta A)*(Yo+\Delta Y)$$

$$Pn = (Ao*Yo)+(Ao*\Delta Y)+(\Delta A*Yo)+(\Delta A*\Delta Y)$$

For the calculation of change in Production, Pn Subtracted by Po,

$$Pn-Po = (Ao*Yo)+(Ao*\Delta Y)+(\Delta A*Yo)+(\Delta A*\Delta Y) - (Ao*Yo)$$

$$\Delta P = [Ao*\Delta Y] + [Yo*\Delta A] + [\Delta A*\Delta Y] \quad \text{.....(2)}$$

Change in production = Yield effect +Area effect + Interaction effect

Po, Ao and, Yo are area, production and yield in base year and Pn, An, and Yn are area, production and yield in last year.

Result and Discussion

The share of area and production of the Maharashtra, Karnataka and Uttar Pradesh States under the sugarcane crop during TE 1980-81 to TE 2011-12 periods presented in Table 1. During TE 1980-81 to TE 2011-12, the area under sugarcane has increased from 2788 thousand hectares to 4699 thousand hectares, while yield has also increased from 52 tonnes per hectare to 70 tonnes per hectare at national level. Due to this expansion, the production of sugarcane has also increased over periods of time. There is no doubt about increment in area, production and yield of sugarcane over periods of time in Maharashtra, Karnataka and Uttar Pradesh. The acreage and production share of Maharashtra has recorded 8.66 percent and 15.17 percent in TE 1980-81, it has increased to 19.38 percent and 23.30 percent in TE 2011-12 respectively. Whereas, the acreage and production share of Karnataka has recorded 5.34 percent and 7.60 percent in TE 1980-81, it has increased to 8.42percent and 10.92 percent in TE 2011-12 respectively. However, the Maharashtra's percentage share of area and production under sugarcane is higher than the Karnataka's share under sugarcane for the same periods. Though Maharashtra state has the highest share in area and production, the trend of yield has declined, whereas the yield of sugarcane has higher increasing trend in Karnataka over the years. In case of Uttar Pradesh, the share in area and production of sugarcane was recorded higher, whereas the yield trend found increasing, but it was found less compared to Maharashtra and Karnataka states. This means that due to low per hectare productivity,sugarcane production is the less proportionate to the area in Uttar Pradesh state compared to the other states.

The changes in sugarcane production occurs due to the number of factors such as area, yield, price, rainfall etc. but here only area and yield major factors have been taken into consideration. Because, price and rainfall not directly affected on sugarcane production, either it directly affected on area under sugarcane or yield level. Generally, production is a multiplication of Area and Yield.

TABLE 1: Share of Area and Production in Sugarcane crop in Maharashtra, Karnataka and Uttar Pradesh

Area (000 hectares), Production (000 tonnes), Yield (kg/ha)

States	Items	TE 1980-81	TE 1990-91	TE 2000-01	TE 2011-12
Maharashtra	Area	241 (8.66)	380 (10.88)	572 (13.61)	914 (19.38)
	Production	21964 (15.17)	29514 (13.23)	49960 (16.95)	77596 (23.30)
	Yield	91236	64000	87470	84866
Karnataka	Area	149 (5.34)	259 (7.43)	341 (8.95)	397 (8.42)
	Production	11021(7.60)	20302(9.11)	33557(13.03)	36303(10.92)
	Yield	74077	78414	98267	91446
Uttar Pradesh	Area	1457 (52.25)	1793 (51.46)	1975 (47.05)	2088 (44.43)
	Production	59253 (40.89)	96502 (43.23)	112657 (38.23)	122168 (36.81)
	Yield	40852	53794	57035	58520

Source: Directorate of Economics and Statistics (DES), MoA, GOI.

Note:The figures in the parentheses are the percentage share in India's sugarcane area and production.

Growth Analysis

The growth rates of area, production and yield of sugarcane crop at national as well as for Maharashtra, Karnataka and Uttar Pradesh states for the five periods are presented in Table 2. The results of this analysis revealed a mixed trend in respect of growth in area, production, and yield under sugarcane crop at national and Maharashtra, Karnataka and Uttar Pradesh states level. It could be seen from Table 2 that the area and production of sugarcane increased substantially over the entire study period in Maharashtra, Karnataka and Uttar Pradesh states. At the all India level the growth of area, production and yield was significantly positive for overall period. The higher growth for sugarcane yield was found in Karnataka compared to Maharashtra, except in the period 1981-82 to 1990-91 and 1971-72 to 2011-12. There is no remarkable growth found for sugarcane yield in Uttar Pradesh. The production growth rates show almost stagnant trend over the years at national level. However, the growth of area, production and yield for the overall period (1971-72 to 2011-12) was found significantly positive at national level and also for Maharashtra, Karnataka and Uttar Pradesh states. However, for Maharashtra yield was negative.

TABLE 2: Acreage, Production and Yield Growth Rate of Sugarcane for the Different Periods (%)

National/ State Level	Item	1971-72 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2011-12	1971-72 to 2011-12
India	Area	1.38	1.32	1.88**	1.55	1.62***
	Production	2.44*	2.91**	2.70***	2.65***	2.51***
	Yield	1.06	1.58***	0.81**	1.1**	0.89**
Maharashtra	Area	5.42***	3.10*	4.11**	8.22**	4.06***
	Production	8.38***	0.18	6.31***	10.56**	3.73***
	Yield	2.96**	-5.94***	3.96***	2.34**	-0.27
Karnataka	Area	4.73***	5.19***	0.29***	2.63	3.02***
	Production	3.76***	5.27***	5.81***	4.43	3.48***
	Yield	-0.96	0.07	2.13**	1.79**	0.46***
Uttar Pradesh	Area	1.06	1.06	0.87	0.28	1.20***
	Production	1.55	3.37***	0.89	0.33	2.26***
	Yield	0.48	2.31***	0.01	0.04	1.06***

Source: Author's Estimation (used Directorate of Economics and Statistics (DES) data, MoA, GoI).

Note: *** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.

Decomposition of Changes in Sugarcane Production

The growth analysis of area, production and yield of sugarcane crop revealed the general pattern of growth and direction of changes. But this analysis doesn't evaluate the exact contribution of area, yield and their interaction effect towards the sugarcane production. So, it is required to examine the sources of sugarcane output. To examine the sources of output for sugarcane, the total change in production is divided into three effects, i.e., area effect, yield effect and interaction effect. The relative contribution

of area, yield and their interaction to changes in sugarcane production at national and Maharashtra, Karnataka and Uttar Pradesh states levelsare presented in Table 3.

The decomposition analysis for India is employed for five periods as shown in Table 3. During the period 1971-72 to 1980-81, an increase in output for sugarcane was mainly due to increase in yield with the contribution towards productivity for this crop of around 61 percent in India. But after the period 1971-72 to 1980-81, the area effect was the major driving force for sugarcane output. For the all over the period (1971-72 to 2011-12), area effect contributed in sugarcane production growth more than 50 percent, followed by an interaction effect (26 percent) and yield effect (23 percent). It can be concluded that the expansion of area under sugarcane is more responsible for high expansion of sugarcane output in India.

The decomposition analysis for Maharashtra reveals that the yield effect (44 percent) was most responsible for the sugarcane output followed by area effect (39 percent) and interaction effect (17 percent) during the period 1971-72 to 1980-81, and since then after area effect was responsible for the expansion of sugarcane output. The changes in sugarcane prices, use of irrigation facilities, influance of sugar cooperative movements and mechanization of sugarcane cultivation were the major factors responsible for expansion of area under sugarcane in Maharashtra state. After the economic reform period, the percentage share of area effect has increased (from 48 percent to 71 percent), whereas the percentage share of yield effect has declined (from 40 percent to 5 percent) over the periods. During 1981-82 to 1990-91, the percentage contribution of yield effect and interaction effect was recorded negative in Maharashtra's sugarcane output. For the all over the period (1971-72 to 2011-12), the area effect contributed to the sugarcane production expansion around 71 percent, followed by interaction effect (24 percent) and yield effect (6 percent). It is clear that major change in output of sugarcane influence by the expansion of area under sugarcane in Maharashtra.

TABLE 3: Relative Share of Area, Yield and their Interaction Effect in Expansion of Sugarcane Production (%)

National/State Level	Item	1971-72 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2011-12	1971-72 to 2011-12
India Level	Area effect	32.26	52.58	74.2	66.08	50.82
	Yield effect	60.72	41.08	22.98	29.71	23.33
	Interaction effect	7.02	6.34	2.82	4.22	25.84
Maharashtra	Area effect	38.52	5564.59	47.66	83.37	70.61
	Yield effect	43.74	-3656.6	39.88	9.41	5.23
	Interaction effect	17.73	-1807.99	12.47	7.23	24.17
Karnataka	Area effect	112.04	118.37	55.12	-32.26	88.43
	Yield effect	-8.22	-11.83	34.33	128.29	2.87
	Interaction effect	-3.82	-6.55	10.55	3.97	8.7
Uttar Pradesh	Area effect	23.29	34.79	-6.63	67.94	43.28
	Yield effect	71.68	58.04	106.31	30.18	33.42
	Interaction effect	5.02	7.17	0.32	1.88	23.29

Note: Sum of Area, Yield and Interaction Effects=100.

The relative contribution of area, yield and their interaction to change in production of sugarcane for Karnataka states showed that during the first three periods (from 1971-72 to 2000-01), the changes in sugarcane production were mainly due to area effect at about 112 percent, 118 percent and 55 percent respectively. Over the period 2001-02 to 2011-12, the results show the yield growth of 128 percent was the major source of growth of sugarcane output. The overall study period (1971-72 to 2011-12) revealed that the area effect has a major contribution to total change in sugarcane output, whereas yield and interaction effect have negligible contribution in output growth of sugarcane in Karnataka state.

The decomposition analysis result for Uttar Pradesh clearly observed from the table 3 that before the period 2001-02 to 2011-12, the total production of sugarcane was completely due to the change in yield of sugarcane and after the same period area effect was responsible and, interaction effect was very less responsible for increasing sugarcane production.

Profitability Analysis of Sugarcane Cultivation

After the independence, the area and production under sugarcane cultivation increased substantially. Maharashtra, Karnataka and Uttar Pradesh states are the major sugarcane growing states. There is a chance to get better profit from sugarcane cultivation because the following three reasons which were explained by Narayanmoorthy (2013). First, there is less chance of crop failures due to failure of monsoon, because it is cultivated under irrigated conditions. Second, price fixed by the Government and third, guarantee of purchase of sugarcane from the sugar industries under the model of contract farming. However, In Uttar Pradesh, there is assured water supply but there is less influence of contract farming due to dominance of private sugar mills. For Maharashtra state, there is no assured water supply, but the large influence of co-operative sugar mills, whereas some part of Karnataka has assured water supply but the dominance of private mills. With this background, let us now find out whether the farmers gets profit or not from sugarcane cultivation by the using cost of cultivation survey data which is the latest available.

The Table 4 indicates that the sugarcane cultivators in Maharashtra were able to make profits during 2004-05 to 2010-11, except the cultivators that had have incurred losses in relation to Cost C2 in 2007-08. Despite the loss incurred in Maharashtra during 2007-08, the sugarcane growers received profit of about Rs. 4 thousand per hectare as a family labour income. In relation to Cost A2, the profit has been recorded positive. The profit in relation to Cost C2 has increased from Rs. 32. 39 thousand per hectare in 2004-05 to Rs. 40.26 thousand per hectare in 2010-11, whereas in relation of Cost A2, it has increased from Rs. 58.57 thousand per hectare to Rs. 77.32 thousand per hectare during the same periods.

TABLE 4: Cost of Cultivation, Value of Output and Income of Sugarcane in Maharashtra at 2004-05 Prices (in 000 Rs./Hect)

Year	Maharashtra							
	Value of (VoP) Product	Cost of Cultivation		Income			Ratio	
		Total Cost (Cost C2)	Paid out Cost (Cost A2)	Family Labour Income (VoP-B2)	Net Income (VoP-C2)	Farm Business Income (VoP-A2)	(VoP/ Cost C2)	(VoP/ Cost A2)
2004-05	104.11	71.72	45.53	37.23	32.39	58.58	1.45	2.29
2005-06	86.14	82.19	58.76	9.95	3.95	27.38	1.05	1.47
2006-07	77.82	68.9	48.96	14.44	8.92	28.86	1.13	1.59
2007-08	62.23	63.52	49.64	4.01	-1.29	12.59	0.98	1.25
2008-09	78.68	69.75	50.72	14.58	8.93	27.96	1.13	1.55
2009-10	169.35	97.92	64.37	79.00	71.43	104.98	1.73	2.63
2010-11	129.84	89.58	75.58	48.27	40.26	54.26	1.45	1.72
2011-12	129.76	94.66	89.16	43.57	35.10	40.60	1.37	1.46
Average	104.74	79.78	60.34	31.38	24.96	44.40	1.29	1.74

Source: Cost of Cultivation Survey Data, Directorate of Economics and Statistics (DES), MoA, GoI.

On comparison, the profit of sugarcane from 2004-05 to 2010-11 in Maharashtra, it is seen that the profit for sugarcane from 2004-05 declined to Rs.8.94 thousand per hectare in 2008-09 and again increased in 2009-10. Samui et al (2005) considered land degradation is a major reason for low sugarcane yield in Maharashtra due to the excess use of water and higher dosage of fertilizers. The declining sugarcane productivity may be affected on profitability of sugarcane cultivation in Maharashtra. Moreover, one of the reasons for variations in cost and profit situation is that the absence of linkage between sugarcane and it's by-product prices, and there is no uniformity of sugarcane prices paid by the sugar mills in Maharashtra (Jugale, 2000). This poses a threat to the economic viability of sugarcane cultivation. The highest profit recorded in 2009-10 in relation to both costs (Cost C2 and Cost A2). The ratio of the value of output and Cost C2 should be equal to or greater to 1. It shows that a positive profit had been got from sugarcane cultivation in Maharashtra state, except during the period 2007-08.

TABLE 5: Cost of Cultivation, Value of Output and Income of Sugarcane in Karnataka at 2004-05 Prices (in 000 Rs./Hect)

Year	Karnataka							
	Value of (VoP)	Cost of Cultivation		Income			Ratio	
	Product	Total Cost (Cost C2)	Paid out Cost (Cost A2)	Family Labour Income (VoP-B2)	Net Income (VoP-C2)	Farm Business Income (VoP-A2)	(VoP/ Cost C2)	(VoP/ Cost A2)
2004-05	93.67	59.36	33.13	40.04	34.31	60.54	1.58	2.83
2005-06	112.78	67.23	39.62	48.49	45.55	73.16	1.68	2.85
2006-07	85.53	52.31	33.59	35.37	33.22	51.94	1.64	2.55
2007-08	62.93	37.07	23.03	27.98	25.86	39.90	1.70	2.73
2008-09	106.58	68.86	46.45	43.52	37.72	60.13	1.55	2.29
2009-10	153.06	67.77	38.84	89.88	85.29	114.22	2.26	3.94
2010-11	119.91	58.69	36.16	69.04	61.22	83.75	2.04	3.32
2011-12	93.67	60.24	52.60	36.81	33.43	41.07	1.55	1.78
Average	103.52	58.94	37.93	48.89	44.58	65.59	1.75	2.79

Source:same as above table 4.

The Table 5 reveals that cost of cultivation and value of output of sugarcane in Karnataka. Sugarcane cultivators in Karnataka were able to make profits during 2004-05 to 2010-11in relation to costs (Cost C2, Cost A2 and Cost B2). The profit in relation to Cost C2 has increased from Rs. 34.31 thousand per hectare in 2004-05 to Rs. 61.22 thousand per hectare in 2010-11, whereas in relation of Cost A2, it has increased from Rs. 60.47 thousand per hectare to Rs. 95.30 thousand per hectare during the same periods.On comparison of the profit of sugarcane from 2004-05 to 2010-11 in Karnataka, it is seen that the profit for sugarcane from 2004-05 declined to Rs.25.89 thousand per hectare in 2007-08 and again increased in 2008-09, 2009-10 and 2010-11. The highest profit recorded in 2009-10 in relation to both costs (Cost C2 and Cost A2). The ratio of the value of output and Cost C2 or Cost A2 shows that the profit had received from sugarcane cultivation at a positive and increasing rate in Karnataka state.

Table 6 reveals that the total cost of cultivation (Cost C2) of sugarcane in Uttar Pradesh has increased from Rs. 36.06 thousand per hectare to Rs. 48.18 thousand per hectare, whereas, the paid out cost (Cost A2) have also increased from Rs. 13.85 thousand per hectare to Rs. 31.96 thousand per hectare during 2004-05 to 2011-12. The growing sugarcane crop found profitable in Uttar Pradesh, in relation to Cost C2, Cost A2 and Cost B2.The average family labour income recorded about Rs 33 thousand per hectare. The ratio of value of sugarcane output with both costs (cost C2 and cost A2) also reveals the higher income from sugarcane cultivation during 2009-10 in Uttar Pradesh. The average net income and farm business income from sugarcane cultivation shows higher in Uttar Pradesh compared to the Maharashtra state.

TABLE 6: Cost of Cultivation, Value of Output and Income of Sugarcane in Uttar Pradesh at 2004-05 Prices (in 000 Rs./Hect)

Year	UttarPradesh							
	Value of	Cost of Cultivation		Income			Ratio	
	Product (VoP)	Total Cost (Cost C2)	Paid out Cost (Cost A2)	Family Labour Income (VoP-B2)	Net Income (VoP-C2)	Farm Business Income (VoP-A2)	(VoP/ Cost C2)	(VoP/ Cost A2)
2004-05	56.51	36.06	13.85	15.17	20.45	42.66	1.57	4.08
2005-06	67.47	39.47	16.72	28.73	28.00	50.75	1.71	4.04
2006-07	63.57	36.77	16.66	30.23	26.80	46.91	1.73	3.82
2007-08	49.88	34.61	16.99	20.34	15.27	32.89	1.44	2.94
2008-09	49.93	35.34	17.10	20.63	14.59	32.83	1.41	2.92
2009-10	93.94	39.63	19.46	62.32	54.31	74.48	2.37	4.83
2010-11	72.35	45.44	28.47	38.43	26.91	43.88	1.59	2.54
2011-12	81.51	48.18	31.96	50.43	33.33	49.55	1.69	2.55
Average	66.90	39.44	20.15	33.28	27.46	46.74	1.69	3.46

Source:same as above table 4.

It is clear from the above pictures that though all selected three states had received profit from sugarcane cultivation, Karnataka's sugarcane cultivators had received more profit compared to that of Maharashtra's and Uttar Pradesh's sugarcane cultivators. It means growing sugarcane in Karnataka is more profitable with compared to the Maharashtra and Uttar Pradesh. Rising labour cost, input prices and other managerial costs are influenced on profit of sugarcane (CACP, Various Reports). Moreover, as discussed, the yield of sugarcane in Karnataka is higher than the Maharashtra's sugarcane yield. It may help to reduce per hectare cost of sugarcane cultivation.

Variations in Cost of Cultivation Structure

Farming as a business is greatly influenced by the level and structure of cost of cultivation (Sen and Bhatia, 2004). In sugarcane cultivation, the most important costly input is human labour which during 2011-12 accounted for about 32 percent of the total cost in Karnataka, slightly over about 29 percent in Maharashtra and around 28 percent in Uttar Pradesh. The other important items of cost of cultivation are machine labour, fertilizers and manure, irrigation and seed. The relative shares of these items varied from state to state and year to year.These variations in cost structure depending upon the proportion of ratoon in the total acreage (Sen and Bhatia, 2004).Despite the water intensive sugarcane varieties adopted by the Karnataka state (CACP (2014), p.no.56), there was less cost of irrigation. The irrigation charges of Maharashtra state was higher compared to Karnataka and Uttar Pradesh due to subsidies on irrigation and short duration of sugarcane crop growing in the state.The cost of fertilizers and manure was higher in Karnataka (around 10 to 13 percent), whereas the cost of fertilizers and manure was very low in Uttar Pradesh (around 5 to 8 percent). The cost of machine labour recorded less in Uttar Pradesh compared to Maharashtra and Karnataka states.All these variable cost items together accounted for about 67 percent of the total cost in Maharashtra during the period 2011-12, because of the relatively higher cost on machine labour, fertilizers,manure and irrigation. Animal labour and machine labour are not important cost items of cost of cultivation of sugarcane in Karnataka and Uttar Pradesh as their share in total cost was generally in the range of 1 to 6 percent.

The shares of operation costs recorded higher than fixed cost, except it was almost more or less equal in Uttar Pradesh. Among the items of fixed cost, the share of the rental value of owned land was found high compared to other items like land revenue, depreciation on implements and interest on fixed capital. It is clear that there is no any specific trend in cost of sugarcane cultivation found in Maharashtra, Karnataka and Uttar Pradesh states.

TABLE 7: Share of Various Inputs Costs to Total Cost at Constant Prices (in percentage)

Items	Maharashtra			Karnataka			Uttar Pradesh		
	2004-05	2007-08	2011-12	2004-05	2007-08	2011-12	2004-05	2007-08	2011-12
Human Labour	24.13	27.37	29.44	30.78	31.42	32.49	24.15	29.69	27.72
Animal Labour	2.86	4.89	3.05	2.64	5.19	2.15	1.06	1.56	2.43
Machine Labour	12.67	10.56	11.03	0.09	3.11	6.29	2.39	2.13	1.58
Seed	5.68	6.35	3.45	3.85	2.69	5.64	5.71	7.68	6.97
Fertilizer and Manure	10.04	11.32	9.44	13.31	10.41	9.99	6.33	6.52	4.73
Insecticides	0.09	0.14	0.33	0.49	0.12	0.07	0.07	0.53	0.52
Irrigation Charges	10.00	10.38	8.58	10.21	3.84	2.21	7.32	5.16	7.49
Interest on Working Capital	3.67	3.92	3.52	3.23	3.04	3.25	2.07	2.37	2.33
Operational Cost	69.15	74.91	68.84	64.61	59.83	62.09	49.10	55.65	53.79
Rental Value of Owned Land	24.20	16.34	22.85	32.71	36.21	32.13	35.79	37.34	38.47
Land Revenue, Taxes, Cesses	0.39	0.28	0.14	0.03	0.04	0.01	0.08	0.06	0.03
Depreciation on Implements and Farm Building	0.71	1.08	0.74	0.84	0.93	0.35	2.99	1.28	1.03
Interest on Fixed Capital	5.55	7.38	7.43	1.81	3.00	5.42	11.96	5.68	6.62
Fixed Cost	30.85	25.09	31.16	35.39	40.17	37.91	50.90	44.35	46.21

Source:same as above table 4.

Trends in Prices Realized by Farmers and MSP /FRP

The CentralGovernment decides the Minimum Statutory Price / Fair Remunerative Price for sugarcane in every year. Consequent to this, every State Government has the autonomy to decide the price (State Advisory Price) for Sugarcane.Since 2009-10 sugar season, the concept of Minimum Statutory Price was replaced by Fair Remunerative Price (FRP).Minimum Statutory Price / Fair Remunerative Price for sugarcane has increased from Rs. 74.50 per quintal to Rs. 170 per quintal during the period 2004-05 to 2011-12, the hike was more especially after 2008-09.The rising cost of production is a major factor that has led to higher support prices (S. MahendraDev and N. ChandrasekharaRao, 2010).

TABLE 8: Farmers' Price Realized in Relation to MSP/FRP of Sugarcane Crop (in Rs./Qtl)

Year	Minimum Statutory Price/ Fair Remu-nerative Price	Maharashtra		Karnataka		Uttar Pradesh	
		Price Realized by Farmar	Ratio of Price Realized to MSP/FRP	Price Realized by Farmar	Ratio of Price Realized to MSP/FRP	Price Realized by Farmar	Ratio of Price Realized to MSP/FRP
2004-05	74.50	109.18	1.47	101.78	1.37	101.24	1.36
2005-06	79.50	99.12	1.25	123.86	1.56	117.65	1.48
2006-07	80.25	90.41	1.13	104.00	1.30	118.37	1.48
2007-08	81.18	74.84	0.92	82.29	1.01	105.86	1.30
2008-09	129.84	121.39	0.93	133.88	1.03	132.22	1.02
2009-10	139.12	209.55	1.51	202.10	1.45	250.05	1.80
2010-11	145.00	180.32	1.24	190.23	1.31	197.76	1.36
2011-12	170.00	190.07	1.12	191.08	1.12	238.64	1.40

Source: Estimated by the Author based on CACP data at current prices.

The ratio price realized by sugarcane growers to Minimum Statutory Price / Fair Remunerative Price (FRP) was almost higher than 1 for sugarcane in Karnataka and Uttar Pradesh during the period 2004-05 to 2011-12 (Table 8).The case of Maharashtra state, it was lower than the 1 during the period 2007-09. Prices realized by sugarcane growers in Uttar Pradesh have been higher and increasing as compared to Maharashtra and Karnataka states.Sugarcane growers are receiving higher prices at their farm gate, because of the widening gap between the sugarcane price decided by state governments (SAP) and MinimumStatutory Price / Fair Remunerative Price (FRP) decided by Central Government (CACP, 2013).

Conclusion and Recommendations

It is all clear from the above discussion that the growth of sugarcane area, production and productivity at the national as well as selected states level show significantly positive trend, except the growth in Maharashtra's sugarcane yield during the periods 1981-82 to 1990-91 and 1971-72 to 2011-12.The decomposition model revealed that the area effect is the major source of the expansion of sugarcane production in Maharashtra and Karnataka states after the period 1981-82, whereas the yield effect was major sources in Uttar Pradesh till 2000-01. Karnataka state has recorded higher actual price received by farmers and profitability compared to Maharashtra and Uttar Pradesh states due to the influence of some government policies or programs like subsidies, price policy, etc., on cost of sugarcane cultivation.Due to the larger share of machine labour and irrigation, the operation cost of sugarcane cultivation in Maharashtra state was found to be high compared to Karnataka and Uttar Pradesh states.

Sugarcane cultivation is facing a major concern is hike in operational cost due to high duration of sugarcane crop which need to be reduced. In order to reduce the operational cost of sugarcane cultivation, the proper record and management of sugarcane harvesting within a particular time period is necessary. This may be beneficial to both players (mill owners and growers) through higher recovery and cutting of cultivation cost.Moreover, the selection of sugarcane variety also has influence on the cost of cultivation. Therefore, there is a need to choose be chosen proper varieties of sugarcane crop. The sugarcane farmers must also be educated to see the long term benefits of multi-cropping alongwith sugarcane crop. It may help to reduce production risk of single crops.Moreover, the government should also take into consideration the need as well as the consequences before giving subsidies on inputs and fixing sugarcane price.

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An Economic Analysis of the Pattern of Physical Input Use under Organic and Inorganic Farming in Nagapattinam District of Tamil Nadu

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Abstract

The present study is concerned with the comparative analysis of variation in the physical input use between organic and inorganic farming under different categories of farmers viz., marginal, small, medium and large in Nagapattinam district of Tamil Nadu. It could be inferred from the result that the different categories of farmers are able to practise organic farming by using various organic inputs like farm yard manure, panchakavya, amirtha karaisal, neem cake, neem oil, green manure and vermi-compost. It shows that with the internal farm input, the organic farmers are able to practise the farming and it has brought out an encouraging trend among the different categories of farmers, especially marginal and small farmers. As against this under inorganic farming, the farmers use commercial inputs such as potassium, complex, urea, pesticide and other chemical inputs which attract more cost for cultivation. By and large, while making a comparison between organic and inorganic farming under different categories of farmers, it becomes clear that the pattern of input use differs between organic and inorganic farming in Nagapattinam district of Tamil Nadu.

Key words: Organic farming, Inorganic farming, Physical input.

I. Introduction and Background

In India, the conventional agriculture was considered to be a best practice to increase production and productivity in order to meet the growing demand for food grains. Of late, the modern agricultural practice is looming as a threat to the sustainability of agriculture. It is due to over application of chemical inputs viz., chemical fertilizer, pesticide, weedicide and exploitation of ground water. As an alternate to the pattern of modern input use in Indian agriculture, organic farming is rising up all over the world, especially India. It uses natural inputs viz., panchakavya, amirtha karaisal, neem cake, neem oil, green manure and vermi-compost. These inputs are produced by the farms by using natural ingredients. Further, these inputs are eco-friendly and it enriches the soil fertility, the production and productivity of the soil in agricultural sector. In addition, these inputs contain all natural components viz., soil minerals, organic matter, micro organism under the soil and on the soil. Besides, these inputs bring a conducive environment to the farming system by encouraging the ecological balance in and around the farms. It also ameliorates the economic conditions of Indian farming community as it mostly contains marginal and small farmers. It may be seen that in Tamil Nadu, the practice of organic farming is rapidly emerging and Nagapattinam district is one of the districts of Tamil Nadu where in organic farming is emerging. In this context, the present study makes a comparative analysis of physical input use under organic and inorganic farming in Nagapattinam district of Tamil Nadu.

II. Objectives

The present study has the following objectives:

1. To analyze the variation in the pattern of physical input use between organic and inorganic farming among the different sizes of land holdings.
2. To suggest suitable policies to bring improvement in the pattern of input use under organic and inorganic farming under different sizes of land holdings in the study region.

III. Methodology

This study is based on primary data. The primary data relating to the pattern organic and inorganic input use in agricultural production, organic input availability and constraints experienced by the farm households have been collected by using a well-structured interview schedule from the study region.

As far as the sampling design of the study is concerned, it is based on multi stage sampling incorporated at four different stages, so as to acquire accurate information by the field of enquiry in Tamil Nadu viz., selection of a Nagapattinam district in Tamil Nadu State, selection of Sirkazhi block in the selected district, selection of a few villages from the blocks selected and selection of organic and inorganic farm households from the selected villages by using random sampling method. In selection of the district, the number of organic farmers will be considered as a prominent indicator. The same indicator has been used to select the block from the district. The crucial stage in the sampling process is the selection of farm households in the villages selected from the Sirkazhi block. About 200 farm households have been selected and interviewed for

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the present study. Among them, 100 farm households are organic and the remaining 100 are inorganic farm households. An important observation, which is to be made here is that the selection of organic farm households in Sirkazhi block is supported by the institution viz., CIKS (Centre for Indian Knowledge System) which is supporting and disseminating the organic farming practice and they are experimental group in the study. More importantly, by recall method what has been observed is that they are practicing the organic farming method for more than five years. In addition, they are employing Nammazhvar approach in their organic farming method. In regard to the period of the study, it covers one agricultural year starting from 1st July 2013 to 30th June 2014.

IV. Results and Discussions

Organic and in-organic physical input structure under the different sizes of land holdings of the farmers.

The average organic inputs and inorganic inputs structure in terms of physical units has been presented according to different sizes of land holdings under organic and inorganic farming.

TABLE 1 Physical Input use in Organic Agriculture

Sl. No.	Source	Marginal	Small	Medium	Large	F	P	CD
1.	Human Labour (Man day)	142.20	132.63	114.42	125.63	14.42*	0	15.14
2.	Animal Labour (Days)	12.63	11.46	8.48	3.42	12.32*	0	143.21
3.	Electricity (Unit)	245.66	342.22	1024.66	1322.4	7.63*	0	151.22
4.	Seeds (Kgs)	94.24	91.21	82.24	88.63	2.24*	0.066	68.34
5.	Farmyard manure (Kg)	71.63	68.52	41.41	35.42	19.14*	0	9.41
6.	Natural panchakavya (Lit)	10.69	15.49	32.46	26.45	9.42*	0	3.26
7.	Amirtha karaisal (Lit)	12.42	21.36	26.34	18.42	17.21*	0	1.29
8.	Machinery (hrs)	0.42	1.72	2.89	2.16	19.14*	0	10.14
9.	Neem Cake (Kgs)	49.42	82.42	113.62	98.63	43.61*	0	46.21
10.	Neem Oil (Lit)	12.42	15.46	24.46	21.32	13.14*	0	3.29
11.	Green Manure (Kg)	54.24	60.48	77.42	70.96	25.21*	0	13.14
12.	Vermi compost (Kgs)	134.84	101.21	183.33	170.34	63.14*	0	9.24

Source: Computed

C.D.: Critical Difference Value

Significance of 'F' Value at 5 per cent level

It could be seen from the results presented in table 1 that except the input seed, all other organic inputs, human labour, animal labour, natural panchakavya, amirtha karaisal, neem cake, neem oil, farmyard manure, green manure and vermi compost are found to be statistically significant at '5' percent level. Similarly, the use of machines is also found to be statistically significant at '5' per cent level.

It is observed from the results of the study that among the different sizes of farmer categories, marginal farmers have used highest magnitude of human labour at 142.20 man days, followed by small farmers at 132.63 man days, large farmers at 125.63 man days, and it is the lowest for medium farmers at 114.42 man days. Regarding per acre utilization of animal labour, a higher amount of animal labour is recorded under marginal farmers at 12.63 days followed by small farmers at 11.46 days, medium farmers at 8.48 days and the lowest amount of animal in agriculture is used by large farmers at 1.44 days. With regard to seed, it may be observed that a higher amount of seed is used by marginal farmers per acre at 94.24 kg followed by small farmers at 91.21 kg, large farmers at 88.63 kg, and the least is found for medium farmers at 82.24 kg. It shows that marginal and small farmers have used a higher amount of seed per acre as compared to medium and large farmers. In regard to the per acre use of panchakavya, large farmers used a highest amount at 32.46 lit followed by medium farmers at 26.4 lit, small farmer at 15.49 lit and marginal farmers have used the lowest amount at 10.69 litres. By and large, it shows that large and medium farmers used panchakavya in a higher amount. As regards the amirtha karaisal, it is observed that small farmers have used a higher amount per acre at 26.34 litres followed by marginal farmers at 12.42 litres, large farmers at 18.42 litres and medium farmers have used the lowest amount at 26.34 litres. It shows that marginal and small farmer categories have a relatively strong belief in using amirtha karaisal to support their agricultural production. In the case of utilization of neem cake per acre, the medium farmers have

used a higher amount per acre at 113.62 kg, followed by large farmers at 98.63 kg, marginal farmers at 82.42 kg and the least is found under small farmers at 49.42 kg per acre. It could be attributed to the fact that the medium and large farmers are able to purchase the neem cake in a higher amount irrespective of price as compared to marginal and small farmers in the study region. In the case of neem oil consumption per acre, it is seen that medium farmers have used a higher amount at 24.46 liters per acre followed by large farmers at 21.32 liters, small farmers at 15.46 liters and the lowest is found in the case of marginal farmers. It is due to the reasons that since the neem oil is priced one, the medium and large farmers are able to use it in a greater amount and the other reason is that in the pest control, they use it in a greater amount as compared to the marginal and small farmers. As regards, per acre cow dung utilization among the different categories of farmers, it is highly interesting to note that small farmers recorded first place at 71.63 kgs per acre followed by marginal farmers at 68.52 kgs, large farmers at 42.51 kgs and the lowest use of cow dung is found under medium farmers at 35.42 kgs. In the case of utilization of thakka pundu per acre, a higher amount of it is used by marginal farmers at 54.24kg per acre, followed by small farmers at 60.48 kgs, medium farmers at 77.42 and the least is found under large farmers at 70.96 kgs. It shows that the marginal and small farmers are using thakka pundu as a main source of nitrogen in their cultivation process as compared to medium and large farmers. Regarding per acre use of vermicompost, it is observed that the highest is found under medium farmers at 183.33kgs followed by large farmers at 170.34 kgs, marginal farmers at 134.84 kgs and the least is recorded under small farmers. Regarding utilization of machines in terms of tractors, power tillers, transplantors and weedors, the medium farmers recorded the first place per acre at 2.89 hrs followed by large farmers at 2.16 hrs, small farmers at 1.72 hrs and the least is found under marginal farmers at 0.42 hrs.

TABLE 2 Physical Input use in Inorganic Agriculture

Sl. No.	Source	Marginal	Small	Medium	Large	F	P	CD
1.	Human Labour	138.20	131.52	122.63	118.42	16.21	0	13.14
2.	Animal Labour (Days)	12.32	10.32	6.62	5.92	12.51*	0	103.21
3.	Electricity (kwt)	159.34	244.66	784.34	82.42	10.43*	0	92.45
4.	Seeds (Kgs)	62.49	74.42	91.12	3.42	2.82	0.074	42.84
5.	Machinery (hrs)	0.94	1.44	2.27	80.41	12.41*	0	10.42
6.	Farmyard manure	131.41	111.34	85.42	0.48	2.06	0.069	87.61
7.	Pesticide (Lit)	0.23	0.32	0.62	76.42	5.42**	0	11.94
8.	Potassium (Kgs)	52.12	60.53	108.42	42.15	31.41*	0	32.14
9.	Complex (kgs)	28.64	32.32	54.63	82.69	21.42*	0	12.49
10.	Urea (Kgs)	59.44	60.44	92.49	60.42	27.46*	0	18.42
11.	NeemCake (Kgs)	42.14	51.11	78.53	65.51	18.31*	0	24.63

Source: Computed

C.D.: Critical Difference Value

Significance of 'F' Value at 5 per cent level

Table 2 shows the per acre utilization of inorganic inputs and also use of human labour and animal labour among different sizes of land holdings in the study region. It could be observed from the table that among the different inorganic inputs used by different categories, the inorganic farmers in the study region, except human labour, animal labour, seed and farmyard manure other inputs like machinery, pottasium, complex and urea are found to be statistically significant at 5 percent level. It shows that these inputs play a vital role in determining the agricultural production under inorganic agriculture under different sizes of land holdings per acre. With regard to the pattern of physical input use in inorganic farming, it may be inferred regarding human labour use a higher amount of human labour is used by marginal farmers at 138.20 man days followed by small farmers at 131.52 man days, large farmers at 118.42 man days and the least amount is used by medium farmers. Regarding animal labour use per acre, it may be observed that marginal farmers occupied the first place in utilization at 12.32 days followed by small farmers at 10.32 days, large farmers at 6.62 days and the least is found in the medium farmers at 5.92 days. Regarding seed, it may be observed from the results that the marginal farmers used a higher amount per acre at 91.12 kgs followed by small farmers at 74.42, medium farmers at 62.49 kgs and large farmers at 82.42. It could be inferred from the results that the higher use of seed per acre by small and marginal farmers is due to the use of higher amount of seedlings in transplantation as compared to medium and large farmers in the study region. With regard to the use of potassium per acre among the different sizes of land holdings in the study region, it is seen that the medium

farmers have used higher amount at 108.42 kg per acre followed by large farmers at 76.42 kgs, small farmers at 60.53 and marginal farmers the lowest amount at 52.12 kgs per acre. In the case of utilization of complex per acre among the different categories of inorganic farmers, it may be inferred from the results that as in the case of potassium use, the large and medium farmers have used the higher amount at 54.63 kg and 42.15 kg per acre followed by large farmers at 32 .32 kg and the least amount is used by marginal farmers at 28.64 kgs per acre. In the case of utilization of urea per acre among the farmer categories, it is brought out that the higher amount is used by large farmers at 82.69 kgs followed by medium farmers at 92.49 kgs, small farmers at 60.44 kgs and the least could be observed in the case of marginal farmers at 59.44 kgs. It shows that all the commercial inputs viz., machinery, potassium, complex and urea are used in a higher amount by medium and large farmers, as they are relatively economically well off and the size of landholding is also relatively large as compared to marginal and small farmers in the study region.

Conclusion

The analysis of physical inputs used among the different sizes of land holdings brings out the following conclusion.

i. It may be inferred from the results that the inorganic farmers under different sizes of land holdings utilize commercial inputs viz., chemical agricultural inputs in terms of chemical fertilizer, pesticide and other chemical inputs. Further, there exists variation in the use of such inputs among the different sizes of land holdings under inorganic agriculture and the same trend is observed in the case of organic farming use of organic inputs among the different categories of farmer.

ii. In the case of organic farming, the farmers under different categories use natural inputs like panchakavya, vermi-compost, neem cake, neem oil, green manure, farmyard manure and other agricultural residues which are eco-friendly and the use of these natural inputs leads to enriching the soil.

Policy Implications

The following policies could be of immense use for policy makers, planners and agricultural scientists in the field of organic farming. Further, the policies suggested here are in the context of the analysis of the present study.

I. As far as the organic farming practice is concerned, proper dissemination of organic farming practice is lacking in the study region to make the pattern of organic input in an efficient manner.

II. Farmers should be made aware of the importance of natural inputs such as farmyard manure, neem oil, neem cake, panchakavya, amirtha karaisal and green manure. Since they are vital organic inputs and enrich the fertility of soil, the application of such inputs should be encouraged as against the synthetic chemical farm inputs which destroy the organisms on the soil and under the soil.

III. In the preparation of natural inputs like vermicompost, amirthakaraisal, panchakavya and other natural inputs, the government should give proper training to the farmers.

IV. Incentives should be widely given to the farmers to adopt the practice of organic farming.

V. The government should supply organic inputs at subsidized rate to the farmers who are practicing organic farming.

VI. Regarding organic products, the government should take adequate steps by offering training on how to prepare the organic inputs and apply those inputs.

Acknowledgements

The authors acknowledge with gratitude that this paper is an outcome of the UGC sponsored Major Research Project entitled "Economics of Organic farming and Inorganic Farming: A Comparative Resource Use Efficiency Analysis in Tamil Nadu".

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Agro-Economic Research

Hybrid Rice: Spread of New Varieties and their impact on the overall production and productivity in Andhra Pradesh*

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Introduction:

Rice is a staple food crop for major population in India. Expanding population invariably puts pressure on its production. Food security, heralded by Green Revolution slowly petered out with population growth. Changes in life style seeped through all sections of society including the farmer community forcing them to look for higher incomes from the farm. More yields are the motto. This syncs with the pressure the policy makers and scientists are undergoing to raise the yields to meet the supply gap. As the scope of expanding the cultivable area being limited higher focus is put on productivity. In addition to intensification, developing seeds of high yield potential was a challenge for the scientists. Research in to Hybrid rice was given a fillip in the early nineties.

Countries such as China have taken a big leap in rice production by going in for hybrid rice cultivation in a big way. Hybrid rice was first commercially cultivated in China in 1976. Area under hybrid rice expanded to more than 13 million hectares by 1990. Hybrid rice not only has a distinct yield advantage over inbred varieties but also is more responsive to fertilizers and can adapt to varying environments.

Rice productivity had witnessed deceleration during 1990s. The productivity potential of modern varieties had hit a plateau. Increase in population and shift in consumption from inferior to superior grains has driven the demand for rice to shoot up in the last few years. According to one estimate India would require 118 million tonnes of rice by 2020 to fulfill the requirement of its rising population. The consumption growth in rice is likely to outpace production increase, which might hurt exports. In case of pronounced slowdown, it will inevitably lead to food insecurity and deficiency. A report, prepared by ASSOCHAM says "If we presume less severe conditions for next decade and expect population growth to decline to 1.6 per cent and assume per capita consumption of rice to remain steady at the current 78.5 kg per year, the country will require about 109 million tonnes of rice in 2020. If the acreage remains stagnant in the next decade and the country manages to keep the average yield growth of 1.2 per cent of the last decade in the forthcoming years, the production is likely to grow to about 108 million tonnes". Whatever be the estimates the yield levels of rice remain to be poor when compared to other countries.

Hybrid seed production technology has been developed and demonstrated by producing an average seed yield of 1.0 to 1.5 tonne per hectare. During the kharif season of 1996 more than 60,000 hectares were planted with hybrid rice in India. Present area under hybrid rice (2009) is 1.32 million hectares out of total rice area of 44 million hectares (3 per cent). Based on research farm data it was reported that average yield of some hybrid rice varieties was 6 to 6.5 tonnes per hectare which was about 15 to 20 per cent higher than the yield of the popular conventional HYV/inbred varieties (DRR 1996, 1999).

Rice is the Principal crop extensively cultivated in all the districts of Andhra Pradesh both in kharif and rabi seasons. It accounted for 32.74 per cent of the total cropped area, 70.99 per cent of the total food grain production during 2010-11. The area under rice during 2010-11 was 47.51 lakh hectares as against 34.41 lakh hectares in 2009-10, recording an increase of 38.07 per cent. The area under rice increased due to favourable seasonal conditions during the south west monsoon period. The productivity of rice is 3035 kgs/hectares in 2010-11 as against 3150 kgs/hectare in 2009-10.

Andhra Pradesh leads other states in production with 14.42 million tonnes in 201011. In terms of area it is next only to Uttar Pradesh (5.66) with 4.75 million hectares. But yield wise, it is far superior with 3036 kg/ha against 2118 for Uttar Pradesh. Overall it comes next to Punjab, where the yield is 3830 kg/ha in 2010-11. The productivity of rice at all India level increased from 1984 kg per hectare in 2004-05 to 2372 kg per hectare in 2011-12.

Bayer is the major company selling Hybrid rice in Andhra Pradesh. It sold 750 kgs of seed in 2011 kharif season and it increased to 11000 kgs in 2012 kharif. These seeds are comparable with MTU-1001 in kharif and MTU-1010 in rabi in grain quality. It sells under ARIZE-444 GOLD brand. It launched ARIZE DHANI in 2008. According to the company it offers a holistic solution to BLB, a dreaded rice disease causing considerable loss (20-60 percent) to production. The company is optimistic in increasing its sales in the coming years.

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Need for the study:

Lot of impetus has been given to research in Rice production and many programmes were launched to break the yield plateau that has been experienced in rice crop in the past. A number of steps are being taken by the government to popularize new hybrid rice varieties through frontline demonstration, mini-kit supply, organizing training programmes for farmers, farm women, seed growers, seed production personnel of public and private seed agencies, extension functionaries of state departments of agriculture, researchers of state agricultural universities and NG0s. But there is no clear data to estimate the results of the concerted efforts put in by the government. Therefore, it has become necessary to conduct a study to assess the actual spread of newly developed varieties in terms of area with simultaneous reduction in area under conventional HYVs of rice and the increase in the average yield per hectare. It is hoped that the results of the study would enable the government to formulate the necessary changes in shaping the programmes like "Bringing Green Revolution to Eastern India (BGREI)".

Objectives of the study:

The study aims to:

— Indicate the extent of adoption and the level of participation by different categories of farmers in the cultivation of hybrid rice.

— Assess the overall impact on rice production and productivity of hybrid rice Cultivation

— Study the Economics of Cultivation of hybrid rice varieties vis-à-vis inbred varieties.

— Identify factors determining the adoption of hybrid rice varieties.

— Address various constraints and outline the prospects for increasing hybrid rice cultivations

— Suggest policy measures for expansion of hybrid rice cultivation.

Database and research methodology:

The study is based on both primary and secondary data. The data is sourced from Directorate of Economics and Statistics Publications to arrive at the trends in area, production and productivity of rice. The performance of rice in the pre-introduction period of hybrid rice with that in post-introduction period is analyzed. As first hybrids were developed and released for commercial cultivation in India in 1994, the study period was divided into three sub periods viz., 1984-85 to 1993-94, 1994-95 to 2003-04 and 2004-05 to 2009-10. The period 1 viz., 1984-85 to 1993-94 refers to the pre-introduction period of hybrid rice while other two periods viz., period — 2 and 3 correspond to post-introduction periods.

For primary survey, NFSM cell in the state department of Agriculture was consulted and two districts where higher concentration of hybrid rice cultivation was practiced were chosen. No proper records were found regarding hybrid rice cultivation either with Department of Agriculture or with Directorate of Economics and Statistics as its cultivation is very sparse and widely distributed. Farmers who cultivate hybrid rice in successive years are even rare. Nizamabad district in Telangana and Srikakulam from North Coastal Andhra area were selected on the advice of state Agricultural Department where higher concentration of hybrid farmers were found. In fact, Nizamabad is known for hybrid rice seed production. In each district, 40 hybrid rice growers from the list of hybrid rice growing cultivators from different size groups, marginal (less than 1 hectare), small (1 to 2 ha), medium (2 to 4 hectares) and large (more than 4 hectares) including SC, ST and Women farmers were selected on the basis of their proportion in the Universe. In addition to this sample, 10 inbred variety (traditional HYVs) rice growers but non-adopters of hybrid rice were selected randomly from the same land size groups following the same procedure. Thus, 50 rice growing cultivators were selected from each district.

For the primary survey, the reference years are 2009-10 and 2010-11. Accordingly, 2 kharif and 2 rabi seasons for the rice crop were covered in the study. A structured schedule/questionnaire was used to obtain information from the sample cultivators.

Growth and Instability of Rice Production in the State:

The growth rates of production and yield of paddy are found to be statistically significant, though there is no significant increase in area. Across the sub-periods, the yield of paddy showed a significant growth in the first and second sub-periods. While in the third sub period no significance is observed. The growth rates of Area in all the sub periods are found to be not significant but showed a negative growth in the second sub-period.

Observing the seasonal growth rates of yields across the sub-periods, positive significance of yields is observed in the two seasons of 1st sub period. While the yield rate in Rabi of second sub-period is only reported as significant. No significant growth is reported in any case of both seasons during third-sub-period. As a whole it can be concluded that the reason for showing significance of yield rates may be due to the quality seed but not due to the changes in any of other variables.

Exposure of sample households to Hybrid rice cultivation:

It is well known that education is the key in accepting new-technologies. In the same vein it is significant to note that 2.44 per cent of people in hybrid adopter group pursued education beyond graduate level while it is nil in non-adopters. In hybrid adopter group 14.63 per cent of people

are graduates while it is 10 per cent in non-adopters. Of the remaining educated in the hybrid farmer group 26.83 per cent had primary education and 45.12 per cent had secondary education. In the non-adopters the corresponding figures are 45 and 25 per cent. Illiterates are higher in non-adopters while it is only half in hybrid rice adopters. These observations indicate that technology acceptance has a positive link with level of education.

Predominant crops in kharif are hybrid paddy, HYV paddy, Groundnut and Turmeric. In rabi season again paddy, both hybrid and HYV are grown along with Blackgram, Sesamum, Groundnut, Turmeric are grown. Maize and Greengram are also raised in small areas.

Hybrid adopters have brought larger area under hybrid paddy in 2010-11 when compared to 2009-10. It increased from 29.38 per cent to 39.35 per cent. Understandably area under HYVs recorded a decrease from 54.30 per cent to 44.60 per cent in this group for the same period. For non-adopters the area under HYV paddy remained the same.

Hybrid rice cultivation is relatively new to Srikakulam district whereas Nizamabad district has some pockets where hybrid rice seed production is popular. The channels of information is analyzed below. Seventy farmers (87.50 per cent) were exposed to this technology through frontline demonstration programme conducted by government followed by 64 (20 per cent) who got the knowledge from private seed companies, Government extension workers also seem to be active as 63 (78.75) per cent are reported to having gained this knowledge from them. About 44 per cent got the information through television whereas news papers were the medium of knowledge for 40 per cent. Progressive farmers have also played a key role in dispersing this knowledge,as 31 per cent of farmers got benefitted by them.

Yield performance of hybrid and HYV rice:

Yield performance by farm size is analyzed here. Mean yield of hybrid rice has shown variation from 68.13 quintals per hectares in 1 — 2 hectare group to 80.62 quintal per hectare in 2 — 4 hectare group in the year 2009-10. In the same year mean yields of HYVs varied from 51.13 quintals per hectare in above 4 hectare group to 56.07 quintal per hectare in 1 — 2 hectare group. It appears from the yield data that there is not much significance to the farm size to yield levels.

When differences in yields are compared by farm size, 1 — 2 hectare group has shown 18 per cent where as the highest difference 34 per cent formed in 2 — 4 hectare group in the year 2009-10. On an aggregate the mean yield of hybrid rice is 70.83 quintals per hectare and HYVs yielded 54 quintals per hectare. The average difference in the mean yield is 23.87 per cent in 2009-10. In the following year, i.e., 2010-11 the overall mean yield has shown little decline and stands at 69.99 quintals per hectare for hybrids and 53.37 quintals per hectare for HYVs. The percentage difference in yield is 23.75.

Yield gain of Hybrid rice over HYVs varied from 12.06 per quintal in 1-2 hectare group to 27.09 per quintal in 2-4 hectare group in 2009-10. Overall average in 2009-10 is 16.93 quintals per hectare. In the following year 2010-11, the yield gain varied from 12.66 to in 1-2 ha group to 18.85 quintals per hectare in 4 ha and above group. The average yield gain stands at 16.62 quintals per hectare.

Comparative economics ?f hybrid and inbred rice cultivation:

While the seed used for inbred varieties is about 55 kgs per hectare, the same farmers have reported lesser), almost one third, use of hybrid seed (15 kgs) per hectare. One way this compensates for the high cost incurred on hybrid seed. Non-adopters of hybrid rice have reported slightly higher use of seed of 57 kgs per hectare in 2010-11. Cattle manure is widely used in the study area. Farmers who do not have cattle are buying manure from others. There is not much difference in use of manure between hybrid rice growers and non-adopters. It ranges from 5 tonnes to 5.25 tonnes per hectare. Though there is an impression that hybrid rice needs more fertilizers, farmers in the sample did not report any additional use of chemical fertilizers. Whereas hybrid rice farmers used same amount of chemical fertilizers i.e., 250 kgs per hectare the non-adopters used little more (260 kgs/ha) for inbred rice varieties. Even in the use of pesticides, hybrid rice farmers used restraint and sprayed only 3 times for both hybrid and inbred varieties. Non-adopters sprayed 4 times instead. A look at the irrigation charges reveal a lower expenditure of Rs1400 and Rs1410 for hybrid and inbred varieties respectively by hybrid rice farmers. Non-adopters incurred a higher cost of Rs1440 for inbred varieties of rice. Use of human labour is significantly lower in hybrid rice farming according to the sample farmers of hybrid growers. While they have employed 99.52 days of human labour for inbred varieties it was only 78.28 days for hybrid rice. Even use of bullock labour is less for hybrid rice cultivation when compared to HYVs amongst both hybrid and non-hybrid cultivators. Overall total human labour employed for hybrid rice comes to 78.28 days/ha and for HYV rice it is 99.52 days.

The cost of hybrid rice seed is comparatively quite high as it involves some additional processes in its cultivation and its limited availability in the market. As it cannot be used for the following year the farmer has to incur higher costs. In the hybrid adopter fields the rise in seed cost over HYV is 64 per cent. The same is 59 per cent in non-adopter fields. The cost of manure is relatively lower, 19 per cent in hybrid cultivator sample and 82 per cent in non-adopter sample. There is not much difference in costs in the use of chemical fertilizers as it is only one per cent lower for hybrids in adopter field and 4 per cent higher for

non- adopter HYV fields. Hybrid adopters have spent more or less the same amount (one per cent higher) for insecticide and pesticides. But the same cost seems to be 27 per cent higher for hybrid rice when compared with HYVs of non-adopters. The irrigation charges for hybrid rice are not higher. It is 1 per cent less for adopters and 3 per cent less for non-adopters when compared with HYVs. Machinery charges for hybrid rice seem to be lower, by as much as 17 per cent of the HYVs of non-adopters and 3 per cent of HYVs of the adopters group. Hybrid rice cultivators incurred 18 per cent lower costs on hired human labour when compared with HYVs on their own fields. But non-adopters have reported slightly lower (3 per cent) costs on HYVs for the same. Use of bullock labour is lower for hybrid rice (9 per cent) in adopter group. It is 4 per cent lower when compared with HYVs of non-adopter group. When total costs are considered the difference is small, 1 per cent higher between hybrid and HYV rice in hybrid adopter group. It is 5 per cent higher when compared with HYV rice of non-adopter sample group. The unit cost of production is lower for hybrid rice (29 per cent) in comparison to HYV rice of same farmers. The same is 18 per cent lower when compared to HYVs of non-adopters.

Hybrids are known for their superior yields. It is 24 per cent higher in hybrid adopter group and 20 per cent higher than HYVs of non-adopter group. The yield is 71 quintals of hybrid rice per hectare as against 54 quintals and 57 quintals of HYVs of adopter and non- adopters respectively.

Market price is not very favourable to hybrid rice. It is Rs.1107/qtls as against Rs 1186/Qtls for HYV rice (7 per cent higher) in the same adopter group. The gross return for hybrid rice is 24 per cent higher when compared to HYV rice of both adopter and non- adopter farmers. The advantage is more pronounced in the net returns. It is 37 per cent higher to HYV rice for adopters and 35 per cent higher to HYVs of non-adopters. Ultimately the key to the success of hybrid rice technology is the cost-benefit ratio. It seems to be favourable for hybrid rice in the study. While it is 1:2.65 for hybrid rice, it is 1:2.05 for HYV rice of hybrid adopters. The same is 1:2.13 for HYV rice of non-adopter group.

Costs and returns of hybrid rice for the year 2010-11 are discussed below. Use of chemical fertilizers has increased when compared to previous year for hybrid rice. It is over 5 per cent on HYVs of adopters and 4 per cent on non-adopters. Overall unit cost of production has increased to Rs. 4.28 from Rs. 3.79 for hybrid cultivators. For HYV farmers the increase is from Rs. 4.91 to Rs. 5.20 for adopters and from Rs. 4.48 to Rs. 4.88 for non- adopters. The gross returns has increased to Rs. 72,626 from Rs. 71,413 (27 per cent increase over HYVs of adopters) in 2010-11. In the same year net returns on hybrid rice dipped marginally from Rs. 44,507 to Rs. 42,638. The same kind of decrease is also seen for HYV of rice for adopters from previous year (from Rs. 27,826 to Rs. 25,117). For non- adopters of hybrid rice the net returns on HYV rice has slightly increased from Rs. 28,795 in 2009-10 to Rs. 29,335 in 2010-11. The cost benefit ratio has shown marginal decrease from 1:2.65 to 1:2.42 in Hybrid rice from previous year. The same is the case with HYV rice for both adopters and non-adopters.

Grain quality and marketing:

One of the reasons put forwarded by hybrid rice cultivators in discontinuing its cultivation is the problem of broken rice or lesser milling 'ratios'. The hulling ratio of 60:40 is observed for both hybrid adopters and non-adopters in the year 2009-10 for the two varieties of hybrid and HYV rice. However, in case of milling ratio in the same year hybrid rice gave 62:38 proportions. For HYVs both adopters and non-adopter reported a slightly higher ratio of 63.37.

Head rice recovery ratio for hybrid rice is slightly lower at 55:45. For HYVs it is 58:42 for adopter and non-adopters in 2009-10. While the same ratio is observed in the following year 2010-11 for HYVs of both categories the hybrids have shown a little lower ratio of 54:46.

Volume of marketing and Prices received:

The production of hybrid rice per farm varied from 108 quintals in below 1 hectare group to 340 quintals in above 4 hectare group. The average hybrid rice production per farm is 141 quintals. In the same pattern HYV production ranged from 39 quintals in below 1 hectare group to 150 quintals in the large size group (above 4 ha). Overall average is 94 quintals of HYV rice. Out of this, the marketed quantity of hybrid rice ranged from 84.40 per cent in below 1 hectare group to 92.91 per cent in 2 to 4 hectare group. Overall average is 89.27 per cent which is 3.44 per cent higher than 85.83 per cent for HYV rice. This higher percentage of marketed volume of hybrid rice is an indicator of its lower performance for home consumption.

Higher price (Rs. 1122) per quintal for hybrid rice is received in 1 to 2 hectare group in 2009-10. The average price on the overall is Rs. 1103 in the same year. HYV rice received a price of Rs. 1070 in 2 to 4 hectare group while above 4 hectare group received higher price of Rs. 1150 in 2009-10. The average price is also slightly higher than the price of hybrid rice at Rs. 1112 in the same year. However, non-adopters could receive only Rs. 1061 as average price for HYVs. Hybrid rice production per farm varied from 63 quintals in below 1 hectare group to 131 quintals in above 4 hectare group. Overall average is 82 quintals per farm. The same pattern is seen in HYV rice production with an overall average of 77 quintals per farm for hybrid adopters in 2010-11. The average price received for hybrid rice in the year 2010-11 does not vary much between the different land size groups and was recorded at Rs. 1103 on the overall. HYV paddy in the adopter category has shown

wide variations from Rs. 1106 in 2 — 4 hectare group to Rs. 1150 in above 4 hectare group in the same year. The average price received for the same is Rs. 1124. This amounts to Rs. 21 higher to the average price of hybrids in the same year. The percentage of output sold of HYV paddy for non-adopters ranges from 79.88 to 88.47 across size groups in 2010-11. The highest is seen in above 4 hectare group. Overall average is 84.37 per cent. The average price received ranges from Rs. 1088 is 2 to 4 hectare group to Rs. 1175 in above 4 hectare group for non-adopters in 2010-11. On an overall the price comes to Rs. 1113 for HYV rice.

Problems and prospects for increasing hybrid rice cultivation:

Hybrid rice cultivation was introduced to the state in 1993-94. But it did not found favour among cultivators due to variety of reasons. Hybrid rice farmers were asked why they had chosen to cultivate the new varieties. The weighing factor according to majority was prospect of high production (47.50 per cent). This was followed by demonstration effect (31.25 per cent). In both the sample districts all farmers reported the private companies as the main source for the seed supply. An overwhelming majority (86.25 per cent) were convinced of better yields of hybrid rice over inbred varieties. All of them expressed that they would get 15 — 20 per cent higher yields. Only 13.75 per cent were not very sure of better results. Though they incur higher costs, all hybrid rice farmers are buying new seeds every year. But they are cultivating the same brand. The supply of fertilizers was not a problem according to 82.50 per cent. The other 17.50 per cent said the fertilizer supply was not on time. Private traders were the only source for all hybrid cultivators. They have also said that hybrid rice does not need any additional fertilizer usage (63.75 per cent). But a third of the farmers differed and reported the need for higher usage. Damage due to pests and diseases was reported by 37.50 per cent of the sample farmers in the reference year. Susceptibility to this problem is equal to hybrid and inbred varieties according to them. Pesticides are easily available according to 86 per cent. About the same percentage of farmers felt that they had the requisite knowledge of use of correct chemical and dose. A large percentage of farmers approximately 92.5 have denied that hybrid rice varieties are more susceptible to pests and diseases. They were asked whether yield losses were lower in inbred varieties due to pests and diseases. Sixty four per cent said 'no'. A vast majority, ninety per cent, of hybrid rice cultivators in the sample felt that these varieties are highly sensitive to crop management practices, use of key inputs and time sensitive operations. Credit is an important input component in crop production and it is more so when higher costs are involved in hybrid rice farming due to its recurring high seed cost. Accordingly 76 per cent of them expressed that they need more credit. For this they are depending on co-operative credit societies and rural banks (70 per cent). At the same time, another 30 per cent of credit needy farmers were unable to obtain loans from any institution. They have cited problems like surety documents and timely disbursal from these institutions. Because of these reasons they have to resort to borrowings from private traders at high interest rates of 36 to 48 per cent.

Easy marketing is crucial for any new product's success. For majority (68 per cent) of hybrid rice farmers marketing seems to be a problem. A third of the hybrid rice sample farmers could overcome this. Disinclination of consumers towards hybrid rice seems to be the major reason for lower prices of hybrid rice. About 64 per cent farmers complained of lower market prices. Especially in coastal Andhra Pradesh consumers are accustomed to thin and long variety of rice which have better cooking quality and would not become sticky. Poor cooking and keeping quality was the reason for lower prices according to 56 per cent of farmers. Among other reasons more broken rice after milling (23 per cent farmers), poor gain quality (21 per cent), lower hard rice recovery (11 per cent) and traders reluctance (9 per cent farmers) are the causes for slower spread of hybrid rice varieties in the state.

A big majority of 78 per cent farmers are convinced of higher yield gain of hybrids over the best inbred rice varieties. Only 23 per cent have disagreed with this view. Except for 3 per cent all other sample farmers believed that hybrid rice production is profitable if suitable seeds are developed specifically to the cultivated area. About 59 per cent of farmers believe that poor cooking quality is hampering the spread of hybrid rice. Similarly, hybrid rice is perceived to be inferior to inbred rice due to poor grain quality (41 per cent farmers), low taste appeal (34 per cent) and stickiness of cooked rice (24 per cent of farmers). According to 95 per cent of farmers traders and millers are not coming forward to readily buy hybrid rice due to higher breakage of grain and poor acceptance by consumers. Only 55 per cent of hybrid rice farmers are convinced of its economic viability and its continuation. The remaining 45 per cent are unsure of its continuing cultivation. All the farmers who would like to continue hybrid rice farming are hoping for new hybrids with better grain quality and higher yields in the study.

As 95 per cent of non-adopters are completely ignorant of hybrid rice technology, the other 5 per cent were asked to express their opinions on varieties of input technicalities. Thirty per cent of them replied that they are not aware of any government assistance to promote hybrid rice cultivation. A large majority (85 per cent) expressed that pure hybrid seed is not available. While 5 per cent felt that hybrid seed is not at all available, the same percentage reported that even if it is available it is not on time. The hybrid seed is very expensive according to 95 per cent of the farmers. About 20 per cent said they had to travel long

distance to buy hybrid seed. Pre-treatment of seed, which they have never done before, was the stumbling block for another 10 per cent of cultivators. There are farmers (15 per cent) who believe that the hybrids yield lower than inbred varieties. Some others (30 per cent) are convinced that hybrid yields are not sufficiently high. Though 45 per cent have agreed that yield gain of hybrid rice is high they are apprehensive of low profitability. While 15 per cent of them are averse of higher risks involved, 25 per cent complained about the grain quality. About 85 per cent believed that hybrid rice varieties need higher dose of fertilizers, the same percentage are also vary of lower resistance to pests and diseases and consequent yield loss. More irrigation is needed for hybrid rice according to 30 per cent of the farmers. Only 15 per cent had doubts about quality of fodder. When asked about their willingness to cultivate hybrid rice if better varieties are developed with superior grain quality and higher yield all of them replied in the affirmative.

Policy Recommendations:

1. Development of hybrid seed varieties that are suitable for the local area and comparable to the conventional HYVs is vital to win the confidence of the farmers for area expansion.
2. Tardy spread of hybrid rice varieties over the years show lack of efforts by the government agencies in its promotion.
3. Private companies' hybrid varieties did not attract the farmers due to poor grain, cooking quality and low market price.
4. The government may consider giving Minimum Support Price for hybrid rice separately by procuring for central pool in PDS programme.
5. Consumers in the state prefer long and thin variety of grain for home consumption. Present hybrid varieties do not fulfill this criterion. Seed developers need to focus more on this aspect to popularize their varieties.
6. Availability of hybrid rice seed on time and on subsidy is crucial for its adoption by the farmers.
7. As one third of the farmers reported problems in accessing institutional credit, efforts should be made in liberalizing the processes involved in speedy disbursal.
8. Though some demonstration programmes were held by the state agricultural department, the knowledge of the farmers with regards to hybrid rice cultivation is poor.
9. Though efforts are needed to raise productivity of any crop, excessive stress on rice crop needs to be reviewed in the back drop of huge buffer stocks being wasted due to improper store and record exports of rice last year. Twice that value of edible oils could be imported. Policy makers may consider raising the production of edible oils and pulses which in fact need lesser irrigation. More support may be given to popularize minor millets that have more nutritional value. Broader policy initiatives may be undertaken to make availability of wide spectrum food grains in PDS programme.

Possibilities and Constraints in Adoption of Alternative crops to Paddy in Haryana*

Usha Tuteja**

Sustainability of agriculture, food security and profitability are the major issues in future development of agriculture in India. The crop rotation of rice-wheat largely adopted in irrigated areas of Haryana has posed a serious challenge for sustainability of agriculture. In particular, continuously increasing acreage under paddy in kharif season is creating problems of resource degradation and depleting water table. Hence, diversification away from paddy to alternative crops is being suggested as a solution. The available literature on crop diversification comprises two sets of studies. First, macro studies at the national, state and district levels based on secondary data, (Bhatia,1965; Pingali,1995; Joshi et al, 2004; Raga et a1,2005; Bhattacharyya,2008; Jha et a1,2009; Chakrabarti and Kundu 2009; Kalaiselvi,2012; Das and Mili,2012; Pal and Kar,2012; Sharma and Mohan,2013; Pinki et a1,2013; Singh et al.,2013; Reddy, 2013 and Saha, 2013) and second, micro studies based on primary data collected by the researchers through field surveys. (Blank, 1990; Ashfaq et al, 2008 and Lin, 2011).

Evidently, literature based on in depth village studies at the micro level is limited to some states and therefore, there is an urgent need to conduct in-depth micro level studies. Such studies provide an important insight that cannot be derived from secondary data based studies due to availability of limited information. The present study is a departure from earlier literature in terms of its focus on issues related to adoption of alternative crops to paddy in kharif season in Haryana at the macro as well as micro levels and therefore, will be useful to frame future policy initiatives.

Objectives of the Study:

The specific objectives of the study are as under:

i) to examine the production and procurement pattern of paddy in Haryana.

ii) to workout the relative economics of paddy vis-a-vis alternative crops.

iii) to bring out the constraints in adoption of alternative crops.

iv) to suggest policy measures to overcome the constraints in adoption of alternative crops to paddy in Haryana.

Research Methodology:

This study is conducted in the state of Haryana. It is based on published and un-published sources of secondary and primary data. The relevant information about the state and districts was obtained from various issues of the Statistical Abstract of Haryana, Government of Haryana, Panchkula. Further, the time series data on area, production and yield of paddy and alternative crops for selected districts and state were also culled out from this source. The required preliminary information regarding the selection of blocks and villages was obtained from the district officials. The meetings with the Deputy Directors of Agriculture of selected districts were useful and informative. The crops for the study were decided as per the study design provided by the coordinator.

The scope of the study is confined to kharif crops i.e. paddy and alternative crops such as bajra, maize and cotton grown by the farmers in Haryana. Six districts namely, Panchkula, Sonepat, Faridabad, Palwal, Jind and Fatehabad with diversification of crops in kharif season were selected for in-depth study. The selection of respondents is based on multistage sampling design. At the first and second stage, paddy and alternative crops producing districts and blocks in these districts were selected. At the third stage, villages were selected on the same criterion. A questionnaire was canvassed to the farmers growing these crops. All farm size categories i.e. small, medium and large were covered in the sample. The number of farm households in each category was decided according to their proportion at the district level.

The primary data pertaining to the year 2012-13 were collected from 210 farmers. The methodology followed for each aspect is different. For measuring the state and district level growth rates of area, production and yield of paddy and alternative crops for the period 1970-71 to latest available period, semi-log equation was used. The entire time period for computation of compound growth rates of area, production and yield of various crops is divided into three sub periods i.e. 1970-71 to 1984-85; 1985-86 to 1999-2000 and 2000-01 to 2011-12. Finally, growth rates were computed for the entire period from 1970-71 to 2011-12.

In Haryana, paddy is the dominant crop during the kharif season. The alternative crops could be bajra, maize and cotton. Although, yield rates of bajra and cotton in the

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state are second highest in the country, farmers prefer to grow paddy due to higher yield, assured market and net returns. They often use inputs especially irrigation, fertilizer and pesticides indiscriminately in cultivation of paddy due to lack of knowledge about optimal use. The over use of these resources is resulting in depleting water table and environmental problems in addition to escalated cost of cultivation. In order to save precious resources and environment, it is imperative to analyze the resource use efficiency of paddy and alternative crops grown by the sampled farmers in Haryana.

We have used Cobb-Douglas type of yield function to assess resource use efficiency. This function is widely used in agricultural research and is convenient for the comparisons of elasticity coefficients. In order to determine resource use efficiency of major inputs, a double log regression model with yield as dependent variable and human labour, machine labour, seed, fertilizer and irrigation as independent variables was formulated. The estimated coefficients of the considered independent variables were used to compute the Marginal Value Productivity (MVP) and Marginal Factor Cost (MFC). Resource use efficiency was measured by comparing the MVP of each resource with corresponding Marginal Factor Cost (MFC).

Main Findings:

Now, we present main findings about the major issues covered in the study

Status of Kharif Crops in Haryana and Selected Districts:

State Level Scenario:

In Haryana, net area sown (NAS) occupies a dominant proportion in the reported area. Around 84 per cent of NAS was sown more than once. It could be possible due to impressive development of irrigation in the state.

The agro-climatic variations in Haryana are large and therefore, a variety of crops can be grown in the state. At present, crop pattern in Haryana is highly skewed towards foodgrain crops with an area allocation of 70.60 per cent of GCA. In addition, mustard and cotton are grown on 8.25 and 9.27 per cent of GCA. The crop pattern has experienced a perceptible change over the past decades with expansion in area under wheat, rice, mustard and cotton. Pulses recorded greatest loss in acreage between 1980-81 and 2011-12.

An examination of area, production and yield of kharif crops in Haryana at TE 1970-71, 1985-86, 2000-01 and 2011-12 indicates that acreage under kharif cereals in total kharif area has declined from 84.23 per cent to 67.18 per cent between 1970-71 and 2011-12 despite a huge expansion in acreage under paddy which has jumped from 14.20 per cent to 49.65 per cent of total kharif are between TE 1970-71 and 2011-12. Cotton and vegetables are the significant gainers while kharif pulses emerged as the greatest losers despite their nutritional value and nitrogen fixing capacity. The production also followed the same trend. The productivity gains appeared to be impressive for paddy, bajra, maize and cotton. The yield of bajra and maize increased at the rate of 3.45 and 3.33 per cent per annum during 1970-71 and 2011-12.

District level Scenario:

An analysis of area, production and yield of major kharif crops in selected six districts (Panchkula, Sonepat, Faridabad, Palwal. Jind and Fatehabad) has exhibited mixed pattern of increase and decrease. In general, acreage under jowar, bajra, maize has declined during the reference period while it has increased under rice and cotton Sonepat is an exception with decline in area and production of cotton. However, production of maize has recorded an increase of 2 per cent per annum in Panchkula due to moderate growth of yield (2.25 per cent) despite decline in area. In Sonepat, production of rice increased at an impressive rate of 8.41 per cent per year due to appreciable growth in area (6.55 per cent per annum) and moderate growth in productivity. The similar trends in area, production and yield of rice could be noticed in Faridabad and Palwal. The district of Jind has exhibited commendable growth in production of rice and cotton during the study period. Among the selected districts, Fatehabad emerged as the pioneer in growth of rice production at the rate of 11.64 per cent per annum due to commendable area expansion (9.32 per cent per year) and yield growth (2.13 per cent per year) between 1970-71 and 2011-12. Fatehabad also appeared to be a front runner in the growth of cotton production during the same period.

Socio-Economic Characteristics of Sampled Districts and Households

For a deeper probe in crop diversification, we have looked into main indicators related to population and workers, agricultural development and infrastructural development at the district level

Sampled Districts:

(i) The total population of Panchkula, Sonepat, Faridabad, Palwal, Jind and Fatehabad districts was 5.61, 14.50, 18.10, 10.43 and 9.42 lakh respectively during 2011. Surprisingly, 88.89 per cent of population in Fatehabad is rural based. Education, although a catalytic factor in development has exhibited poor performance in Palwal and Fatehabad districts. The share of agricultural workers in total workers in selected districts was between 9.84 and 63.52 per cent. The share of non-agricultural workers in Faridabad and Panchkula was more than 80 per cent. It appeared that growing work opportunities in these districts benefited rural population due to relatively better development of non agricultural

sector. The composition of workers in farm and non-farm sectors was markedly different across the selected districts for field survey. Faridabad has shown around 90 per cent workers engaged in the non-farm sector. On the contrary, Jind has exhibited.36 per cent of the work force involved in this sector. Thus, Faridabad is much ahead of other selected districts in rural non-farm employment.

(ii) A comparison of important indicators of agricultural development reveals wide disparities across the selected districts. The agricultural economy of all these districts is food grains based with an area allocation of more than 65 per cent of GCA under these crops. The cotton is grown on more than 10 per cent of GCA in Jind and Fatehabad districts. The irrigation status, yield rates of important crops, input use were analyzed to gauge the disparities. Out of the selected districts; Fatehabad appeared to be much ahead in productivity of paddy and cotton in comparison to other selected districts.

(iii) The infrastructural development of selected districts was distinctively different. Although, Faridabad is the most important industrial and commercial centre near the capital city of Delhi, it is not found rich in infrastructure such as roads.

Sampled Farmers:

For better understanding of crop diversification, we have looked into main indicators related to population, educational status of the head of households, farm size, nature of land ownership, cropping pattern, sources of irrigation and farm assets. The efficiency and success of farming is influenced to a significant degree by the socio-economic background of the households. In addition, these characteristics influence adoption of improved technology and marketing behavior.

Demographic Characteristics:

The average size of the family of selected farm households was 7.08 persons at the aggregate level. A positive correlation emerged between farm size and average size of family. The large farmers in selected districts indicated an average size of family around 9 persons against 6 persons by small households. It could be due to prevalence of joint family system. The literacy rate of the head of households was not found to be impressive however, head of large farm households indicated higher level of literacy. Around half of the head of households were between the age group of 32 to 50 years. Only 8 per cent were in the age group of below 30 years. The main occupation of head of households was agriculture. A small fraction of them also had subsidiary occupation. The number of permanent farm labour employed by selected households was 57 adults and most of them were males. These were largely employed by large farmers followed by medium farmers. In addition, 10 children were also employed by large farm households. The average wage per month was Rs. 6192, 4774 and 2430 for male, female and children.

Ownership of Farm Inventory:

Land and other resources influence the level and pattern of farm management in farm households. The sampled farm households on an average possessed assets worth Rs. 4,03,138 at the overall level. The farm size disparities were wide. The small category of farm households owned farm assets worth Rs. 99,855 against Rs. 7.64,807 by the large farm category. It may be highlighted that the present value of farm assets increased with increasing size of holding and indicated a positive relationship. As expected, households in small category indicated lowest value of farm assets while the large category of farm households owned the highest by indicating present value of Rs.7,64,807 per household. Each category of farm households possesses various inventories. Tractors followed by submersible pumps exhibited higher present value in comparison to other assets.

Land Resources:

The nature of land ownership influences crop pattern, adoption of technology and innovation. At the aggregate level, average land owned by selected farmers was 3.85 hectares. The practice of leasing-in land was prevalent but a minuscule share of land was leased out. The net operated area per household was 5.26 hectares. A positive relationship emerged between land operated and farm size. Thus, large farmers operated 13.40 hectares against 1.26 by small farmers. Tubewells are the major source of irrigation. Some farmers combined tubewells and canal for watering their fields. The sources such as tanks are non-existent.

Crop Pattern:

The crop pattern on the sampled farms was found different in kharif and rabi seasons Wheat is the dominant crop in rabi season occupying 80.63 per cent of NAS. In addition, fodder and vegetables were also grown on 5.33 and 2.23 per cent of NAS. Paddy is the main crop grown by the farmers in kharif season occupying 43.31 per cent of NAS. The commercial crop of cotton was allotted 20.42 per cent of NAS. The most important coarse cereal crop of bajra received 8.20 per cent of NAS and maize was grown on 6.04 per cent of NAS. The farm size variations were common in allocation of area to different crops grown by the farmers.

Production and Disposal:

An analysis of production, retention and disposal of paddy and alternative kharif crops grown by the farm households during the reference year revealed that production of paddy was around 101 qtls per farm during 2012-13. Farm size variations were found wide. The sampled households

retained a part of production i.e. 2.58 qtls for domestic consumption and seed requirements. In retention, self consumption dominated whereas other requirements were found marginal. The quantity of paddy sold was around 17162 qtls of basmati and 3634 qtls of nonbasmati during the reference year. Since medium farm category produced higher quantity than other categories, they also dominated in sales. The price of paddy realized by the medium farmers was Rs. 3730/qt1 for basmati and Rs.1372 for nonbasmati. The produce of paddy was sold primarily to local traders followed by government agencies and private companies.

The output of bajra was 5.22 qtls per farm at the overall level during the reference year. The retention of bajra was less than 1 qtl per household at the aggregate level and it was around the same for all categories of farm households. The marketed surplus of bajra was sold to local traders irrespective of farm size

Results of field survey indicate that production of maize was 8.67 qtls per farm at the aggregate level during 2012-13. A small quantity of 0.59 qtl per farm was retained for domestic consumption and other purposes. Like bajra, maize was also sold to local traders by all categories of farmers.

The selected farmers also produced 22.34 qtls. of cotton per farm during 2012-13. Further, large variations in production of cotton could be observed across farm size. The entire quantity of cotton produced by farm households was sold to local traders and they realized an average price of Rs. 4957/qt1 during the reference year.

Economics of Paddy vis-a-vis Alternative Crops Cultivation:

We have analyzed input use pattern, cost of cultivation and economics of production of paddy vis-a-vis alternative crops (bajra, maize and cotton) grown by the sampled farmers during kharif season in Haryana.

Input Use

Paddy is the most important crop of kharif season. Results state that paddy growers used around 59 mandays of human labour, 79 hours of machine labour, 11.4 kg seed, 232 kg urea and 43 hours for irrigation per hectare during 2012-13. Further, plant protection was also resorted by the farmers. The usages of these inputs varied significantly across farm size.

Farmers in Haryana treat bajra as a low value crop and therefore, they apply minimum doses of expensive inputs. The cultivators used around 21 mandays of human labour, 21 hours of machine labour, 3.9 kg seed, 102 kg urea and merely 2 hours of irrigation per hectare for cultivation of bajra during 2012-13. Evidently, input use for cultivation of bajra was much lower in comparison to paddy.

Maize is not a popular coarse cereal grown by the farmers in Haryana despite its multiple uses. The producers used around 33 mandays of human labour, 16 hours of machine labour, 14 kg seed, 177 kg urea and 3 hours irrigation per hectare during 2012-13.

Cotton is a major commercial crop which has been generating employment in Haryana in spite of technological advancement. The growers used around 63 mandays of human labour, 29 hours of machine labour, 238 kg urea, 117 kg DAPand 8.5 hours of irrigation. In particular, farmers used several variants of chemical fertilizer for this crop.

Cost of Cultivation:

The sample farmers incurred cost on above mentioned items used by them in cultivation of paddy and alternative crops in kharif season. The per hectare cost of cultivating paddy was Rs. 35, 581 on sampled farms and the maximum proportion of cost was incurred on human labour followed by machine labour and chemical fertilizer. Findings show that per hectare cost of cultivating bajra on sampled farms was Rs. 11039 during 2012-13. The human labour, machine labour and fertilizer were found to be the major components of cost. The second alternative crop of maize was grown by incurring a cost of Rs. 22,613 per hectare. The human labour, seed, fertilizer and machine labour were the major components of cost. Among the included crops, cost of cotton production was found higher than other crops. The producers incurred a cost of Rs. 38,999 per hectare during 2012-13. Like, paddy, bajra and maize, human labour, machine labour, fertilizer, seed and plant protection were the major items in cost composition.

To sum up, cost of cultivation varies from one crop to another. Farm size variations are common. Among the included crops, cost of cultivation was found higher in production of cotton and paddy due to expenditure on pesticides and irrigation.

Returns from Cultivation of Paddy vis-a-vis Alternative Crops:

The per hectare yield of paddy on sampled farms was 44.4 qtls. Farm size and productivity were found negatively related. After deducting the cost from gross returns, producers earned a profitability of Rs. 1,09,258 per hectare during 2012- 13. The net returns per hectare from bajra, maize and cotton were Rs. 11,964, Rs. 11,950 and Rs. 64.052 respectively during 2012-13 Thus, profitability from cultivation of paddy and cotton was found higher than other kharif crops grown by the farmers.

Resource Use Efficiency:

We had formulated Cobb-Douglas type of regression model to measure resource use efficiency of human labour,

machine labour, seed, fertilizer and irrigation in cultivation of paddy, bajra, maize and cotton. The yield of crops is used as dependent variable and above mentioned factors as independent variables. In order to examine resources use efficiency, we have further computed Marginal Value Productivity (MVP) and Marginal Factor Cost (MFC) of included resources.

The regression results of paddy reveal that coefficients of human labour, machine labour, fertilizer and seed turned out positive and statistically significant. This implies that increase in these resources would influence yield positively. The model explained 88 per cent variation in yield. Further, Σ indicated constant returns to scale at the overall level. The regression results of the model carried out for small, medium and large farms pointed out mix pattern in terms of significance of included variables. However, coefficient of irrigation for large farms turned out negative. It implies that large farmers are overusing this resources and any addition would lead to fall in productivity of paddy. The estimated MVPs and MFCs and their ratio indicated that none of the resource is optimally used and therefore, farmers need to make adjustment in their usage to attain resource use efficiency.

In case of bajra, coefficient of human labour was positive, high and statistically significant. Seed was another variable which turned out to be statistically significant. The returns to scale measured by adding coefficients were found constant at the aggregate level. The MVPs of human labour and seed are considerably above their MFCs. This implies that marginal productivity of these factors exceeds the cost and therefore, resources are underutilized while machine labour is being overused. Hence, farmers need to adjust the usage of resources in order to attain resource use efficiency.

In case of maize, coefficients of human labour, seed and fertilizer are positive and statistically significant. This is indicative of positive influence of these variables on yield. Σ was slightly above one and therefore, indicates increasing returns to scale. The MVPs and MFCs of included resources have shown mixed pattern. It is reiterated that none of the included resources was used optimally by sampled growers and therefore, adjustment is needed in their usage in order to obtain optimal resource use.

In cotton cultivation, the coefficient of human labour turned out to be positive, high and statistically significant at the overall level. Seed was another variable which came out as positive and significant. The model explained 90 per cent variation in the yield of cotton. Further, Σ exceeded one and implied increasing returns to scale. Like paddy, bajra and maize, none of the included resources was used at optimal level by cotton growers and therefore, they need to make adjustments in their usage in order to attain resource use efficiency.

Constraints in Cultivation of Alternative Crops

The long term sustainability of rice-wheat rotation in Haryana has posed a serious challenge for policy makers due to over exploitation of natural resources (soil and water), lowering of water table and emergence of new weeds and pests. There is an urgent need to reduce acreage under paddy in kharif season by encouraging farmers to grow alternative crops in order to conserve environment and natural resources. This requires an understanding of constraints responsible for non-adoption of alternative crops. We have analysed constraints in cultivation of paddy and alternative crops i.e. bajra, maize and cotton in terms of biotic and aboitic stresses through qualitative responses. Generally, crops are affected negatively by aboitic and biotic stresses. Aboitic stresses occur in many forms such as drought, variability in temperature and rainfall, flood, etc. On the other hand, biotic stresses occur as a result of harm done to crops by living organisms such as diseases, insect/pests and weeds.

Agriculture is a risky business because it deals with uncertain factors such as weather and market conditions. These factors make income from agriculture uncertain. Therefore, selection of suitable crops through land allocation is one of the most important decisions for the farmers. During the survey, we had asked farmers reasons for growing a particular crop. The analyses of paddy, bajra, maize and cotton revealed that climatic conditions, suitability of soil, input availability, environmental problems and marketing play an important role in decision making to allocate land.

Diseases:

Diseases take a heavy toll of paddy, bajra, maize and cotton. In case of rice, blast, foot rot, bacterial leaf spot and anthracnose etc affect the productivity of paddy. The powdery mildew, grain, smut, ergot, late blight and pod rot create problems in bajra cultivation. Further, maize is susceptible to powdery mildew, seed rot, leaf blight and pod rot while cotton gets diseases such as wilt, leaf curl, root rot, angular leaf spot, etc. These diseases may result in yield loss upto 15 per cent. The severity of the problems stated by different categories of farmers differs considerably but all of them agreed about loss in yield of these crops due to occurrence of diseases.

Insect/pests:

The infestation of insect/pests in crops damages the quality of the produce in addition to reduction in productivity. Rice hispa, whitefly, stem borer, hairy caterpillar and leaf folder are the major insect/pests which affect rice crop while bajra is susceptible to root bug, grass hopper, maize borer, hairy caterpillar and leaf folder. The major insect/pests impacting maize are maize shoot fly, thrips, maize borer, hairy caterpillar and leaf folder. Cotton gets insect/pests such as termites, leaf hopper, cotton semi looper, aphid, red cotton

bug, durky cotton bug and mealy bug. The sampled farmers opined that these insect/pests negatively affect the crops by impacting productivity and quality of the produce.

Weeds:

Weeds affect crops by reducing productivity. These are self grown and compete with the major crop for water, soil nutrients and sun light. Rice is exposed to weeds such as itsit, mathana, bhakhra, motha and sonfa. The almost same type of weeds grow in bajra and maize. The common weeds in case of cotton are mundi, sati, motha, somwa, jhangi germs, dalchoti, casauta etc. Farmers stated that removal of weeds is essential for harvesting good yield.

Other Constraints:

The environmental factors such as drought, rain and shifting temperature affect different stages of plant growth. The farmers expressed that these problems create severe constraints and may reduce yield upto 25 per cent. The crop diversification has advantage of mitigating price and production risks. The advantage depends on availability of land and economic factors. Farmers stated that they face severe constraints in access to information on price, variability in price, losses due to storage, shortage of human labour and lack of nearby markets. We had also sought responses of sampled farmers on research and development for the alternative crops. Most of the farmers reported that drought and disease resistant varieties of the alternative crops is a serious problem which should be solved on priority basis by the researchers and scientists. The farmers also emphasized the urgency of efficient extension services.

We have analysed perceptions of sampled farmers about severity of problems emerging in crop production due to biotic and aboitic stresses including environmental factors (drought, rainfall and variability in temperature), diseases, insect/pests and weeds and their impact on productivity of paddy and alternative kharif crops. The opinions of different categories of farmers on these concerns varied significantly, however they agreed that biotic and aboitic stresses impact crop production negatively due to damaging effects and reduce crop productivity in turn influencing the quality of produce and profitability. This holds true for paddy and its alternative kharif crops, i. e. bajra, maize and cotton in Haryana. The impact of these menaces can be reduced or eliminated by control measures.

A variety of integrated approaches based on physical, chemical, biological and cultural methods have been recommended and were found effective in controlling insect/pests, diseases and weeds. Therefore, farmers should rely on a judicious combination of different practices suitable in a particular location. It is advisable that farmers may consult extension workers before purchasing the chemicals considering the limitations of cash, environment and safety. At the end, there is an urgent need to develop resilient agricultural systems. The scientists should evolve technology with least effect of these factors to make farming profitable and attractive.

Policy Implications:

It has been widely recognized that diversification of existing crop systems is the viable solution to cope with the drawbacks of monoculture of wheat and paddy in irrigated conditions in Haryana. In this context, switching over from paddy to alternative crops in kharif season assumes special significance since paddy is a water guzzling crop responsible for depleting water table and environmental problems The shift away from paddy is not easy because of higher returns from cultivation of paddy vis-à-vis alternative crops. Therefore, ensuring profitability of alternative crops on sustainable basis through suitable policy reforms appears to be a pre-requisite for successful crop diversification in Haryana. We recommend following policy measures for this purpose.

Results of our study show that paddy is the most profitable crop in kharif season on the sampled farms. This is due to higher yields, favorable price policy, availability of inputs at affordable prices and efficient extension services. In order to reduce area under paddy, there is an urgent need to ensure parallel facilities for alternative crops including research and development to augment yield levels and its effective dissemination at the grass root level.

The degree of production and price risks in alternative crops is higher than paddy. Climate change is further aggravating the yield risk. The first risk can be reduced by development of suitable technology and second, by favorable price policy, credit and insurance facilities, investment in creating nearby markets and rural infrastructure. This is possible through wholehearted support of the government and participation of the private sector.

At the end, crop diversification away from paddy towards alternative crops in the kharif season in Haryana requires a favorable price regime, technology for raising the existing levels of productivity, financial support, rural infrastructure and above all, multi-pronged government support. Without firm policy reforms in favour of alternative crops, crop diversification will remain an elusive goal in Haryana and will persist as an issue which will be debated on different forums without any concrete outcome.

Commodity Reviews

Foodgrains

During the month of September, 2015, the Wholesale Price Index (Base 2004-05=100) of pulses increased by 2.39%, cereals increased by 0.30% & foodgrains increased by 0.80% respectively over the previous month.

INDEX NUMBER OF WHOLESALE PRICES

(Base: 2004-2005=100)

Commodity	Weight (%)	WPI for the month of September, 2015	WPI for the month of August, 2015	WPI A year ago	Percentage Change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	238.3	238.2	247.3	0.04	-3.64
Wheat	1.116	216.8	214.5	209.8	1.07	3.34
Jowar	0.096	271.9	274.3	295.5	-0.87	-7.99
Bajra	0.115	254.3	248.6	258.6	2.29	-1.66
Maize	0.217	249.8	253.5	234.6	-1.46	6.48
Barley	0.017	222.9	220.8	228.1	0.95	-2.28
Ragi	0.019	326.9	324.1	332.7	0.86	-1.74
Cereals	3.373	233.8	233.1	236.2	0.30	-1.02
Pulses	0.717	333.8	326.0	240.9	2.39	38.56
Foodgrains	4.09	251.4	249.4	237.0	0.80	6.08

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

The following Table indicates the State wise trend of Wholesale Prices of cereals during the month of September, 2015.

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

Procurement of Rice

0.450 million tonnes of rice(including paddy converted into rice) was procured during September 2015, as against 0.367 million tonnes of rice(including paddy converted into rice)procured during September, 2014. The total procurement of rice in the current marketing season i.e 2014-2015, up to 30.10.2015 stood at 32.16 million tonnes, as against 31.69 million tonnes of rice procured, during the corresponding period of last year. The details are given in the following table.

PROCUREMENT OF RICE

(in Thousand Tonnes)

State	Marketing Season 2014-15 (upto 30.09.2015)		Corresponding Period of last Year 2013-14		Marketing Year (October-September)			
					2013-14		2012-13	
	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	3591	11.17	3717	11.73	3722	11.76	6464	19.00
Chhatisgarh	3423	10.64	4290	13.53	4290	13.56	4804	14.12
Haryana	2015	6.27	2406	7.59	2406	7.60	2609	7.67
Maharashtra	199	0.62	161	0.51	161	0.51	192	0.56
Punjab	7786	24.21	8106	25.58	8106	25.62	8558	25.16
Tamil Nadu	1049	3.26	684	2.16	684	2.16	481	1.41
Uttar Pradesh	1698	5.28	1127	3.56	1127	3.56	2286	6.72
Uttarakhand	465	1.45	454	1.43	463	1.46	497	1.46
Others	11936	37.11	10749	33.91	10678	33.75	8129	23.89
Total	32162	100.00	31694	100.00	31637	100.00	34020	100.00

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2015-2016 up to July, 2015, is 28.09 million tonnes against a total of 27.17 million tonnes of wheat procured during last year. The details are given in the following table.

PROCUREMENT OF WHEAT

(in Thousand Tonnes)

State	Marketing Season 2015-16 (upto 13.07.2015)		Corresponding Period of last Year 2014-15		Marketing Year (April-March)			
					2014-15		2013-14	
	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	6778	24.13	6414	23.61	6495	23.20	5873	23.41
Madhya Pradesh	7309	26.02	7188	26.46	7094	25.34	6355	25.33
Punjab	10344	36.83	10775	39.66	11641	41.58	10897	43.43
Rajasthan	1300	4.63	2155	7.93	2159	7.71	1268	5.06
Uttar Pradesh	2267	8.07	628	2.31	599	2.14	683	2.72
Others	90	0.32	6	0.02	6	0.02	16	0.06
Total	28088	100.00	27166	100.00	27994	100.00	25092	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseed and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 217.1 in September, 2015, showing an increase of 2.0 percent and 2.2 percent over the previous month and year, respectively. The WPI of cotton seed increased by 13.4 percent, groundnut seed by 3.4 percent, sunflower seed by 1.9 percent, rape & mustard seed by 1.5 percent, soyabean by 1.2 percent and niger seed by 0.1 percent over the previous month. However, the WPI of gingelly seed decreased by 8.6 percent, safflower seed by 3.3 percent and copra by 3.0 percent over the previous month. The Wholesale Price Index (WPI) of edible oils as a group stood at 148.0 in September, 2015 showing an increase of 0.1 percent and 3.2 percent over the previous month and year, respectively. The WPI of sunflower oil increased by 2.1 percent, cotton seed oil by1.2 percent, mustard & rapeseed oil by 0.6 percent and groundnut oil by 0.5 percent over the previous month. However, the WPI of copra oil decreased by 2.5 percent, soyabeanoil by 1.2 percent and gingelly Oil by 0.1 percent over the previous month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of fruits & vegetable as a group stood at 269.3 in September, 2015 showing an increase of 1.3 percent over the previous month. However, it is lower by 7.4 percent over the previous year.

Potato

The Wholesale Price Index (WPI) of potato stood at 175.7 in September, 2015, showing a decrease of 2.0 percent and 57.3 percent over the previous month and year, respectively.

Onion

The Wholesale Price Index (WPI) of onion stood at 758.0 in September, 2015, showing an increase of 14.4 percent and 113.7 percent over the previous month and year, respectively

Condiments & Spices

The Wholesale Price Index (WPI) of condiments & spices (Group) stood at 340.4 in September, 2015, showing an increase of 1.3 percent and 11.7 percent over the previous month and year, respectively.The WPI of chillies (dry) (6.5 percent), turmeric (0.5 percent) and black pepper (0.2 percent) increased over the previous month

Raw Cotton

The Wholesale Price Index (WPI) of raw cotton stood at 193.2 in September, 2015, an increase of 0.5 percent over the previous month. However, it is lower by 10.1 percent over the previous year.

Raw Jute

The Wholesale Price Index (WPI) of raw jute stood at 371.5 in September, 2015, showing an increase of 2.6 percent and 38.7 percent over the previous month and year, respectively.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

Commodity	Latest	Month	Year	% Variation Over	
	September, 2015	August, 2015	September, 2014	Month	Year
OIL SEEDS	217.1	212.8	212.4	2.0	2.2
Groundnut Seed	262.7	254.0	220.7	3.4	19.0
Rape & Mustard Seed	224.2	220.8	191.4	1.5	17.1
Cotton Seed	201.9	178.0	183.3	13.4	10.1
Copra (Coconut)	154.7	159.5	206.9	-3.0	-25.2
Gingelly Seed (Sesamum)	307.3	336.1	437.0	-8.6	-29.7
Niger Seed	354.1	353.6	203.9	0.1	73.7
Safflower (Kardi Seed)	148.4	153.5	126.6	-3.3	17.2
Sunflower	194.3	190.6	185.1	1.9	5.0
Soyabean	194.0	191.7	202.4	1.2	-4.2
EDIBLE OILS	148.0	147.9	143.4	0.1	3.2
Groundnut Oil	195.5	194.5	162.8	0.5	20.1
Cotton Seed Oil	181.9	179.7	176.5	1.2	3.1
Mustard & Rapeseed Oil	181.3	180.3	155.4	0.6	16.7
Soyabean Oil	144.3	146.0	150.4	-1.2	-4.1
Copra Oil	150.2	154.0	136.8	-2.5	9.8
Sunflower Oil	130.1	127.4	121.9	2.1	6.7
Gingelly Oil	165.7	165.9	176.1	-0.1	-5.9
FRUITS & VEGETABLES	269.3	265.8	290.8	1.3	-7.4
Potato	175.7	179.3	411.9	-2.0	-57.3
Onion	758.0	662.8	354.7	14.4	113.7
CONDIMENTS & SPICES	340.4	336.0	304.8	1.3	11.7
Black Pepper	731.7	730.5	737.7	0.2	-0.8
Chillies(Dry)	344.3	323.3	292.9	6.5	17.5
Turmeric	245.4	244.3	223.5	0.5	9.8
Raw Cotton	193.2	192.3	215.0	0.5	-10.1
Raw Jute	371.5	362.0	267.9	2.6	38.7

STATISTICAL TABLES

WAGES

1 : AVERAGE DAILY AGRICULTURAL WAGES IN SOME STATES (CATEGORY-WISE)

(In Rs.)

State	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	July,15	8	325	150	300	150	250	200	NA	NA	NA
	Guntur	Tadikonda	July,15	8	313	200	NA	NA	250	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	March,15	8	260	190	300	NA	NA	NA	NA	NA	NA
Karnataka	Bangalore	Harisandra	June,15	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tumkur	Gidlahali	June,15	8	168	160	180	180	180	180	180	180	180
Maharashtra	Nagpur	Mauda	Sep, 14	8	100	80	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Sep, 14	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	March,14	8	120	120	100	100	75	75	200	200	NA

1.1 : AVERAGE 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	Harvest-ing	Other Agri Labour	Herds-man	Skilled Labour		
												Carpenter	Black Smith	Cobbler
Assam	Barpeta	Laharapara	May,15	M	8	250	250	250	250	250	200	300	250	250
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Muzaffarpur	BhaluiRasul	June,14	M	8	310	210	210	260	250	210	350	360	310
				W	8	NA	NA	NA	250	210	NA	NA	NA	NA
	Shekhpura	Kutaut	June,14	M	8	220	NA	NA	NA	220	NA	280	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihaba	June,15	M	8	300	150	NA	150	150	100	250	200	100
				W	8	NA	NA	NA	120	100	80	NA	80	80
Gujarat*	Rajkot	Rajkot	Apr,15	M	8	221	213	160	183	150	190	442	442	350
				W	8	NA	169	150	180	138	125	NA	NA	NA
	Dahod	Dahod	Apr,15	M	8	186	157	157	157	129	NA	257	207	207
				W	8	NA	157	157	157	129	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Aug,15	M	8	400	400	400	400	400	NA	NA	NA	NA
				W	8	NA	300	300	300	300	NA	NA	NA	NA
Himachal Pradesh	Mandi	Mandi	Dec,13	M	8	NA	162	162	162	162	NA	260	240	240
				W	8	NA	162	162	162	162	NA	650	NA	NA
Kerala	Kozhikode	Koduvally	June,15	M	4-8	1230	660	NA	660	957	NA	760	NA	NA
				W	4-8	NA	NA	460	510	510	NA	NA	NA	NA
	Palakkad	Elappally	June,15	M	4-8	500	500	NA	500	466.66	NA	600	NA	NA
				W	4-8	NA	NA	300	300	300	NA	NA	NA	NA
Madhya Pradesh	Hoshangabad	Sangarkhera	July,15	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Satna	Kotar	July,15	M	8	200	200	200	200	200	200	300	300	300
				W	8	NA	200	200	200	200	200	NA	NA	NA
	Shyopurkala	Vijaypur	July,15	M	8	NA	300	NA	NA	NA	250	300	300	NA
				W	8	NA	300	NA	NA	NA	NA	NA	NA	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily working Hours	Ploughing	Sowing	Weeding	Harvest-ing	Other Agri. Labour	Herds-man	Skilled Labour		
												Carpenter	Black Smith	Cobbler
Odisha	Bhadrak	Chandbali	May,15	M	8	250	250	NA	250	250	200	400	300	200
				W	8	NA	200	NA	200	150	200	NA	NA	NA
	Ganjam	Aska	Apr,15	M	8	300	200	200	250	200	200	400	400	200
				W	8	NA	200	100	250	100	100	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	July,14	M	8	300	300	300	NA	365	NA	395	395	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	July,15	M	8	NA	NA	NA	NA	NA	300	700	500	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Jalore	Sarnau	July,15	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil	Thanjavur	Pulvarnatham	March,15	M	8	NA	317	NA	NA	316	NA	NA	NA	NA
Nadu*				W	8	NA	NA	123	117	122	NA	NA	NA	NA
	Tirunelveli	Malayakulam	May 15	M	8	NA	287	NA	375	471	NA	NA	NA	NA
				W	8	NA	135	158	155	300	NA	NA	NA	NA
Tripura		State Average	Apr, 14	M	8	287	263	264	277	261	270	305	212	285
				W	8	NA	197	201	209	197	200	NA	NA	NA
Uttar	Meerut	Ganeshpur	June,15	M	8	283	271	272	NA	266	NA	385	NA	NA
Pradesh*				W	8	NA	200	200	NA	200	NA	NA	NA	NA
	Aurraiya	Aurraiya	June,15	M	8	150	150	150	160	150	NA	250	NA	NA
				W	8	NA	NA	NA	160	150	NA	NA	NA	NA
	Chandauli	Chandauli	June,15	M	8	NA	200	200	200	200	NA	350	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA

M-Man
W-Woman
NA- Not Available
* States reported district average daily wages

PRICES

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

Commodity	Variety	Unit	State	Centre	Sep-15	Aug-15	Sep-14
Wheat	PBW 343	Quintal	Punjab	Amritsar	NA	1600	1500
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1470	1470	NA
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1425	1452	1650
Jowar	-	Quintal	Maharashtra	Mumbai	2300	2200	2350
Gram	No III	Quintal	Madhya Pradesh	Sehore	4426	4530	2435
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1370	1365	1315
Gram Split	-	Quintal	Bihar	Patna	5750	5500	4445
Gram Split	-	Quintal	Maharashtra	Mumbai	5800	5600	3900
Arhar Split	-	Quintal	Bihar	Patna	10000	9140	6890
Arhar Split	-	Quintal	Maharashtra	Mumbai	11000	10000	6750
Arhar Split	-	Quintal	NCT of Delhi	Delhi	9650	9550	6035
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	12500	12500	7400
Gur	-	Quintal	Maharashtra	Mumbai	3100	3100	4300
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4000	4000	4300
Gur	Balti	Quintal	Uttar Pradesh	Hapur	NA	NA	2700
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	4000	3950	3325
Mustard Seed	Black	Quintal	West Bengal	Raniganj	4450	4450	3600
Mustard Seed	-	Quintal	West Bengal	Kolkata	4950	4700	3900
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4240	4240	4150
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	3980	3935	3850
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2000	1900	1800
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2000	2000	2375
Castor Seed	-	Quintal	Telangana	Hyderabad	3950	4050	3725
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	13500	13415	13000
Copra	FAQ	Quintal	Kerala	Alleppey	7800	8300	10150
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	4500	4500	5000
Groundnut	-	Quintal	Maharashtra	Mumbai	6500	6500	5400
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1369	1368	1200
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1575	1500	1230
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1650	1500	1163
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1920	1845	1298
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1391	1395	1414
Castor Oil	-	15 Kg.	Telangana	Hyderabad	1283	1260	1238
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1890	1880	1860
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1800	1800	2475
Coconut Oil	-	15 Kg.	Kerala	Cochin	1650	1755	2265
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2055	2000	1775
Groundnut Cake	-	Quintal	Telangana	Hyderabad	4071	4071	3500
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	4000	4000	4300
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	NT	3400	NT
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	4400	4040	2775

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

Commodity	Variety	Unit	State	Centre	Sep-15	Aug-15	Sep-14
Jute Raw	W 5	Quintal	West Bengal	Kolkata	4350	3990	2725
Oranges	Big	100 No	Tamil Nadu	Chennai	500	500	630
Banana	-	100 No.	NCT of Delhi	Delhi	375	375	375
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	502	495	478
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	65000	65000	58000
Almonds	-	Quintal	Maharashtra	Mumbai	73000	72000	65000
Walnuts	-	Quintal	Maharashtra	Mumbai	72000	70000	65000
Kishmish	-	Quintal	Maharashtra	Mumbai	20000	19000	19000
Peas Green	-	Quintal	Maharashtra	Mumbai	4100	4100	4700
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1750	1370	2200
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	1500	1200	1500
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1350	1500	1425
Potatoes	Red	Quintal	Bihar	Patna	780	780	1890
Potatoes	Desi	Quintal	West Bengal	Kolkata	660	640	1700
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	NA	NA	3298
Onions	Pole	Quintal	Maharashtra	Nashik	3800	4500	1200
Turmeric	Nadan	Quintal	Kerala	Cochin	12500	12500	10000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	8100	8100	9300
Chillies	-	Quintal	Bihar	Patna	9400	9100	9200
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	NT	63000	55000
Ginger	Dry	Quintal	Kerala	Cochin	20000	22000	23500
Cardamom	Major	Quintal	NCT of Delhi	Delhi	131000	131500	135000
Cardamom	Small	Quintal	West Bengal	Kolkata	105000	110000	120000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3600
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	30015	30015	30015
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	47000	47000	36000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	34600	34500	33000
Fish	Rohu	Quintal	NCT of Delhi	Delhi	9600	7100	10500
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	33000	35000	28000
Eggs	Madras	1000 No.	West Bengal	Kolkata	4250	3950	4200
Tea	-	Quintal	Bihar	Patna	21100	21100	21350
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	33000	33000	13000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	31000	31000	30000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	13000	13000	15500
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	4500	4500	4750
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3560	3500	3600
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3900	3900	3900
Rubber	-	Quintal	Kerala	Kottayam	9800	9800	10400
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	31500	31500	29800

3. Month end Wholesale Prices of Some Important Aricultural Commodities in International Markets during Year 2015

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
CARDAMOM	Guatmala Bold Green	U.K.	-	Dollar/MT	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00
				Rs./Qtl	74160.00	74100.00	75396.00	75948.00	76596.00	76212.00	76944.00	79272.00	79464.00
CASHEW KERNELS	Spot U.K. 320s	U.K.	-	Dollar/lbs	3.60	3.62	3.64	3.68	3.85	3.75	3.70	3.72	3.64
				Rs./Qtl	49034.59	49267.11	50405.74	51332.75	54162.31	52491.02	52288.58	54161.80	53125.39
				Dollar/MT	7877.32	7932.59	7644.65	8194.35	8431.63	8251.98	8257.78	8050.66	8015.47
				Rs./Qtl	48681.84	48983.74	48031.34	51862.04	53819.09	52408.32	52948.89	53182.66	53078.44
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands	-	Dollar/MT	1700.00	1525.00	1434.00	1434.00	1434.00	1575.00	1539.00	1540.00	1500.00
				Rs./Qtl	10506.00	9416.88	9009.82	9075.79	9153.22	10002.83	9868.07	10173.24	9933.00
CHILLIES	Birds eye 2005 crop	Africa	-	Dollar/MT	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00
				Rs./Qtl	25338.00	25317.50	25760.30	25948.90	26170.30	26039.10	26289.20	27084.60	27150.20
CLOVES	Singapore	Madagascar	-	Dollar/MT	10500.00	10500.00	10500.00	10500.00	11200.00	11200.00	11200.00	11200.00	11200.00
				Rs./Qtl	64890.00	64837.50	65971.50	66454.50	71489.60	71131.20	71814.40	73987.20	74166.40
COCONUT OIL	Crude Phillipine/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	1080.00	1140.00	1040.00	1085.00	1125.00	1105.00	1070.00	950.00	1050.00
				Rs./Qtl	6674.40	7039.50	6534.32	6866.97	7180.88	7017.86	6860.84	6275.70	6953.10
COPRA	Phillipines cif Rotterdam	Phillipine	-	Dollar/MT	679.50	726.00	657.00	682.50	714.00	701.50	679.50	597.00	652.50
				Rs./Qtl	4199.31	4483.05	4127.93	4319.54	4557.46	4455.23	4356.95	3943.78	4320.86
CORRIANDER		India	-	Dollar/MT	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
				Rs./Qtl	12360.00	12350.00	12566.00	12658.00	12766.00	12702.00	12824.00	13212.00	13244.00
CUMMIN SEED		India	-	Dollar/MT	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	2380.00	2380.00
				Rs./Qtl	13905.00	13893.75	14136.75	14240.25	14361.75	14289.75	14427.00	15722.28	15760.36
GINGER	Split	Nigeria	-	Dollar/MT	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00
				Rs./Qtl	13905.00	13893.75	14136.75	14240.25	14361.75	14289.75	14427.00	14863.50	14899.50
GROUNDNUT kernels	US 2005, 40/50	European Ports	-	Dollar/MT	1350.00	1350.00	1350.00	1320.00	1250.00	1250.00	1270.00	1280.00	-
				Rs./Qtl	8343.00	8336.25	8482.05	8354.28	7978.75	7938.75	8143.24	8455.68	-
GROUNDNUT OIL	Crude Any Origin cif Rotterdam	U.K.	-	Dollar/MT	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
				Rs./Qtl	7416.00	7410.00	7539.60	7594.80	7659.60	7621.20	7694.40	7927.20	7946.40
MAIZE		U.S.A.	Chicago	C/56 lbs	373.25	375.75	395.00	372.50	349.50	366.50	367.75	361.75	383.25
				Rs./Qtl	906.53	911.86	975.34	926.52	876.73	914.76	926.70	939.16	997.39
OATS		CANADA	Winnipeg	Dollar/MT	365.75	341.64	352.54	315.21	297.89	313.24	325.14	286.62	302.46
				Rs./Qtl	2260.34	2109.63	2215.01	1994.96	1901.43	1989.39	2084.80	1893.41	2002.89
PALM KERNAL OIL	Crude Malaysia/Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	945.00	1070.00	980.00	990.00	945.00	880.00	850.00	650.00	815.00
				Rs./Qtl	5840.10	6607.25	6157.34	6265.71	6031.94	5588.88	5450.20	4293.90	5396.93
PALM OIL	Crude Malaysian/Sumatra, cif Rotterdam	Netherlands	-	Dollar/MT	630.00	678.00	658.00	655.00	648.00	670.00	625.00	480.00	533.00
				Rs./Qtl	3893.40	4186.65	4134.21	4145.50	4136.18	4255.17	4007.50	3170.88	3529.53
PEPPER (Black)	Sarawak Black lable	Malaysia	-	Dollar/MT	10000.00	11000.00	11000.00	11000.00	12000.00	12000.00	12000.00	11200.00	11200.00
				Rs./Qtl	61800.00	67925.00	69113.00	69619.00	76596.00	76212.00	76944.00	73987.20	74166.40
RAPESEED	Canola	CANADA	Winnipeg	Can Dollar/MT	449.80	458.50	460.60	445.10	468.90	511.90	493.30	469.70	466.30
				Rs./Qtl	2204.02	2264.53	2319.12	2318.97	2408.74	2636.29	2431.97	2333.00	2314.71
	UK delivered rapeseed, delivered Erith(buyer)	U.K.	-	Pound/MT	242.00	240.00	233.00	242.00	247.00	238.00	243.00	230.00	230.00
				Rs./Qtl	2254.96	2285.04	2175.06	2305.29	2414.92	2380.00	2431.22	2352.21	2319.09
RAPESEED OIL	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/MT	577.00	586.00	601.00	587.00	607.00	639.00	611.00	565.00	599.00
				Rs./Qtl	5376.49	5579.31	5610.34	5591.76	5934.64	6390.00	6113.06	5778.26	6039.72
SOYABEAN MEAL	UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk	U.K.	-	Pound/MT	334.00	319.00	317.00	306.00	294.00	280.00	278.00	273.00	263.00
				Rs./Qtl	3112.21	3037.20	2959.20	2914.96	2874.44	2800.00	2781.39	2791.97	2651.83
SOYABEAN OIL		U.S.A.	-	C/lbs	30.34	31.71	31.04	31.56	31.73	33.27	30.21	26.12	26.33
				Rs./Qtl	4132.53	4315.64	4298.34	4402.34	4463.82	4657.00	4269.29	3802.97	3842.83
	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/MT	756.00	611.00	593.00	558.00	595.00	590.00	564.00	539.00	569.00
				Rs./Qtl	7044.41	5817.33	5535.66	5315.51	5817.32	5900.00	5642.82	5512.35	5737.23
SOYABEANS		U.S.A.	-	C/60 lbs	970.25	1007.75	978.75	970.50	927.00	981.75	983.00	877.75	863.75
				Rs./Qtl	2200.59	2283.79	2256.86	2254.22	2171.55	2288.28	2313.20	2128.02	2099.15
	US NO.2 yellow	Netherlands	Chicago	Dollar/MT	420.90	409.40	418.00	392.80	380.90	397.30	387.20	363.80	363.40
				Rs./Qtl	2601.16	2528.05	2626.29	2486.03	2431.28	2523.25	2482.73	2403.26	2406.43

3. Month end Wholesale Prices of Some Important Aricultural Commodites in International Markets during Year 2015—*contd.*

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
SUNFLOWER SEED OIL	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	664.00	656.00	665.00	672.00	715.00	694.00	686.00	700.00	680.00
				Rs./Qtl	6187.15	6245.78	6207.78	6401.47	6990.56	6940.00	6863.43	7158.90	6856.44
TALLOW	High grade delivered	U.K.	London	Pound/MT	295.00	295.00	290.00	330.00	335.00	335.00	350.00	310.00	300.00
				Rs./Qtl	2748.81	2808.70	2707.15	3143.58	3275.30	3350.00	3501.75	3170.37	3024.90
Wheat		U.S.A.	Chicago	C/60 lbs	505.25	497.75	519.00	498.75	487.75	518.00	496.25	489.75	507.50
				Rs./Qtl	1145.94	1128.01	1196.74	1158.47	1142.58	1207.36	1167.78	1187.35	1233.36

Source- Public Ledger

Foreign Exchange Rates

Currency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
CanDollar	49.00	49.39	50.35	52.10	52.93	51.50	49.30	50.06	49.64
UKPound	93.18	95.21	93.35	95.26	98.73	100.00	100.05	102.71	100.83
USDollar	61.80	61.75	62.83	63.29	64.08	63.51	64.12	66.06	66.22

Note: Data regarding Agricultural Prices and Wages incorporated above pertains to the month of September, 2015

Crop Production

4. Sowing And Harvesting Operations Normally In Progress During The Month of December, 2015

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Summer Rice, Jowar (R), Maize, Ragi, Small Millets (R), Gram, Urad (R), Mung (R)	Winter Rice, Urad (K), Bajra, Ragi (K), Small Millets (K), Sugarcane, Ginger, Mesta, Sweet Potato, Groundnut, Nigerseed, Onion
Assam	Wheat	Winter Rice, Sugarcane, Castor seed, Sesamum
Bihar	Wheat, Barley, Gram, Winter Potato (Plains), Sugarcane, Linseed	Winter Rice, Jowar (K), Bajra, Winter Potato (Plains), Groundnut, Cotton
Gujarat	Winter Potato (Hills), Sugarcane, Onion	Winter Rice, Jowar (K), Sugarcane, Ginger, Chillies (Dry), Tobacco, Caster seed, Sesamum, Cotton, Turmeric
Himachal Pradesh	Onion	Sugarcane, Ginger, Cillies (Dry), Cotton, Turmeric
Jammu & Kashmir	Onion	Winter Potato (Plains), Sugarcane, Ginger, Chillies (Dry), Sesamum
Karnataka	Summer Rice, Gram, Urad (R), Mung (R), Winter Potato (Plains), Summer Potato (Plains), Sugarcane, Onion	Summer Rice, Gram, Urad (K), Mung (K), Ragi, Small Millets (K), Tur (K), other Kharif Pulses, Winter Potato (Plains), Summer Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Groundnut, Castor seed, Sesamum, Cotton, Mesta, Sweet Potato, Sannhemp, Nigerseed, Kardiseed, Tapioca
Kerala	Summer Rice, Sugarcane, Sesamum (3rd Crop), Sweet Potato (3rd Crop)	Winter Rice, Ragi, Small Millets (R), Tur (R), Other Kharif Pulses, Other Rabi Pulses, Sugarcane, Ginger, Pepper Black, Sesamum (2nd Crop), Sweet Potato (2nd Crop), Turmeric, Tapioca
Madhya Pradesh	Winter Potato (Hills), Sugarcane, Castorseed, Onion	Autumn Rice, Jowar (K), Bajra, Small Millets (K), Tur (K), Mung (R), Other Rabi Pulses, Summer Potato (Plains), Chillies (Dry), Tobacco, Ginger, Sugarcane, Castorseed, Sesamum, Cotton, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed
Maharashtra	Maize (R), Other Rabi Pulses, Sugarcane, Onion	Winter Rice, Jowar (K), Small Millets (K), Sugarcane, Chillies (Dry), Groundnut, Sesamum, Cotton, Sannhemp, Nigerseed
Manipur		Winter Rice, Sweet Potato
Orissa	Summer Rice, Bajra (R), Urad (R), Mung (R), Chillies (Dry), Rape & Mustard, Cotton (Late)	Winter Rice, Sugarcane, Chillies (Dry), Groundnut, Castorseed, Cotton (Early), Mesta, Nigerseed

4. Sowing And Harvesting Operations Normally In Progress During The Month of December, 2015—*Contd.*

(1)	(2)	(3)
Punjab and Haryana	Wheat, Barley, Winter Potato (Plains), Tobacco, Onion	Summer Potato, Sugarcane, Ginger, Chillies (Dry), Groundnut, Cotton, Sweet Potato, Turmeric, Sannhemp
Rajasthan	Wheat, Barley, Tobacco, (3rd Crop)	Autumn Rice, Jowar (K), Small Millets (K), Tur (K), Urad (K), Mung (K), other Kharif Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Groundnut, Sesamum, Cotton
Tamil Nadu	Winter Rice, Jowar (R), Bajra, Tur (R), other Rabi Pulses (Kulthi), Winter Potato (Hills), Sugarcane, Chillies (Dry), Tobacco, Onion	Autumn Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Gram, Tur (K), Mung (K), Winter Potato (Hills), Sugarcane, Pepper Black, Chillies (Dry), Groundnut, Castor seed, Sesamum, Cotton, Onion, Tapioca
Tripura	Summer Rice, Urad (R), Mung (R), other Rabi Pulses, Winter Potato (Plains), Chillies (Dry), Tobacco	Winter Rice, Sugarcane, Cotton
Uttar Pradesh	Wheat, Winter Potato (Hills), Sugarcane, Tobacco, Onion	Winter Rice, Jowar (K), Tur (K), Winter Potato (Plains), Summer Potato, Sugarcane, Groundnut, Rape & Mustard, Cotton, Sweet Potato, Tapioca
West Bengal	Summer Rice, Wheat, Gram, Urad (R), Mung (R), other Rabi Pulses, Sugarcane, Tobacco, Chillies (Dry)	Winter Rice, Tur (K), Urad (K), Mung (R), other Rabi Pulses, Sugarcane, Ginger, Chillies (Dry), Sesamum, Mesta
Delhi	Tobacco	Sugarcane
Andaman & Nicobar Island		Winter Rice

(K)—Kharif (R)—Rabi

GMGIPMRND—2781Agriculture—450 Copies—21-12-2015.

ISSN 0002-1679
Regn.No.:840

P. Agri. 21-11-2015
450

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PRINTED BY
THE GENERAL MANAGER GOVERNMENT OF INDIA PRESS, MINTO ROAD, NEW DELHI-110002
AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110054-2015