AGRICULTURAL SITUATION IN INDIA

MAY, 2015

Publication Division
DIRECTORATE OF ECONOMICS AND STATISTICS
DEPARTMENT OF AGRICULTURE AND COOPERATION
MINISTRY OF AGRICULTURE
GOVERNMENT OF INDIA
C-1, HUTMENTS, DALHOUSIE ROAD,
NEW DELHI-110 011
PHONE : 23012669

Subscription

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

Copies Available from

The Controller of Publications,
Ministry of Urban Development,
Deptt. of Publications,
Publications Complex (Behind Old Secretariat),
Civil Lines, Delhi-110 054.
Phone : 23817823, 23819689, 23813761,
23813762, 23813764, 23813765

Agricultural Situation in India

VOL. LXXII May, 2015 No. 2

CONTENTS

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

NOTE TO CONTRIBUTORS

Articles on the state of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Cooperation monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. The articles in Hard Copy as well as Soft Copy (email ID: 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 fullscape paper in Times New Roman font size 12, addressed to the Editor, Publication Division, Directorate of Economics and Statistics, M/o Agriculture, C-1, Hutments Dalhousie Road, New Delhi-110 011along 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.

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

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

STATISTICAL TABLES

Abbreviations used

N.A.	—	Not Available.
N.Q.	—	Not Quoted.
N.T.	—	No Transactions.
N.S.	—	No Supply/No Stock.
R.	—	Revised.
M.C.	—	Market Closed.
N.R.	—	Not Reported.
Neg.	—	Negligible.
Kg.	—	Kilogram.
Q.	—	Quintal.
(P)	—	Provisional.

Plus (+) indicates surplus or increase.

Minus (–) indicates deficit or decrease.

General Survey of Agriculture

Trends in Foodgrain Prices

During the month of March, 2015, the All India Index Number of Wholesale Price (2004-05=100) of Food grains declined by 1.05 per cent from 238.1 in February, 2015 to 235.6 in March, 2015.

The Wholesale Price Index (WPI) Number of Cereals declined by 1.37 per cent from 234.1 to 230.9 and WPI of Pulses increased by 0.35 per cent from 256.9 to 257.8 during the same period.

The Wholesale Price Index Number of Wheat declined by 0.05 per cent from 215.6 to 215.5 while that of Rice declined by 2.79 per cent from 240.3to 233.6 during the same period.

Weather, Rainfall and Reservoir Situation During March, 2015

Cumulative Pre-Monsoon Season (March to May) rainfall for the country as a whole during the period 1st March to 22nd April, 2015 is 96% higher than Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period was higher than LPA by 226% in Central India, 156% in North-West India, 130% in South Peninsula and 1% in East & North East India.

Out of a total of 36 meteorological sub-divisions, 35 sub-divisions received excess/normal rainfall and 1 sub-division received deficient rainfall.

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). Current live storage in these reservoirs as on 23rd April, 2015 was 49.25 BCM as against 55.39 BCM on 23.04.2014 (last year) and 42.53 BCM of normal storage (average storage of the last 10 years). Current year's storage is 89% of the last year's and 116% of the normal storage.

Economic Growth

The growth rate of Gross Domestic Product (GDP) at constant (2011-12) market prices is estimated at 7.4 per cent in 2014-15 (advance estimates), as compared to 6.9 per cent and 5.1 per cent in 2013-14 and 2012-13 respectively (Table 1).

The growth rate of Gross Value Added (GVA) at constant (2011-12) basic prices for agriculture & allied sectors, industry sector and services sector are estimated to be at 1.1 per cent, 5.9 per cent and 10.6 per cent respectively, in 2014-15 compared to 3.7 per cent, 4.5 per cent and 9.1 per cent respectively in 2013-14 (Table 1).

The growth rate of GVA at constant basic prices for the first, second and third quarters of 2014-15 is estimated at 7.0 per cent 7.8 per cent 7.5 per cent respectively, compared to 7.2 per cent,7.5 per cent and 6.6 per cent respectively during the corresponding quarters of previous year (Table 2.)

The final consumption expenditure as a percentage of GDP increased from 69.7 per cent in 2012-13 to 7.10 per cent in 2013-14 and further to 72.1 per cent in 2014-15. Gross fixed capital formation (GFCF) as a percentage of GDP declined from 31.4 per cent in 2012-13 to 29.7 per cent in 2013-14 to 28.6 per cent in 2014-15.

There has been 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

All India Production of Foodgrains

As per the 2nd advance estimates released by Ministry of Agriculture on February 18, 2015 production of total foodgrains during 2014-15 is estimated at 257.1 million tonnes compared to 265.6 million tonnes in 2013-14 (final) and 257.1 million tonnes in 2012-13 (Table 3).

Procurement

Procurement of rice as on 01.04.2015 was 24.2 million tonnes during Kharif marketing season 2014-15 and procurement of wheat was 28.0 million tonnes during Rabi marketing season 2014-15. (Table 4).

Off-take

Off-take of rice in January 2015 was 27.9 lakh tonnes. This comprises 24.3 lakh tonnes under TPDS and 3.6 lakh tonnes under other schemes. In respect of wheat, the total off-take was 31.3 lakh tonnes comprising of 17.8 lakh tonnes under TPDS and 13.4 lakh tonnes under other schemes.

Stocks

Stocks of foodgrains (rice and wheat) held by FCI as on April 1, 2015 were 41.0 million tonnes, which is lower by 15.2 per cent compared to the level of 48.4 million tonnes as on April, 2014 (Table 5).

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

Sector	Growth			Share in GVA		
	2012-13	2013-14	2014-15 (AE)	2012-13	2013-14	2014-15(AE)
Agriculture, forestry & fishing	1.2	3.7	1.1	17.7	17.2	16.2
Industry	2.4	4.5	5.9	32.3	31.7	31.2
Mining & quarrying	-0.2	5.4	2.3	3.0	3.0	2.9
Manufacturing	6.2	5.3	6.8	18.3	18.1	18
Electricity, gas, water supply & other utility services	4.0	4.8	9.6	2.4	2.3	2.4
Construction	-4.3	2.5	4.5	8.6	8.3	8
Services	8.0	9.1	10.6	50.0	51.1	52.6
Trade, hotels, transport, communication and services related to broadcasting	9.6	11.1	8.4	18	18.8	18.9
Financial, real estate & professional services	8.8	7.9	13.7	19.5	19.7	20.9
Public administration, defence and Other Services	4.7	7.9	9.0	12.5	12.6	12.8
GVA at basic prices	4.9	6.6	7.5	100.0	100.0	100.0
GDP at market prices	5.1	6.9	7.4	---	---	---

Source: CSO. AE: Advance Estimates

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

Sectors	2013-14				2014-15		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Agriculture, forestry & fishing	2.7	3.6	3.8	4.4	3.5	2.0	-0.4
Industry	4.8	4.0	5.0	4.3	6.1	6.0	3.9
Mining & quarrying	0.8	4.5	4.2	11.5	5.1	2.4	2.9
Manufacturing	7.2	3.8	5.9	4.4	6.3	5.6	4.2
Electricity, gas, water supply & other utility services	2.8	6.5	3.9	5.9	10.1	8.7	10.1
Construction	1.5	3.5	3.8	1.2	5.1	7.2	1.7
Services	10.2	10.6	9.1	6.4	8.6	10.1	13.5
Trade, hotels, transport, communication and services related to broadcasting	10.3	11.9	12.4	9.9	9.4	8.7	7.2
Financial, real estate & professional services	7.7	11.9	5.7	5.5	11.9	13.8	15.9
Public administration, defence and Other Services	14.4	6.9	9.1	2.4	1.9	6.0	20.0
GVA at basic prices	7.2	7.5	6.6	5.3	7.0	7.8	7.5

Source: CSO.

Table 3 Production of Major Agricultural Crops (2nd Adv. Est.)

Crops	Production (in Million Tonnes)		
	2012-13 (Final)	2013-14 (Final)	2014-15 (2nd AE)
Rice	105.2	106.7	103.0
Wheat	93.5	95.9	95.8
Total Coarse Cereals	40.0	43.3	39.8
Total Pulses	18.3	19.8	18.4
Total Foodgrains	257.1	265.6	257.1
Total Oilseeds	30.9	32.8	29.8
Cotton	34.2	35.9	35.1
Sugarcane	341.2	352.1	355.0

Table 4 Procurement in Million Tonnes

Crop	2010-11	2011-12	2012-13	2013-14	2014-15
Rice	34.2	35.0	34.0	31.8	24.2*
Wheat	22.5	28.3	38.2	25.1	28.0
Total	56.7	63.4	72.2	56.9	52.2

*Position as on 01.04.2015

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

Crops	Off-take				Stocks	
	2011-12	2012-13	2013-14	2014-15 (Till Jan.)	April 1, 2014	April 1, 2015
Rice	32.1	32.6	29.2	27.4	20.3	17.1
Unmilled Paddy#					15.3	10.0
Converted Unmilled Paddy in terms of Rice					10.3	6.7
Wheat	24.3	33.2	30.2	22.2	17.8	17.2
Total (Rice & Wheat)	56.4	65.9	59.8	49.6	48.4	41.0

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

Table 6 Percentage Change in Index of Industrial Production

Industry Group	April-February, 2013-14	April-February, 2014-15	February-2014	February-2015
General index	-0.1	2.8	-2.0	5.0
Mining	-0.7	1.5	2.3	2.5
Manufacturing	-0.7	2.2	-3.9	5.2
Electricity	6.2	9.1	11.5	5.9
Basic goods	1.8	7.4	4.5	5.0
Capital goods	-2.6	6.0	-17.6	8.8
Intermediate goods	3.3	1.6	4.0	1.1
Consumer goods	-2.9	-3.7	-5.2	5.2
Durables	-12.3	-13.3	-9.8	-3.4
Non-durables	4.8	2.8	-2.0	10.7

NOTE TO CONTRIBUTORS

Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Cooperation's monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. Good articles in Hard Copy as well as Soft Copy in MS Word, not exceeding five thounsand words, may be sent in duplicate, typed in double space on one side of fullscape paper in Times New Roman font size 12, addressed to the Editor, Publication Division, C-I, Hutments, Dalhousie Road, New Delhi 110011, 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, (agri.situation@gmail.com) Phone No. and their permanent address only on the forwarding letter so as to maintain anonymity of the author while seeking comments of the referees on the suitability of the article for publication.

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

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

Farm Sector News Releases

Union Agriculture Minister underlines the important role of 'eMarketing' and the infrastructure Development for Agriculture 'eMandis'

Union Agriculture Minister Shri Radha Mohan Singh underlined the importance of 'eMarketing' and the infrastructure development for 'eMandis'. He urged States to think about the unified agriculture market so that farmers can sell their agricultural produce at a single place. This will also enable the concept of 'National Unified Agriculture Market' to be successful. He said that 'eMandis' would require a software where farmers could enter the data related to agriculture produce. He emphasised this during the in-session meeting of the consultative committee of Ministry of Agriculture in New Delhi on 30th April.

Chairing the meeting of the consultative committee of Parliamentarians of the Ministry of Agriculture, Shri Radha Mohan Singh informed that the eMarketing will help to bring one market concept and farmers would need to be educated about this concept. He said that agri-market will promote direct linkage between the farmer and the consumer without the need for intermediaries and enable effective consumer information dissemination.

Shri Radha Mohan Singh also mentioned that one Mandi License fee for the farmers in the entire state for the 'eMandi' and will have the flexibility for the farmer to sell agriculture produce in one Unified Mandi in the entire state.

Participating in the discussion, MP Shri Shankarbhai N. Vegad suggested to create awareness among farmers regarding 'eMandis'. MP, Shri Manshankar Ninama suggested about creating awareness about the role of 'eMandis' and the States responsibility.

Soil Health and Nutrient Management

A new scheme "Soil Health Card" has been introduced in year 2014-15 to assist State Governments to issue Soil Health Card to all farmers in the country, once in every three years. Soil Health Card provides information to farmers on soil nutrient status of their soil and recommendation on appropriate dosage of nutrient to be applied for improving soil health.

Apart from above, Government is implementing Soil Health Management under National Mission for Sustainable Agriculture (NMSA). Soil Health Management (SHM) aims at promoting Integrated Nutrient Management (INM) through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and biofertilizers for improving soil health and its productivity; strengthening of soil testing facilities to provide soil test bases recommendations to farmers for improving soil fertility; upgradation of skill and knowledge of soil testing laboratory staff, extension staff and farmers through training and demonstrations.

There is no proposal to utilize Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for augmenting farm activities in the country.

Area under Cultivation of Fruits and Vegetables and associated Promotional Schemes

Depending on the rainfall situation, weather and temperature conditions, availability of water in reservoirs, irrigation facilities and inter-crop shift in the area coverage on account of comparative profitability of other competing crops, the area under foodgrains in the country in the recent years has been fluctuating. However, due to higher profitability of horticultural crops, the overall area under fruits and vegetables in the country has been increasing. A statement showing details of area under foodgrains, oilseeds, fruits and vegetables for the year 2009-10 onwards is given below:

Crops	Area (Lakh Hectare)					
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Food grains	1213.34	1266.71	1247.55	1207.76	1250.40	1208.93*
Oilseeds	259.59	272.24	263.08	264.84	280.51	259.99*
Fruits	63.29	63.83	67.04	69.82	72.16	73.42#
Vegetables	79.85	84.95	89.90	92.05	93.96	93.55#

*As per 2nd advance estimate released by DES. # As per 1st advance estimate released by DAC.

In order to promote agricultural sector in the country, the Department of Agriculture and Cooperation is implementing various schemes and programmes such as Mission for Integrated Development of Horticulture (MIDH), National Food Security Mission (NFSM), National Mission for Sustainable Agriculture (NMSA), National Mission on Agriculture Extension and Technology (NMAET), National Mission on Oilseeds and Oil Palm (NMOOP), National Crop Insurance Programme (NCIP) etc. Under the above schemes the focus of Government is primarily on expansion of farm income, creation of non-farm income opportunities, improvement in productivity of rainfed agriculture, increasing coverage of farming areas under protective irrigation etc.

The Ministry of Food Processing Industries is also implementing a Central Sector Scheme of Cold Chain, Value Addition and Preservation of Infrastructure since 2008-09 throughout the country.

Agricultural Statistics

Timely availability of reliable estimates of area production and yield of major agricultural crops is extremely important for macro level agricultural planning. However, dis-aggregated agricultural estimates are also required for agricultural planning at district and lower level of administrative hierarchy.

In the existing system, Government of India prepares all-India estimates of major agricultural crops on the basis of data received from State Agricultural Statistics Authorities (SASAs) in various States/UTs. The State Governments prepare their estimates on the basis of area enumeration in a sample of 20% villages and yield assessment through Crop Cutting Experiments (CCEs) conducted in a sub-sample of the villages selected for area enumeration. Field work of area enumeration and CCEs in the States/UTs are normally carried out by the staff of Department of Revenue/Agriculture.

An Expert Committee constituted under the Chairmanship of Prof. A. Vaidyanathan observed that due to multiple responsibilities assigned to the primary worker and heavy workload on account of increasing number of CCEs, the quality of primary data and, consequently, the State/National level estimates of area, production and yield of crops has deteriorated.

Presently, the responsibility for furnishing crop-wise agricultural estimates in the States/UTs rests either with State Department of Agriculture/Revenue of Directorate of Economics & Statistics designated as SASA, and the work is assigned to dedicated statistical personnel. However, the quality of agricultural estimates highly depends on the reliability of primary data collected by field staff, irrespective of the fact that the overall responsibility of compilation and preparation of district/State level estimates lies with the State Governments or an Independent Agency.

Relief Package to Farmers Affected by Unseasonal Rains and Hailstorms

In the month of February-March 2015, many States like Gujarat, Punjab, Himachal Pradesh, Haryana, Maharashtra, Bihar, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Rajasthan, Jammu & Kashmir, West Bengal, Telangana & Kerala were hit by hailstorm followed by untimely rainfall. As per inputs received from States, State wise crop area affected due to hailstorm and unseasonal rains in country on the basis of preliminary assessment is given below:

State Governments have been requested to take immediate steps to address the notified calamities by utilizing the funds under SDRF. States have also been advised to submit memorandum as per extant procedure/ norms, if additional financial assistance is required from National Disaster Response Fund (NDRF) and in the meantime, utilize contingency fund of the State, if SDRF is exhausted. In addition, the calamity affected farmers are entitled for claims under various crop insurance schemes.

(Area In Lakh ha.)

S.No.	States	Total Area (as on 16.4.15)
1	Gujarat	1.75
2	Madhya Pradesh	5.70
3	Maharashtra	9.89
4	Rajasthan	16.89
5	Haryana	22.24
6	Punjab	2.94
7	Uttar Pradesh	29.64
8	Uttarakhand	0.39
9	Himachal Pradesh	0.67
10	Bihar	1.86
11	J&K	1.33
12	Telangana	0.01
13	Kerala	0.01
14	West Bengal	0.49
	Total	93.81

Good Cotton Growing Practices

To encourage the farmers to use improved technology for cultivation of cotton, cotton development programme is being implemented under National Food Security Mission (NFSM) in major cotton growing States including Gujarat from 2014-15.

To maximize the production & productivity of cotton, assistance is provided for Front Line Demonstration on High Density Planting System (HDPS), intercropping, for cultivation of Extra Long Staple (ELS), Desi Cotton besides programme on Insecticides Resistance Management (IRM) and Online Pest Monitoring and Advisory Services (OPMAS) under NFSM—Commercial Crop during 12th five year plan. An allocation of Rs.1200.00 lakh was made for cotton under NFSM during 2014-15. The programme is implemented through the State Department of Agriculture, Indian Council of Agricultural Research, (ICAR), State Agriculture Universities (SAUs), Krishi Vigyan Kendras (KVKs) etc.

In order to improve quality of seeds and to boost cotton production in Gujarat, the Central Institute for Cotton Research (CICR), Nagpur and All India Coordinated Cotton Improvement Project (AICCIP), Coimbatore of the ICAR are conducting basic, strategic, applied research and development in cotton through Navasari Agricultural University and Junagarh Agricultural University. Besides, the State Department of Agriculture and Krishi Vigyan Kendras are also disseminating scientific cotton production technologies in the State.

Assistance to Farmers for Loss of Crops Due to the Unprecedented Rains

As State Government is empowered to undertake necessary relief measures in the wake of natural calamities like, drought, hailstorm, pest attack & cold wave/frost from State Disaster Response Fund (SDRF) which is readily available with them. They have been requested to take immediate steps to provide relief to the victims of notified calamities by utilizing the funds available under SDRF. Besides, for providing immediate relief to the victims of State-specific disaster within the local context, which are not included in the list notified natural calamities, Ministry of Home Affairs has recently authorized the State Governments to incur an expenditure of 10% of funds available under SDRF, subject to the procedures laid down therein. They were also advised to submit memorandum as per extant procedure/norms, if additional financial assistance is required from National Disaster Response Fund ((NDRF) and in the meantime, utilize contingency fund of the State, if SDRF is exhausted. Memoranda have been received from Government of Uttar Pradesh, Rajasthan and Haryana seeking financial assistance from NDRF in the wake of hailstorm. Inter-Ministerial Central Teams (IMCTs) had visited the States of Uttar Pradesh, Rajasthan and Haryana for assessing the ground situation.

Government of India also released the first installment of Central Share of SDRF in advance of Rs.413.50 crore for Rajasthan, Rs.114.50 crore for Jammu & Kashmir and Rs.253.125 crore for Uttar Pradesh during the period for 2015-16.

Price Stabilization Fund for Price-Control interventions in case of Agri-horticultural Commodities

The Department of Agriculture & Cooperation has approved the Price Stabilisation Fund (PSF) as a Central Sector Scheme, with a corpus of Rs.500 crores, to support market interventions for price control of perishable agri-horticultural commodities during 2014-15, 2015-16 and 2016-17. PSF will be used to advance interest free loan to State Governments/Union Territories and Central agencies to support their working capital and other expenses on procurement and distribution interventions for such commodities. Initially the fund is proposed to be used for onion and potato only.

The Price Stabilization Fund will be managed centrally by a Price Stabilization Fund Management Committee (PSFMC) which will approve all proposals from State Governments and Central Agencies. The PSF will be maintained in a Central Corpus Fund account to be opened by Small Farmers Agri-Business Consortium (SFAC), which will act as Fund Manager. Funds from this Central Corpus will be released in two streams, one to the State Governments/UTs as a one time advance to each State/UT based on its first proposal and the other to the Central Agencies. The Central Corpus Fund has already been established by SFAC in 2014-15.

The one time advance to the States/UTs based on their first proposal along with matching funds from the State/UT will form a revolving fund, which can then be used for all future market interventions to control prices of onions and potatoes based on approvals by State level Committee set up explicitly for this purpose. In case of North Eastern States, the State level corpus will comprise of 75% funds from Centre and 25% from the State. While the advance is returnable, the Central Government will share 50% of losses (75% in case of NE states), if any, at the time of settlement of the advance on 31st March, 2017. The Central Government likewise also intends to share the profits, if any, in the same ratio. The States could also request Central Agencies to undertake such operations on their behalf to be supported out of the State corpus. Additionally, the Centre can also requisition the Central Agencies like SFAC, NAFED, etc. to undertake price control operations for onion and potato.

Procurement of these commodities will be undertaken directly from farmers or farmers' organizations at farm gate/mandi and made available at a more reasonable price to the consumers.

Post-Harvest Management and Market Development

To ensure adequate supply of fruits and vegetables in domestic market; Government has taken various measures to incentivize diversification towards high value products

by way of promotion of post-harvest management and market development and processing. These are:—

i. Under the Scheme of Mission for Integrated Development of Horticulture (MIDH) and Agricultural Marketing Infrastructure sub-scheme of Integrated Scheme for Agricultural Marketing (ISAM), assistance on capital cost is provided for development of integrated post-harvest management and marketing infrastructure including establishment of cold storage, cold chain logistics, Integrated Value Chains (IVCs) and for reefer vans. Further, under the MIDH scheme, retail outlets, rural primary markets, wholesale markets and terminal market complexes are also covered.

ii. For reducing post-harvest losses of horticultural & non-horticultural produce, the Ministry of Food Processing Industries is implementing a Central Sector Scheme of Cold Chain, Value Addition and Preservation Infrastructure since 2008-09 under which assistance is provided for setting up of Integrated cold chain and preservation infrastructure facilities without any break from the farm gate to the consumer.

iii. The Government has been advocating agri market reforms by way of deregulation of marketing of fruits and vegetables outside the market yard to facilitate the emergence of alternative marketing channels like direct purchase of fruits and vegetables from farmers at their farm gate, private wholesale market and Kisan Mandis which will also promote private investment in development of post-harvest and marketing infrastructure.

iv. For better post-harvest management ICAR institutions and Krishi Vigyan Kendras also impart training to farmers in relevant skills and exposure to best practices.

In order to address the logistic gap between production clusters and marketing centres, the Government, in addition to the scheme mentioned above, is also taking various other measures including advocacy of reforms in State marketing laws to facilitate development of collection centres/ purchase centres in private and cooperative sector near the production cluster. Further, to provide backward and forward linkages, Government is promoting formation of Farmers Producers Organizations (FPOs) which will allow the benefits of aggregation both to farmers and to the processors/consumers/wholesalers.

Laboratories for Testing Agro Products

Organizations like Directorate of Marketing and Inspection (DMI), an Attached Office of Department of Agriculture and Cooperation and Bureau of Indian Standards (BIS), under Department of Consumer Affairs prescribe grading standards/quality certification for agricultural produce in the country. DMI, under the provisions of Agricultural Produce (Grading & Marking) Act, 1937, has so far formulated 105 grading and Marking Rules covering 213 agricultural commodities. Further, Organic Agricultural Produce Grading and Marking (Amendment) Rules, 2011 prescribe standards for certification of organic products under Agmark.

Bureau of Indian Standards (BIS) has finalized standards for Bajra, maize, ragi, jowar and barley. The standards specify grades as well as quality parameters.

For export purpose Agriculture & Processed Food Products Export Development Authority (APEDA) has prescribed compliance with Agmark grading standards in respect of table grapes, pomegranates and okra and exporters obtain certification from Directorate of Marketing and Inspection (DMI) through approved commercial labs.

The commodities which are certified under Agmark are Ajowain, Besan, Black Pepper, Cardamom, Chillies, Clove, Compounded Asafoetida, Coriander, Creamery Butter, Cumin, Fennel, Fenugreek, Ghee, Ground Spices, Honey, Isubgol Husk, Kinnow, Large Cardamom, Maida, Mustard Seed, Oil Cake, Poppy Seed, Pulses, Rice, Roasted Bengal Gram, Safron, Seedless Tamarind, Suji, Table Eggs, Table Potato, Tamarind Seeds & Powder, Tapioca Sago, Turmeric, Vegetable Oils, Wheat Atta, Wheat Porridge for domestic trade and Creamery Butter, Ghee, Grapes, pomegranate, Onion and Tobacco for export. Further, no organic product has been certified so far under the Organic Agricultural Produce Grading and Marking (Amendment) Rules, 2011.

There is one Central Agmark Laboratory at Nagpur and eleven Regional Agmark Laboratories located at Delhi, Kolkata, Mumbai, Jaipur, Amritsar, Kochi, Kanpur, Guntur, Chennai, Bhopal, Rajkot which are engaged in monitoring Agmark certification and research analysis. Besides, this Agmark certification is done by 1410 approved primary grading laboratories of the packers, State Governments, Cooperatives and Commercial establishments in the country.

These grading laboratories are equipped for testing of commodities for certification under Agmark as per quality parameters prescribed in the concerned Commodity Grading and Marking Rules.

Call Centres for Refrigerated Van Drivers

Government has set up a Toll-Free number (1800 267 6223), operated through a 24x7x365 Reefer Vehicle Call-in-centre (RVC). Salient features of the Reefer Vehicle Call-in-center are as follows:

(i) Bhagidaari in governance through toll free access for refrigerated transporters for providing information of roadside delays, if any.

(ii) Complaints received are centrally monitored by National Centre for Cold-chain Development (NCCD), for analyzing the type and frequency of problems faced, and to address transit delays, as appropriate

Union Agriculture Minister Emphasises on the Assistance given to the Sugar Mill Should be provided to Farmers Directly

Assessing the Sugar Industry's situation, Union Agriculture Minister Shri Radha Mohan Singh emphasized that; the assistance given to the sugar mill should be provided to farmers directly.

Shri Radha Mohan Singh also emphasized on encouraging sugar exports and to increase sugar import duty by 40% so that we can stop the imports.

Delegation Led by Mr. Colin Barnett Premier of Western Australia, Calls on the Minister of State for Agriculture Sh. Mohanbhai Kalyanjibhai Kundariya at Krishi Bhawan, New Delhi

Delegation led by Mr. Colin Barnett Premier of Western Australia called on the Minister of State for Agriculture Sh. Mohanbhai Kalyanjibhai Kundariya at Krishi Bhawan, New Delhi. During the discussion with the delegation from Australia, Sh. Kundariya mentioned about Australia's high efficient agriculture sector with expertise and technology to support agricultural productivity across a range of areas.

Shri Kundariya said that Australia has been importing a number of agriculture commodities from other countries of the world and India is in a position to export cake of soyabeans, soyabeans cashewnuts, chickpeas, coconut, coconut oil, ginger, grapes, groundnuts, lentils, oranges and vegetables. He urged to consider importing these commodities from India.

Shri Kundariya said that India would like to collaborate with Australia in the areas of logistics, in particular cold chains and warehousing, agriculture processing in particular horticulture and fisheries and productivity enhancement.

The Australian team invited the officials from Ministry of Agriculture to visit Australia and study the model of working for storage of foodgrains, logistic. They emphasized on research and technologies on increasing productivity in Agriculture.

Radha Mohan Singh Urges Initiatives towards Bringing Green Revolution and Increasing Agriculture Productivity to Eastern Region

Union Agriculture Minister, Shri Radha Mohan Singh emphasised the need for bringing Green Revolution to Eastern Region of the country. Inaugurating a workshop on "Agriculture Scenario in Eastern India, Review and Future Prospects", in Pusa, New Delhi, he said that Proper care has to be taken by balanced usage of fertilisers in bringing 2nd Green revolution, particularly in eastern region of the country. He emphasised that indiscriminate use of the urea and chemical fertilisers may be avoided. He underlined the importance of organic farming taking into consideration the ecological aspects.

Shri Singh said that for the first time, soil health card is being implemented in Mission Mode and every farmer of the country will be provided with Soil health card in next three years and they will be empowered with complete details about soil nutrient for effective crop management.

Shri Singh emphasised for making available high quality seeds and agriculture plantation material to farmers for increasing productivity. He said that Front Line extension and Field extension of agriculture should work in syngery. He said that Agricultural Technology Management Agency should play an important role in this respect.

During the Programme, he emphasised on the initiatives of the Central Government like the Soil Health Management System, Soil testing laboratories, 'Pradhan Mantri Krishi Sinchai Yojana', Unified National Agriculture Market and 'Paramparagat Krishi Vikas Yojana'. He said that increasing productivity is important along with proper marketing facilities for the agricultural crops. He emphasised that districts in the country have an important role during the planning and implementing initiatives like 'Pradhan Mantri Krishi Sinchai Yojana'. He said that Prime Minister vision of 'Per Drop More Crop' can be realised by proper coordination between the Centre and the States. During his address, he urged the Small Farmers' Agriculture-Business Consortium to support farmers and formation of more 'Farmer Producer Organization' for the development of farmers.

He mentioned that two more 'Indian Agricultural Research Institute' are planned to be established, one each in Jharkhand and Assam to enhance the educational and Research opportunities. This would enable to improve eduaction and awareness on agricultural productivity and Green revolution in Eastern region of the country.

Articles

Relative Profitability of Turmeric Cultivation over Cereals in the Green Revolution Belt: A Case Study in Hoshiarpur District of Punjab

UDESHNA TALUKDAR[1] AND KAMAL VATTA[2]

Introduction

Turmeric (*Curcuma longa*) (Family: *Zingiberaceae*) is a widely used condiment in India with many medicinal properties. It is used as a condiment, dye, drug, cosmetics and is also used in religious ceremonies. It is grown on an area of 2.23 lakh ha in India with total production of 11.7 lakh tonnes during 2010-11. It passes through several processes to obtain the turmeric powder which is finally used for consumption. The raw turmeric undergoes many different steps during the process of obtaining the turmeric powder. India is also an important exporter of turmeric in the world. The important states cultivating turmeric are Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra and Assam. Out of these states, Andhra Pradesh alone occupies 35 per cent of the area under turmeric and accounts for 47 per cent of the national production.

The Green revolution in the state of Punjab, which is considered as food basket of the country, is characterized by cultivation of cereals predominated by wheat and rice. Punjab, contributes more than 60.00 per cent of foodgrain to the central pool. Rice and Wheat (R-W) cultivation are considered as low valued and more exhaustive putting stress on environment and ecology of the state. The farmers are in search of alternative cropping pattern so as to increase income and employment in their families to sustain food security. The cultivation of turmeric has emerged more remunerative with low environmental risk. It was encouraged after the establishment of Farmers' Produce Promotion Society (FAPRO) at Ghugial village of Hoshiarpur District of Punjab under RSVY scheme of the Government of India registered under Societies Registration Act XXI of 1860 in the cooperative sector. The farmers were members of the society which was integrated vertically by providing quality rhizomes and packages and buying back the produce from the farmers at remunerative prices. The area under rice and wheat was found to be substituted by the area for turmeric in the village generating more income and employment. The study is an attempt to examine the economics of production of turmeric and its relative profitability and relative economic advantages over R-W cropping system in Punjab.

Materials and Methods

The study was conducted in Hoshiarpur district during 2010-11 based on primary data collected with the help of a pre tested schedule from the member growers of the society. Thus 1 marginal, 11 small, 17 medium and 11 large farmers were selected. Data was collected by personal interview method using a structured questionnaire after pre testing the interview schedules. The information was collected for various parameters such as, operational holding, cropping pattern and important sources of income to the household. The collected data was analyzed using various statistical tools like percentage, simple average through tabular analysis.

Distribution of Land Holdings

The pattern of land holdings of the farmers is expected to be strongly correlated with the phenomenon of membership of the producers' organizations or cooperative societies. The distribution of land holding of the member farmers of FAPRO is depicted in Table 1. Almost 70 per cent of the member farmers growing turmeric belonged to the medium and large farm-size categories. On the other hand, 40 per cent of the bee-keeper members were the marginal farmers and another 20 per cent belonged to the small farm-size category. The overall average size of operational holding was 7.00 acre and 2.97 acre for the turmeric growing and bee-keeper members, respectively. In nutshell, the turmeric growing members were operating comparatively larger sized holdings as compared to the bee-keeper members. A large proportion of bee-keeping activity was confined to the marginal and small farmers which is good sign from the equity perspective.

Table 1: Distribution of Land Holdings Amongst Turmeric Growers

Farm size	Turmeric growers		
	Number of farmers	% share	Average size(acre)
Marginal	1	2.5	1.00
Small	11	27.5	3.81
Medium	17	42.5	5.76
Large	11	27.5	12.63
Total	40	100.00	7.00

1. Ph D scholar, Department of Agricultural Economics, Assam Agricultutal University, Jorhat.
2. Centres for International Project Trust (CIPT), New Delhi-110016
The paper is a part of unpublished MSc thesis of the first author submitted to the Department of Economics and Sociology, Punjab Agricultural University, Ludhiana.

Existing Cropping Pattern followed by the Member Farmers

The cropping pattern of the members of FAPRO seemed to be more diversified than the overall cropping pattern of the Punjab state. The cropping pattern is revealed in Table 2. In case of the turmeric growers, each of the rice and wheat crops covered 20.8 per cent of the Gross Cropped Area (GCA). Turmeric was being grown on 26.4 per cent of the Gross Cropped Area and the proportion of vegetables in each of the kharif and rabi season was 11.6 per cent. Vegetables also covered about 16.8 per cent of the area. It was seen that the FAPRO members had relatively more diversified cropping pattern as compared to the cropping pattern of the overall state. It was due to the reason that these farmers were growing turmeric and vegetables and was not inclined to the monoculture of rice - wheat cropping system.

Table 2: Existing Cropping Pattern of Farmers in Ghugial Village, 2010-11

Name of crops	Turmeric growers	Pc of GCA
Kharif crops(acre)		
Rice	2.21	20.8
Turmeric	2.81	26.4
Sugarcane	0.55	5.2
Vegetables	1.23	11.6
Fodder	0.20	1.9
Sub-total	7.00	65.8
Rabi crops(acres)		
Wheat	2.21	20.8
Vegetables	1.23	11.6
Fodder	0.20	1.9
Sub-total	3.64	34.2
Gross cropped area	10.64	100.00

Economics of Turmeric Cultivation

The cost of cultivation of turmeric, wheat and rice has been presented in Table 3. The seed appears to be the most expensive component of cultivation of turmeric, compared to the rice and wheat crops. The expenses on labour use are also higher for turmeric. After all, the variable costs are Rs 29117 per acre for turmeric, Rs 7775 per acre for wheat and Rs 9703 per acre for rice, which implies that the costs are almost 67 per cent higher in turmeric cultivation when compared to the combined cost of cultivation of rice and wheat. The gross returns from turmeric (Rs 119000/ acre) were almost double the combined gross returns from rice and wheat (Rs 60600/acre). In a similar manner, the returns over variable costs per acre were Rs89883, Rs27325 and Rs 15797 for turmeric, wheat and rice respectively.

Table 3: Costs of Cultivation of Turmeric, Rice and Wheat in GhugialVillage, (2010-11)

(Rs/acre)

Costs structure	Turmeric	Wheat	Rice
Land preparation	184	1375	1155
Sowing	20000	478	278
Fertilizer and weed control	2050	1965	2186
Irrigation	428	300	300
Harvesting and threshing	-	1000	-
Human labour			
Land preparation	463	400	355
Sowing	400	372	300
Fertilizer application and weed control	736	400	450
Irrigation	400	1000	2000
Harvesting and threshing	2987	100	1911
Transportation	400	50	350
Interest on variable costs @9 % for half crop period	1253	335	418
Total variable costs	29117	7775	9703
Gross Returns	119000	35100	25500
Returns over variable costs	89883	27325	15797
Variable cost return ratio	4.09	4.51	2.63

Variable cost to return ratio per annum indicated that this ratio was 4.09 for turmeric as perennial crop while the combined ratio for wheat and rice together was 3.47, which was lower than turmeric. It clearly demonstrates that turmeric cultivation was much more remunerative as compared to the rice-wheat rotation. The cultivation of turmeric by the FAPRO farmers not only helped in raising their farm incomes but also the extent of employment as turmeric cultivation was more labour intensive, compared to the rice-wheat rotation. On the other hand, there is scope for intercropping with turmeric for further increase in farm income.

Composition of Household Income of the Farmers

The distribution of average household income of the members of FAPRO is presented in Table 4. Total income of the turmeric growing households was Rs. 2,63,125/- per annum and that of bee-keepers was Rs. 1,04,000/- per annum. For the turmeric growers, the income from farming(except turmeric) was Rs.68,050/- and that from turmeric was Rs. 1,73,625/-. The annual income from turmeric accounted for about 66 per centof the total

Table 4: Composition of Income of the Farm Households, 2010-11

(Rs. /household)

Source of Income	Turmeric growers	% share
Income from crop farming	68050	25.9
Live stock	6250	2.4
Turmeric cultivation	173625	66.0
Other income	15200	5.7
Total household income	263125	100.00

household income for these households. Hence, for the turmeric growers, turmeric was the major source of income followed by the other crops such as wheat and rice.

Employment Generation at the Farm Level

A significant amount of employment generation occurred at farmers' fields due to cultivation of turmeric. This employment generation is due to labour-intensive character of turmeric cultivation. Table 5 indicates the average employment generation at the farm level during turmeric cultivation was 33 man days per acre. The harvesting of turmeric crop was the most labour-intensive operation accounting for 54.4 per cent of total labour use for the cultivation of turmeric. It was followed by land preparation and weed control in turmeric cultivation. Other activities like sowing/planting, fertilizer application, irrigation and transportation generated 2 man days each per acre with the share of 6.1 per cent in the total labour use.

Table 5: Generation of Employment at Farm Level from Cultivation of Turmeric, 2010-11

Particulars	Labour use (Man days/ acre)
Land preparation	3(9.1)
Sowing/planting	2(6.1)
Fertilizer application	2(6.1)
Irrigation	2(6.1)
Weed control	3(9.1)
Harvesting	18(54.4)
Storage	1(3.0)
Transportation on farm and to factory	2(6.1)
Total employment generation	33(100.0)

Note: Figures in parentheses are percentages of the total employment generation.

Conclusion

The study was conducted in the Ghugial village of Hoshiarpur district of Punjab during 2010-11, with an objective to examine the economics of cultivation of turmeric as a high valued cash crop and as an alternative to Rice -Wheat cropping system in the state. The study was based on primary data collected from parts of the country for cultivation of high valued crops, linking the processing with value addition for strengthening 40 turmeric growing farmers, who were members of Farm Produce Promotion Society, established under RSVY scheme of Government of India registered through Societies Registration Act XXI of 1860.It was observed that turmeric occupied 26.40 per cent of GCA whereas rice and wheat occupied 20.80 and 20.80 per cent of GCA respectively. The results indicated that return over variable cost in turmeric cultivation was more than three times than that of rice and wheat cultivation. The combined net return of rice and wheat during the year was found 32.60 per cent less over turmeric per acre. It was found that the farm households could earn 66.00 per cent of total farm income from turmeric during the year. It could generate 33 man-days of labour per acre. The potentiality to increase income from turmeric could be higher in society if it is inter cropped with other viable crops during the year. It can be suggested that the farmers can go for turmeric cultivation by substituting substantial area under rice and wheat for turmeric. This is so as turmeric is a high valued cash crop which can increase income security of the farmer, as turmeric is a remunerative crop having an assured market domestically. The model can be replicated in other states of the country to enhance farm income through cultivation of high valued cash crop.

References

Acharya S S and N. L. Agarwal (2011).

Agricultural Marketing in India, Oxford and IBH Publications, New Delhi, India.

Angles S, A Sundar and M Chinnadurai (2011).

Impact of Globalization on Production and Export of Turmeric in India - An Economic Analysis, Agricultural Economics Research Review 24: 301-308.

Arora, V.P.S and S K Srivastava (1996).

Diversification of Cropping Pattern and Food Grain Mix in India: Pace, Magnitude and Implications, Indian Journal of Agricultural Economics 51.

Baviskar S B (2009).

Cooperatives in Maharashtra: Challenges Ahead. Economic and Political Weekly 21:4217-21.

Chand Ramesh and T Haque (1997).

Sustainability of Rice-Wheat cropping system in Indo-Gangetic Region, Economic and Political Weekly 32: 26-30.

Karthik V and J.S. Amarnath (2014).

An economic analysis of turmeric production in Tamil Nadu, India, Direct Research Journal of Agriculture and Food Science 2: 66-76.

Kiruthika N (2013).

The economics of production of turmeric in India: A case study of Erode district of Tamil Nadu, Journal of Innovative Research and Studies 1: 23-30.

Lokesh G B and M. G. Chandrakanth (2004).

Economics of production, marketing and processing of turmeric in Karnataka, Indian Journal of Agricultural Marketing 18: 32-44.

Paroda, R.S, Terene Woodland and R B Singh (eds) (1994).

Sustainability of Rice-Wheat production system in Asia, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

Roy B C and K KDatta (2000)

Rice -wheat system in Haryana: Prioritizing production constraints and implications for future research, Indian Journal of Agricultural Economics 55: 671.

Sidhu, H.S (2000).

Crisis in agrarian economy in Punjab-Some Urgent steps, Economic and Political Weekly 37: 3137-38.

Singh J and J S Kolar (2001)

Agricultural economy of the Punjab at cross road, International Journal of Punjab Studies 8: 239-50.

Talukdar Udeshna and Kamal Vatta(2015).

Producers' organization and economics of cultivation of turmeric as high valued crop against rice-wheat cropping system for increasing farm income: a case study in Hoshiarpur district of Punjab, Economic Affairs 60:29-32.

Envisaging Argus-Eyed Measures to Preserve Aromatic Katarni Paddy: An Analytical Over-view of Bihar

RAJIV KUMAR SINHA[1] BASANT KUMAR[2] AND ROSELINEKUSUM MARANDI[3]

Prologue

Prior to making efforts for understanding the need to conserve sustain distinguished fragrance of Katarni paddy and problems and prospects involved in its production, it will be rather desirable to expatiate about- (i) Historical perspective in Indian context, (ii) Agro-ecosystems of Bihar for Rice, (iii) Importance of aromatic rice in the state, (iv) Indigenous varieties of rice grown in Bihar, (v) Work after 1952; and (vi) Current status.

Historical Perspective

Before coming to the discussions related to aromatic Katarni, it may be advisable to have a brief insight into other better and historically known fragrant rice varieties of India found in the ancient period.

"Basmati" is known since ancient times. In Sanskrit, it means "ingrained aroma". It has been grown since centuries in the sub-continent which is evident from references available in ancient texts, folklore and poetry. First reference of Basmati appeared in epic poem of 'Heer and Ranjha', penned by a Punjabi poet, Waris Shah (1766). 'Krishi Sukti', an old Indian Scripture, describes a number of scented rice varieties Ain-i-Akbari, written by Abul Fazl (1596-97) also mentioned about the scented rice varieties. In the Royal kitchen of Mughal Emperor Akbar, a red grained scented variety 'Mushkin' and a deepwater scented variety 'Sukhdas' are said to have been popular. Archaeological Excavation at 'Ahar' village near Udaipur has revealed remains of a long grained rice considered to be a possible ancestor of Basmati.

'Kashyap Samhita' also mentions about some scented varieties of aromatic rices. The charred rice grains excavated from Mohanjodaro must be one of our 1000 strains of 'Basmati', as the area of Punjab is still one of the largest growers of this rice (Sharma, 1998).

Foreign Traveller, Chinese Huien Tsang (stayed in Nalanda Monastery in Bihar) wrote in 630 AD that "Mahashal" is an aromatic variety of rice. It used to be as large as black bean. After cooking, this used to emit aroma. Even today, it is grown in the villages of Nalanda district of Bihar. Jean Bapiste Tavernier, a European traveller, who travelled in 1945 A.D. (Sharma, 1398) described about a small grained scented rice variety. He mentioned while he was in Surat, Gujarat that all the different rice which is grown in this country have different qualities. The Basmati like grain of BARA could only be grown under the King's supervision near the fortress of BARA in Peshawar, and ordinary persons were not allowed to visit these fields. When the British came to the sub-continent, they started the farming of Bara (Hansraj) in Uttar Pradesh and Basmati (Peshwari) in Sirsa (Haryana) in 1863 (Sabharwal, 1998). It is these ancient scriptures, which are our best hopes to fight the patent battle for Basmati. Since long farmers are using local strains of scented rice. Even today, 95% of scented rice area in Bihar is under traditional varieties. Farmers have been growing these varieties mainly for home consumption.

Introductory: Indian Context

With about 43 Million Hectares (MHs) of rice area, India is the second largest producer of rice in the world after China. Rice production in India reached 104.40 Million Tonnes (MTs) during 2012-13. Of these, the three states: West Bengal, Uttar Pradesh and Andhra Pradesh account for about 42.00 per cent of the total production. India also produces some of the best quality rice in the world. These include the long grained export quality 'Basmati' and a 'host of locally adapted small and medium grained scented rice varieties', known for their excellent cooking and eating qualities. Some rice growing states in the country have few while others have many varieties, like the Basmati that is found in Punjab, Haryana and Western Uttar Pradesh. The small and medium grained scented rice varieties like: (i) Kalanamak, (ii) Shakarchini, and (iii) Hansraj are found in UP, (i) Dubraj, (ii) Chinoor in Chhattisgarh, Kalajoha in North-East, Ramdhuni Pagal in Orissa,Ambemohar in Maharashtra, and so on. The long grained Basmati rice is generally exported and has assured markets, whereas 'the small and medium grained non-basmati scented rice' is consumed locally.

1. Research Associate, "Agro-Economic Research Centre for Bihar & Jharkhand" (MOA, GOI), T.M. Bhagalpur University, Bhagalpur- 812007 (Bihar), E-mail: rajiv.sinha1959@gmail.com
2. Director, "Agro-Economic Research Centre for Bihar & Jharkhand" (MOA, GOI), T.M. Bhagalpur University, Bhagalpur- 812007 (Bihar).
3. Research Associate, "Agro-Economic Research Centre for Bihar & Jharkhand" (MOA, GOI), T.M. Bhagalpur University, Bhagalpur- 812007 (Bihar)

Besides the above, due to the quest for high yielding varieties, beginning in the mid sixties, a large number of small and medium-grained varieties slowly vanished from farmers' fields. For example, only few years back, Uttar Pradesh farmers grew as many as 40 well known scented varieties. But today, one finds not more than 3 or 4 being grown by farmers, that too on limited scale, and only in some specific areas (Singh & Singh, 2000).

These low yielding varieties are susceptible to logging and also to various pests and diseases. The fact that some of these varieties still exist can be attributed to the special interests of the farmers.The farmers grow them mostly for their own consumption.The marketable surplus is hardly there and is limited to a few pockets, like the sale of Dubraj inChhattishgarh region, or Kalanamak in Sidharth Nagar and Basti districts in Uttar Pradesh. Dubraj was sold at the rate of Rs.20-25/kg, while Kalanamak fetched Rs. 30-40/kg, so they were quite remunerative. However, in the absence of any improvement programme or non-availability of pure seeds, most varieties found on the farmers' fields are mixed. It is difficult to get pure unadulterated culture of any of these varieties at the moment.

Importance of Aromatic Rice in the State & Area

The yield of traditional aromatic rice varieties is usually less than that of the traditional non-aromatic rice. Therefore, their cultivation is confined to specific regions and to some extent, on lower scale in all regions for use as special rice. The aromatic rice are usually not consumed by the masses, but are generally used by rich people at special occasions such as marriages, feast etc., and served to special guests. Scented rice in Bihar is used also in preparation of Kheer and Cheura i.e. flattened rice (common breakfast food). Mircha, a short bold rice especially grown for Cheura in Champaran district, while Katarni of Bhagalpur is grown both for cooked rice and Cheura. Cultivation of scented rice is widespread in the districts of Bhagalpur and Champaran.

Area

The area under scented rice may be around one lakh hectares with productivity of about 1.16 tonnes/ha. Dehradun rice with long slender grain is grown in some of the areas, but develops no scent. Similarly, Katarni of Bhagalpur region, where it is extensively grown, when planted in other regions, expresses very little or no scent.Location-specific land and specific varieties are, therefore, cultivated.Pusa Basmati-1, an improved variety, was adopted in the state, but could not become popular mainly due to poor yield on account of susceptibility to diseases and pests. Moreover, milling and hulling for this variety is not easily possible. Malida, with excellent aroma, possessing short bold grain, is also grown on large scale in Darbhanga and Madhubani, both under deep water and lowland areas.

Indigenous Varieties: Bihar

In Bihar, although aromatic rice are grown all over the state, they are mainly concentrated in Bhagalpur and Magadh divisions. Bhagalpur has been a traditional aromatic rice growing area, where the varieties such as Katarni, Tulsi Manjari, Badshahbhog, Br-9 and Br-10 are most common. These are photo period-sensitive, tall and hence susceptible to logging and several diseases and pests. Their yields vary from 2.0-2.5 t/ha. Katarni is the most prevalent variety of the region. However, over the time, there has occurred a large variation, which has resulted into various types, such as, Bhauri Katarani, Deshla Katarani and Sabour Katarani. In the Magadh region, which is the main rice growing tract of Bihar, farmers grow Karibank, Marueya, Mehijawain, Shyamjira, TulsiPhool, Sonachur and Shah Pasand. Over the time, the area under these varieties has drastically reduced although farmers still grow Karibank and Marueya, but on a small scale only. The Tarai region of West Champaran was, at one time, known for its good quality aromatic rice varieties that included Lal Champaran Basmati, BhuriChamparan Basmati, Kali Champaran Basmati, Baharni, Badshahbhog, Chenaur, Dewatabhog, Kesar, Kamod, Kanakjeera, Marcha, Ram Janwain, Sonalari, and TulsiPasand. Most of these varieties are either already lost or at the verge of extinction.

Two types of local Champaran Basmati are grown in East and West Champaran in small tracts for personal consumption by the local farmer community. Some of the local varieties grown in Bihar are given in Table-1.

Table 1 Local Scented Rice Varieties and Landraces of Bihar.

S.No.	Location	Scented Rice Varieties/Landraces	Land Type	Important Characteristics
1.	Patna	Basmati-3, Karibank-2, MohinDhan, Sagarbhog and Hansraj	Medium and Lowlands	Tall, late duration, small to medium fine grain, aromatic, and photoperiod sensitive
2.	Bhojpur	Sonachur, Karibank, Basmati, Badshahbhog and Kanakjeera	-:Do:-	-:Do:-
3.	Rohtas	Sonachur, Shyamjeera, Basmati-3, Shahpasand and Tulsiphool	-:Do:-	-:Do:-

S.No.	Location	Scented Rice Varieties/Landraces	Land Type	Important Characteristics
4.	Gaya	Basmati and Kanehonehur	-:Do:-	-:Do:-
5.	Aurangabad	Shyamjeera and Mehijawain	-:Do:-	-:Do:-
6.	Bhagalpur	Tulsimanjari, Katarnibhog, Badshahbhog and Br-9, Br-10	-:Do:-	-:Do:-
7.	Munger	Tulsimanjari, Shyamjeera, Karibank, Marueya and Lakhisar	-:Do:-	-:Do:-
8.	North Bihar	Badshahbhog, Badshahpasand, Baharni, Basmati-3, Br-9, Br-10, BhuriChamparan, Basmati, Chenaur, DewtaBhog, Hansraj, Kamod, Katarnibhog, Kali Champaran Basmati, Karibank, Karibank-2, Kanakjeera, Kesarbani, Kesar, LalChamparan Basmati, Lakhisar, Marcha, Marueya, Malbhog, Mehijawain, MohinDhan, Ram Jawain, Sagarbhog, SonaLari, Sonachur, Shyamjeera, Shahpasand, Tulsipasand, Tulsimanjari, TulsiPhool	-:Do:-	-:Do:-

Statement of the Problem

Local varieties which have yield potential ranging from 15 to 30 qtls/ha, are tall possessing short grains characteristics.Many of them are highly susceptible to various insect-pests and diseaseslikestem borer and bacterial blight. Since they have excellent cooking quality and aroma, they are still grown by farmers on small scale, except three-Kamini (Katarni), Mircha and Malida. Each of these three has its own speciality: Katarni for cooked rice, Mircha for Cheura and Malida for its adaptability in lowland deep water. All land races of aromatic types grown in Bihar have fine but short grains and consequently low export values. It has led to constant declines in their areas replaced by HYV paddy and other 'more profit yielding crops'.

In view of the lower yield and 'eroding aroma of traditional aromatic rice varieties in Bihar as a result of using adulterated seeds, there has been decline in area under Katarni paddy over the years. Most of the good quality aromatic rice varieties are either being lost, or facing the threat of extinction. In the light of above contexts, the paper has been undertaken with the objectives noted below:

Objective of the Paper

(i) To assess the potential area of Katarni paddy in the study area;

(ii) To inscribe historical perspective of scented rice;

(iii) To briefly delineate indigenous varieties grown in Bihar;

(iv) To discuss current status of aromatic rice in Bihar;

(v) To study the economics of Katarni paddy in the study area;

(vi) To identify the marketing channels of Katarni paddy in the study area;

(vii) To briefly mention future concerns and opportunities;

(viii) To enunciate problems and constraints in growing Katarni paddy; and

(ix) To suggest 'Observation-based Action Points' for the development of Katarni paddy in the study area.

Methodology

The paper is mainly based on primary data collected from 30 Katarni paddy growing cultivators each from Bhagalpur and Banka districts. 'Multi-stage simple random sampling method' was followed to select respondents.

At the first stage of sampling, two districts, namely; Bhagalpur and Banka were purposively chosen, as the specific variety of Katarni, to which this paper is devoted, is grown only in particular areas of these two districts. At the second stage of sampling, one block from each district was selected on the basis of area under Katarni paddy. Jagdishpur and Amarpur blocks were selected from Bhagalpur and Banka districts respectively. At the third stage of sampling, maintaining the harmonious basis of choosing potential villages in regard to cultivation of Katarni paddy, two villages each from the two selected blocks of the concerned districts were identified. The two villages are namely: 'Bhawanipur-Deshari' and 'Jagdishpur cluster of villages' under Jagdishpur block and (i) 'Tardih-Lakshmipur', and (ii) 'Ramchandrapur-Bhadariya' villages from Amarpur block of Banka district. At the fourth stage

of sampling, enlistment of Katarni paddy growers in the selected villages was made. At the fifth stage of sampling, indispensable classification of farmers, from out of the enlisted growers was done based on farm size owned by them. All the enlisted growers were broadly kept in four categories: (i) Marginal - owning land up to 1 hectare, (ii) Small - 1.01 to 2 hectares, (iii) Medium - 2.01 to 4 hectares and, (iv) Large - 4 hectares.

At the sixth stage of sampling, 15 farmers from each of the selected villages (if required number of Katarni paddy growers was not found in a particular village, then cluster of adjoining villages was also considered), were selected for detail study. The selection of farmers was done on probability proportion method. Further, with a view to maintain discreet selection of respondents, due emphasis was given on social composition of the enlisted growers.

In this way, the selection of sample can be illustrated as below: 2 districts × 1 block each (=02) × 2 villages each (04v) × 15 farmers = 60 Katarni paddy growers.

Statistical Tools

Simple tabular and percentage methods have been followed to analyze the data and interpretation of observed facts thereafter.

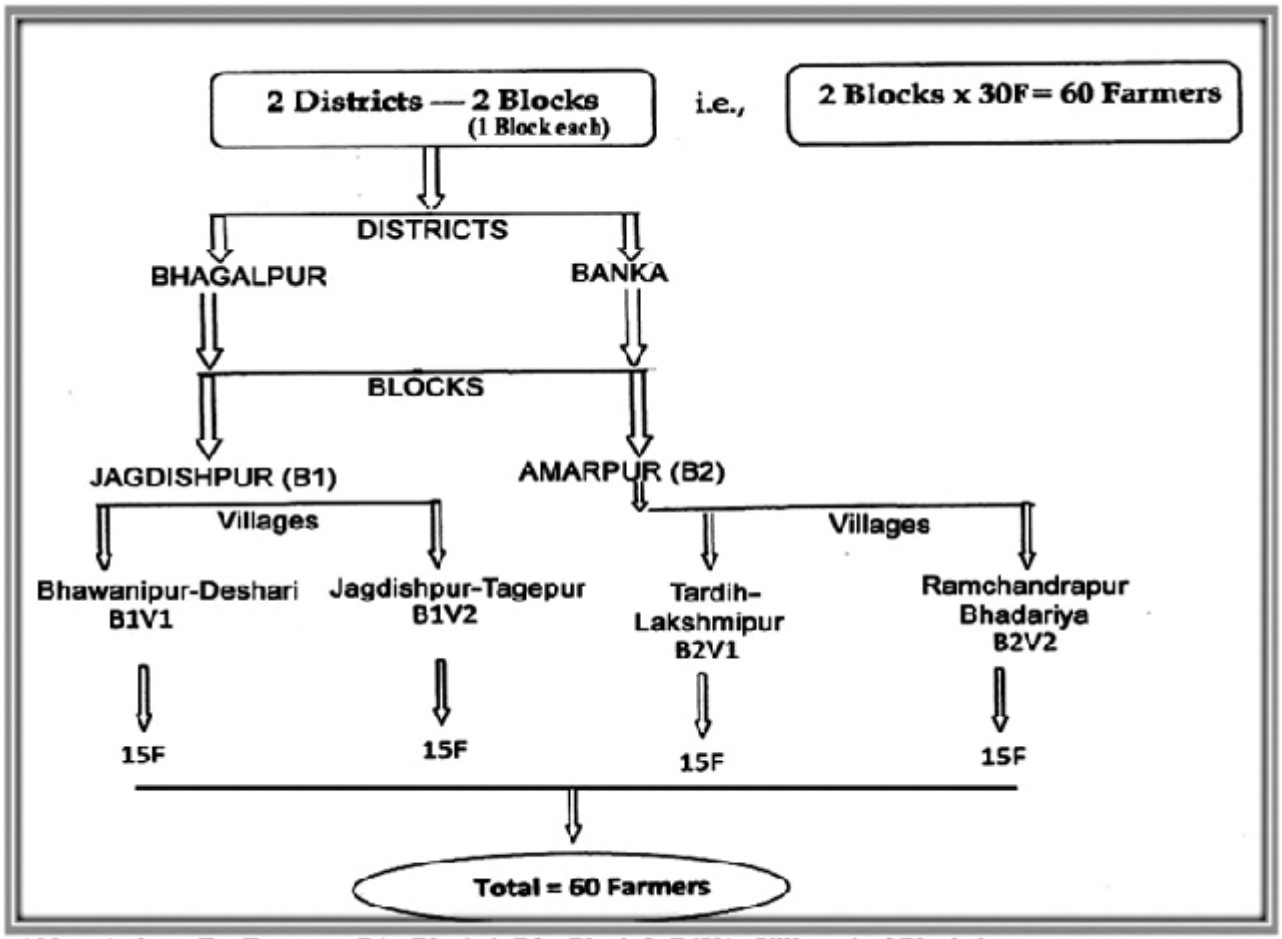
Reference Period

Primary data collection revisited in 2014. However, the secondary data pertains to the latest one available in the Department of Agriculture, Government of Bihar, Bhagalpur & Banka districts.

Work After 1952

It will be interesting to have a glance on the efforts of the agricultural scientists to develop different selections from the famous Katarni of Bhagalpur region. Work on fine grained variety, was not a priority after 1952. However, land races were collected and evaluated periodically. Two varieties, namely Sugandha and Kamini were released during the period. Their characteristic features are given below:

Diagrammatic presentation of sampling is given below:



Abbreviation: F = Farmers, B1= Block 1, B2= Block 2, B1V1= Village 1 of Block 1, B1V2= Village 2 of Block 1, B2V1= Village 1 of Block 2, B2V2= Village 2 of Block 2

Sugandha

This variety has been developed as a selection from Cuttack Basmati. It is photosensitive with medium slender grain having good cooking quality. Its height is 145-150 cm and matures in 160-165 days, giving an average yield of 25-30 q/ha. This was released in the year 1983 for cultivation in Bihar.

Kamini

This variety was developed as a selection from the famous local variety Katarni of Bhagalpur region, which has numerous ecotypes. Though Katarani was grown on a large scale in Bhagalpur division, this was not identified for release. Therefore, a program was initiated to collect and evaluate all available fine grained land races including different ecotypes of Katarni in early 80s. One of its ecotypes was selected and later released as "Kamini" (Thakur et. al., 1991). It is tall, photosensitive and flowers in third week of October giving a yield of 30-35 qtls/ha. Its cooking quality is excellent and is also suitable for Cheura (flattened rice or flake rice) making. It is superior to Sugandha in yield and is disease-pest resistance.

Pusa Basmati-1

Developed at IARI, Delhi, it was recommended for cultivation in Bihar. This is a dwarf and photo insensitive variety having maturity duration of 105-110 days. Pusa Basmati-1 gives yield of 35-40 q/ha. This variety, however, could not make headway due to susceptibility to various diseases and pests.

Current Status

Although, Type-3, an aromatic rice was recommended long back in the state of Bihar, it could not be very popular. Similarly, Pusa Basmati-1 also did not spread especially due to poor hulling and milling and high susceptibility to pests and diseases. Some time back, work on aromatic rice improvement was intensified, and using three donor parents- Kamini, Type-3 and Sugandha-numerous crosses were made (Singh et al., 2001). Progenies from Type-3/ Saket 4 and Kamini/Sitahave been included in various state trials, several of them are scented. After thorough testing and evaluation, one culture of Type-3/Saket-4 was identified, which has long slender grain, dark erect leaves, with maturity period of 115-120 days. It has yield potential of 5.5 t/ha during kharif and more than 7 t/ha in boro season with mild aroma.

Economics of Katarni Paddy

This section seeks to circumspectly examine economics of Katarni paddy in the study area i.e., Bhagalpur and Banka districts of Bihar. With the view to calculate cost of cultivation per hectare, data related to: (i) fixed cost, (ii) variable cost, (iii) production, (iv) rate (price), (v) productivity (yield), and, (vi) returns etc., were collected from surveyed farmers and analyzed. The data inscribed in table No. 2 lead us to ascertain that on overall level under variable cost maximum expenditure, i.e., in percentage terms, was incurred on hired labour[Rs. 9,070 per hectare (24.68%)], and the minimum being in case of depreciation on implements and farm buildings Rs. 650/- (1.77%). While the amount paid as wages to hired labourers was higher for Banka district (Rs. 9,100/-), the transplantation cost was higher in Bhagalpur (Rs. 1,050/-). As the quantum of net returns were quite higher in Bhagalpur district (Rs. 12,986.72) in comparison to that of Banka district (Rs. 9,552.70), so Cost-Benefit Ratio (CBR) of Bhagalpur district (1:1.36) was found to be genuinely higher than that of the later district (1:1.26).

Data in Table-2 further displays that on overall level, cost of production per quintal of Katarni paddy was estimated at Rs. 979.34. In Banka district, it was a bit higher (Rs. 2030.37) than that of Bhagalpur district (Rs. 1928.31), which might be due to the fact that irrigation cost in Banka district (Rs. 5000/- per hectare) was quite higher in than that of Bhagalpur district. Jagdishpur block, under the villages of which the survey was conducted, is situated nearer to the main marketing centre and well developed and old commissionary headquarters of Bhagalpur situated hardly at 15-16 kms distance in comparison to villages under Banka district (25-26 kms each from Bhagalpur and Banka district headquarters both). Further, if the growers for Banka district preferred to sell their produce in Jagdishpur market, the distances covered by them will be about 40 kms and 70 kms via Bhagalpur and Banka via Dhaka Mode, Rajoun, Punsia respectively. So, not only the price of Katarni paddy was higher in the former district (Rs. 2350/- per qtl) than that of the later one (Rs. 2280.25 per qtl), rather less transportation cost might have led to lower cost of production in Bhagalpur district. In aggregate terms, hired labour, irrigation, harvesting, ploughing and manure were found to be the items that shared major amounts of cost/investment.

On overall level, cost benefit ratio of Katarni paddy is estimated at 1:1.31, which may be corroborative of the fact that, if an encouraging environment is provided to farmers by ensuring more remunerative market, the prospect of Katarni paddy growing will be broader and brighter.

Table 2 Per Hectare Cost of Cultivation of Katarni Paddy

S.No.	Particulars	Bhagalpur	Banka	Overall (in %)
Average Area Under the Crop (in ha)		0.281	0.645	0.463
A	Fixed Cost :			
	(i) Value of Land	3.71 lakh/ha	3.46	---
	(ii) Interest on Fixed Capital	6183.33	5766.66	---
	(iii) Land Revenue Paid	45.28	50.00	47.64 (0.13)
	(iv) Rental Value of Land	8251.50	7757.69	8004.59 (21.77)
B	Variable Cost :			
	(i) Ploughing	3100.00	3000.00	3050.00 (8.30)
	(ii) Transplantation	1050.00	950.00	1000.00 (2.72)
	(iii) Seeds (both farm produced & purchased)	1800.00	2000.00	1900.00 (5.17)
	(iv) Fertilizer	2187.50	2193.25	2190.38 (5.96)
	(v) Manure (owned & purchased)	2500.00	2550.00	2525.00 (6.87)
	(vi) Labour (hired & imputed family labour)	9040.00	9100.00	9070.00 (24.68)
	(vii) Irrigation	4000.00	5000.00	4500.00 (12.24)
	(viii) Harvesting	3318.00	3000.00	3159.00 (8.59)
	(ix) Interest on working capital	630.00	692.52	661.26 (1.80)
	(x) Depreciation on implements and Farm Buildings	600.00	700.00	650.00 (1.77)
	Total	28225.50	29185.77	28705.64
	Total Cost [A (iii, iv) + B)]	36522.28	36993.46	36757.87 (100.00)
C.	Gross Return (including price of straw @ Rs. 5000/- per ha)	49509.00	46546.16	48027.58
	(i) Rates (@ Rs./Qtl)	2350.0	2280.25	2315.13
	(ii) Yield Rate (Qtl/ha)	18.94	18.22	18.58
D.	Net Return (in Rs.)	12986.72	9552.70	11269.71
E.	Cost of Production (in Rs.)			
	(i) Per quintal (Rs.)	1928.31	2030.37	1979.34
F.	Cost Benefit Ratio	1:1.36	1:1.26	1:1.31

NB: The calculated value of rent is meant for 5.5 months' period from sowing to harvesting of Katarni paddy (already paid before).

Sale and Marketing Channel

This section of the paper dwells upon quantity sold by the growers/farmers through different marketing channels. Five channels have been identified during the course of field survey. These are:

- Channel-I : Encircles ⇨Producer ⇨Consumer
- Channel-II : Comprises⇨Producer⇨Itinerant trader ⇨Consumer
- Channel-III : :Encompasses⇨Producer⇨Wholesaler ⇨Retailer⇨Consumer
- Channel-IV : Includes Producer⇨Retailer⇨Consumer, and;
- Channel-V : Consisted others (if any).

A glance on the table clearly reveals Channel-III to be the most prominent one for selling maximum quantities of Katarni paddy by the surveyed growers of Bhagalpur and Banka districts (59.38% and 54.34%) respectively. The channel of sale through which lowest quantities were sold, was channel-I in both the districts (7.29% and 4.77%) respectively.

In Bhagalpur district, Channel-IV (Producer⇨Retailer ⇨onsumer i.e., PRC) was the second commonly used outlet for selling the marketed surplus (20.83%), while in Banka, it was Channel-II (Producer-Itinerant trader-Consumer i.e, PIC) that accounted for 22.72 per cent. Channel-IV in Banka district (Producer⇨Retailer⇨Consumer i.e., PRC 18.17%) also revealed popular source of disposing off the marketed surplus, while in Bhagalpur, it was Channel-II (12.50%) [Table No. 3].

Marketing Margin

A brief discussion of marketing margins and costs are important, for they reveal many facets of marketing and the price structure, as well as, the efficiency of the system. The magnitude of the marketing margins relative to the first level price (means the price received by the primary growers of Katarni paddy), indicates the efficiency or

otherwise of the marketing system. It refers to the efficiency of the intermediaries between the producer and the consumer in respect of the services rendered and the remuneration received by them. While comparing the efficiency of the marketing system by means of marketing margins over space or time, the difference in the value added to the product through various services/functions has been taken into account.

In Bhagalpur district, as the Table No. 3 itself reveals, the marketing margins at Channel-II (PITC), Channel-III (PWRC) and Channel-IV (PRC) could be calculated at Rs. 150/-, Rs. 300/- and Rs. 100/- only respectively. It means that from Producer and Consumer Points of view, Producers-Retailers-Consumers' Channel is the most advantageous, desirable and effective channel.

In Banka district, almost similar scenario of marketing margins could be seen, except the amount of margin in case of Channel-IV being Rs. 50/- lower than that of Bhagalpur district. It was Rs. 2,150/- per quintal in PRC Channel.

It can thus be concluded that if the number of intermediate traders are reduced, then the growers may earn higher sale price, which is urgently desired with the view to encourage the farmers to undertake cultivation of Katarni paddy in more areas.

Table 3 Quantity Sold by Different Marketing Channels (in qtls)

District	Quantity/Price	Zero Level Producer-Consumers (PC)	One Level Producers Itinerant Traders Consumers (PITC)	Third Level Producers-Wholesalers-Retailers Consumer (PWRC)	Forth Level Producers-Retailer-Consumer (PRC)
Bhagalpur	Qty (in qtls)	7.00(7.29)	12.00(12.50)	57.00(59.38)	20.00 (20.83)
	Selling Price (in Rs./qtls)	2100.00	2250.00	2400.00	2200.00
Banka	Qty (in qtls)	10.50 (4.77)	50.00 (22.72)	119.61 (54.34)	40.00 (18.17)
	Selling Price (in Rs./qtls)	2100.00	2250.00	2400.00	2150.00

NB : Figures in brackets indicate percentages of the Marketed Surplus of the Districts concerned, i.e., out of the total quantities sold - estimated at 96 qtls for Bhagalpur and 220.11 qtls for Banka.

Shift of Cultivation

This section elaborately discusses farmers' response given by them about reasons for shift of areas from Katarni paddy to other crops. Table No. 4 contains data in percentage terms, out of the total surveyed farmers in both the districts i.e. Bhagalpur and Banka. Some of the remarkable factors told by the respondents as cross elements that led them to shift areas under Katarni paddy to other crops were: (i) farmers did not get remunerative prices, (ii) long duration of the crop; (iii) lack of irrigation facilities, (iv) unchecked excavation of sand from river Chandan that made irrigation costly and; (v) non-availability of real Katarni paddy seed by any government agency.

While farmers not getting more than remunerative prices was highlighted as the most prominent causes of shifting areas under Katarni paddy to other crops in both the districts (100%), non-availability of Katarni paddy seed by any government agency was the least intense factor for such trend in Bhagalpur and Banka districts (76.67% & 80%) respectively. Data in Table No. 4 further expresses higher percentage of respondents quoting unchecked excavation of sand from river Chandan that made irrigation to become a costly component (100% & 86.67%) respectively as one of the significant reasons for shifting of area. It was followed by the factor Katarni being a long duration crop (90% & 86.67%) in Bhagalpur and Banka districts respectively and lack of irrigation before harvesting (80% each in the two districts).

It can thus be deduced that if suitable and stringent measures are taken for stopping uncontrolled excavation of sand from river Chandan and original/certified seeds of Katarni paddy are made available to farmers by any government agency, then a remarkable increase in areas under Katarni paddy in both the districts can be certainly brought.

Table 4 Reasons for Shifting Cultivation of Katarni Paddy to Other Crops (%).

S.No.	Reasons	Bhagalpur	Banka
1.	Farmers do not get remunerative price	100.00	100.00
2.	Long duration crop	90.00	86.67
3.	Lack of irrigation	80.00	80.00
4.	Unchecked excavation of sand from river Chandan that made irrigation costly	100.00	86.67
5.	Non-availability of real Katarni paddy seed by any government agency	76.67	80.00

Problems / Constraints:

The problems that were captured during the course of field survey, have been mentioned below:

(1) One of the main reasons for lower productivity is filling up of sand in thousand acres of land as a result of devastating floods that occurred in 1995 and 2001.

(2) Traditional variety of Katarni paddy is a long duration crop (165-170 days, means nearly 5 and ½ months).

(3) In traditional variety, higher production is not generally possible due to its length (150-155 cms).

(4) Traditional aromatic rice varieties are : Photoperiod-sensitive, tall and hence susceptible to logging and several diseases and pests.

(5) Due to specific standards required for 'Export Quality Rice (EQR)' - slender grain with > 7.0 mm length, export potential is choked.

(6) The reliability and conspicuous fragrance of Katarni are being eroded because 'Sonam' and 'Sobha' are used by the farmers as replacement and claiming it to be 'Katarni'.

(7) Such a distinct product couldn't be patented and branded.

(8) 'Badshah bhog' a fine rice variety, is the local scented rice variety of North Bihar, but the state couldn't get it patented in its name.

(9) We are reluctant, rather not much interested in adequately propagating our uniquely scented rice varieties at National and International levels.

(10) 'Super Katarni' and 'Kanpur Katarni', not originally and genetically bred, are likely to destroy the original Katarni paddy of Bhagalpur region.

(11) BRBN, TDC, SFC, FCI, RAU, NSC and other private companies didn't take any pain or make efforts to preserve, produce / develop and promote 'Original Katarni Paddy Seed'.

(12) There is 2-3% possibility of cross pollination.

(13) Due to exchange of seeds in some cases, 'Non-Real Katarni Seed' is used resulting in 'Extinction or erosion of originality'.

Scientists Perception / Observed Facts :

Efforts have also been made to capture scientists', scholars and farmers' perceptions / views / angle in regard to expected brighter future of Katarni paddy. These have been mentioned below:

(i) Fortification and specific identity of Katarni paddy is likely to take place in near future.

(ii) Farmers of Jagdishpur block likely to get foreign technology.

(iii) IRRI to provide global recognition to this crop; determined to economically strengthen the farmers.

(iv) A team of IRRI, Philippines led by Physiologist (Dr. Emli Henry), with Dr. Arvind Kumar and other scientists of "BAU, Sabour, Bhagalpur" (including the then Dean, Agriculture— Dr. D. Roy, Director-Research, Dr. Ravi Gopal Singh and others) had taken stock of Katarni paddy planted (in November, 2011).

(v) Productivity of Katarni paddy is not much below estimated at - 20 qtls/ha (as reported by the surveyed farmers).

Future Concerns and Opportunity

In Bihar, aromatic rice is primarily grown in the districts of East and West Champaran. Bhagalpur, Rohtas, Bhojpur, Sitamarhi, besides in some small pockets of other districts. Efforts have been under way to breed high yielding quality rice in the recent past. There appears an urgent need to expand and increase the area of cultivation under Basmati rice from the present level of nearly one lakh hectares. Some dwarf, photoperiod insensitive and high yielding aromatic rice, having short maturity period have been developed. More emphasis should be given on generating resistance to major pests and diseases to improve productivity.

There is great scope of aromatic rice in Bihar.However,due to specific standards required for export quality rice (slender grain with > 7.0 mm length), the local rices with length lesser than this, although having other pre-requisite characteristics, are not considered for export. These standards need to be reviewed. It is not true that all importing countries prefer long slender grains. Iran, for example, prefers short fine rice. The comprehensive data on the aromatic rice of Bihar and other quality rices are provided in the Table-5. As evident, except for length, all

rices from Bihar have the requisite traits. It may be emphasized that Kamini has better taste and softness than even the Dehradun rice after cooking. If such barriers are removed, increased exports will help the farmers of Bihar to go a big way in expanding aromatic rice cultivation.

Table 5 Characteristic Features of Some Improved Aromatic Rice of Bihar and Other Regions

Variety	Plant Height (cm)	Duration (days)	Yield (qtls/ha)	Grain length (mm)		Expansion Ratio	Milling %
				Un--cooked Rice	Cooked Rice		
Basmati-370	150-160	165-170	20-25	6.84	13.09	1.91	70.00
Taroari Basmati	145-150	160-165	28-30	7.13	16.25	2.28	68.00
Type-3	135-140	110-115	24-25	7.00	14.00	2.00	70.00
Sugandha*	145-150	160-165	25-30	4.50	9.00	2.00	70.00
Kamini*	140-145	165-170	30-35	5.50	9.50	1.90	70.00
BR-9*	150-155	165-170	20-25	4.75	9.50	2.00	68.00
Br-10*	150-155	160-165	23-25	5.00	9.75	1.90	68.00
Pusa Basmati-1	100-105	120-125	35-40	7.20	13.91	1.93	70.00
Kasturi	105-110	120-125	27-30	7.00	12.35	1.78	70.00
Haryana Basmati	105-110	120-125	27-30	7.06	12.43	1.76	70.00

* Developed by RAU, Pusa, Bihar

Encouraging Observed Potential

(1) Now, cultivation will be done by using improved techniques. Blue print is being prepared.

(2) In BAU, Sabour, Bhagalpur - Research is being conducted to save fragrance of Katarni paddy.

(3) As stated by scientists from International Rice Research Institute, Philippines, productivity will be doubled by using improved/ modern techniques.

(4) Efforts have been under way to breed high yielding quality Rice in the recent past.

(5) There is great scope and potential of aromatic rice in Bihar.

(6) Kamini has better taste and softness than even the Dehradun Rice after cooking.

(7) Dr. R.N. Sharma (the then Director, "Krishi Anusandhan Sansthan, Mithapur, Patna") made three desired modifications/improvements in traditional Katarni variety.

(a) Duration reduced to 120 days enhancing productivity by more than double,

(b) Dwarfing of plants height to 90 cms from 1 metre.

(c) The height of traditional variety had been 155-160 cms.

(8) But, it can be termed as a matter of anxiety that the Dwarf variety of 'S.No.-07' couldn't be practiced/ adopted by the farmers in absence of proper demonstration.

(9) Actually Katarni is 'a Ceremonial Rice'.

(10) Fine scented Rice is the strength of Bihar.

Suggested Action Points

(1) Some dwarf, photoperiod-insensitive, high yielding and 'resistant to major pests and diseases' variety needs to be developed. (IARI, MOA, GOI, Deptt. of Agriculture, Govt. of Bihar, RAU, BAU)

(2) Agronomically developed seeds need to be produced.

(3) All the formal and informal agencies, i.e. government agencies and private agencies (directly or indirectly involved in developing seeds), should emphasize on preserving traditional Katarni paddy seeds.(Attn - BRBN, NSC, BAU, RAU)

(4) "National Bureau of Plants and Genetic Research, New Delhi" needs to be invited to look into the problem / threat of eroding aroma and for retaining the originality of Katarni Rice (NBPGR, IARI, BAU, Sabour).

(5) By mutation (Gamma Radiation) genetical improvement in yield and quality improvement can be obtained (Deptt. of Plant Breeding and Genetics, BAU, Sabour).

(6) Use of organic manure should be propagated and encouraged (Agriculture Deptt, GOB).

(7) To accentuate the ever increasing threat of Adulterated seed— Nucleus seed need to be maintained (NBPGR, Block level officers of Agriculture Deptt.).

(8) Genetic Purity (True to Type) of Katarni Paddy should be maintained (Deptt. of Genetic Engineering, BAU, Sabour).

(9) Use of Bio-fertilizers and Natural Manure should be encouraged for countering vanishing fragrance of Katarni due to excessive use of chemical fertilizers.

(10) All concerned (means the Government, Policy Makers, Scientists Scholars and Farmers combined together) - should make all efforts for branding, patenting and popularising Katarni paddy all over the world.

(11) Check dams in river Chandan should be constructed at some identified points to uplift and retain water level for ensuring easy availability of cheaper irrigation facility.

(12) Unchecked Excavation of sand from different locations of Chandan River in both 'Bhagalpur' and 'Banka' districts— needs to be strictly checked. Sand less bed of this river has lost water retention capacity, which has led to deepening of river bed and making irrigation more expensive (BSMDC, GOB, DM and District Mining Officer, Bhagalpur).

References

1. Jha (Dr.), Basant Kumar Sinha (Dr.), Rajiv Kumar and Marandi (Dr.) RoslineKusum *"Problems And Prospects of Katarni Paddy Production* in Bihar", 'AERC for Bihar & Jharkhand', TMBU, Research Study No. 32, September-2012.
2. Thakur, R. Chaudhary, V.K. and Singh, J.P. *"The Aromatic Rices of Bihar",* Singh & Singh (Ed.): *"A Treatise on the Scented Rices of India" (2003),* Kalyani Publishers.
3. Alam, M. (1938): *Detailed Scientific Report of Rice Research Station,* Sabour for 1937-38.
4. FazlAbul (1596): *Ain-i-Akbari.*
5. Mandal, S.C., Alam, M., Rao, M.S.S., and Gupta, B.K. (1970): *Agriculture Research in Bihar,* Published by R.A.U., Pusa.
6. Richharia, R.H. (1951): *Improved varieties of crop plant. p*. 18-19.
7. Richharia, R.H. and Govindaswami, S. (1966): *Rices of India, p. 93-105.*
8. Sabharwal, V. (1998): *Basmati has been known since ancient times.* The Times of India, April 25, 1998.
9. Saran, A.B. and Richharia, R.H. (1953): *The new selections of paddy-evolved between 1942 and 1952 at Sabour, Bihar,* Academic of Agricultural Sciences, Technical Bulletin No. 1.
10. Sharma, R.D. (1998): *Basmati-A Resident of India by Birth.* Science Reporter (April): 9-15.
11. Singh, R.K. Sahai, V.N., Sharma, R.V., Singh, U.S., Singh, S. and Singh, O.N. (2001): *Current status and future prospects of improving traditional aromatic rices in India*. In: Specialty rices of the world: breeding, production, and marketing. Eds. R.C. Chaudhary, D.V. Tran and R. Duffy. FAO, Rome, Science Publishers, Inc. USA: 79-88.
12. Singh, R.K. Singh, U.S., Khush, G.S, Rohilla, R. Singh, J.P., Singh, G. and Shekhar, K.S. (2000): *Small and medium grained aromatic rices of India.* In: Aromatic Rices. Eds. R.K. Singh, U.S. Singh and G.S. Khush. Science Publishers, Inc., USA: 155-176.
13. Singh, S.P. 1999. *Basmati Dhan ki Unnat Krishi Vidhian.* ICAR Publication, p. 1-27.
14. Thakur, R., Hasan, M.A., Roy, A.K. and Ghosh, N.C. (1991): *Kamini,* A Quality Rice Released in Bihar, India. IRRN, 18: 4
15. Verma, U.N. and Saran, S. (1974): *Review of Rice Research in Bihar,* p. 36-68.
16. Shah, Waris (1766): *"HeerRanjha".*

Structural Changes within 'Agriculture and Allied' Sector in India

SARADAGOPALAKRISHNAN* AND K. JOTHI SIVAGNANAM**

Abstract

Capital formation is one of the basic factors of agricultural production. Capital formation in agriculture occurs both at the household level and at macro level. Temporal trends in agricultural capital formation give insight on policy implication. Many scholars pool agriculture, forestry and fisheries sector as 'agriculture and allied' sector. Is there any change in the structural composition within this 'agriculture and allied' sector? If yes, how? At what cost? This paper intends to study the trend and composition of capital formation in Indian agriculture over the last 30 years.

Introduction

Agriculture was and remains the most defining factor in the development of the human society and continues to play a vital role in Indian economy. More than 60 per cent of the workforce draws its sustenance from agriculture one way or the other. The need for a strong agricultural sector is not over emphasized, particularly when we are talking about food and nutritional security. Capital formation is one of the basic factors of agricultural production. To make Indian agriculture viable and profitable,strong capital base is the basic requirement. The problems we face in Indian agriculture are plenty. Is there any decline in capital formation in Indian agriculture?

Capital Formation— Some Basics

It is the measure of the net additions to the (physical) capital stock of a country in an accounting interval. Tostlebe (1957) reported that capital formation is not an automatic process but a response to investment of money, effort and time in new resources or facilities of production. Rao (1953) stated that capital formation involves investment, whether public or private, investment involving the purchase of factors of production and their utilisation for the creation of non-consumption output.

Gross Capital Formation is that part of country's total expenditure which is not consumed but added to the nation's fixed tangible assets and stocks. Gross capital formation includes additions to assets plus replacement of assets during a period. The process of capital formation is initiated through savings, borrowings, liquidation of assets, family labour and appreciation. It refers to the aggregate of gross additions to fixed assets and change in stocks during the accounting period. It refers to the aggregate of gross additions to fixed assets *i.e.*fixed capital formation and change in stocks during the accounting period. Fixed assets comprise construction and machinery and equipment (including transport equipment and breeding stock, draught animals, dairy cattle and the like). It is measured by the total value of the 1. Gross fixed capital formation 2. Change in inventories 3. Acquisitions less disposals of valuables.

Net Capital Formation (NCF) is computed as Gross Capital Formation (GCF) less Consumption of Fixed Capital (CFC).

Capital Formation in Agriculture

Capital formation in agriculture includes; (i) Land improvements (ii) Purchase of livestock (iii) Purchase of implements and machinery (iv) Purchase of transport equipments (v) Construction and repair of farm buildings (vi) Digging and repair of wells, irrigation appliances and layering of orchards. Factors influencing capital formation at the household level are (i) Annual income (ii) Size of the farm (iii) Size of family (iv) Irrigation (v) Borrowings. At the macro level includes construction of dams and other irrigation structures, cold storage units, soil and water conservation, land reclamation etc.

Objectives

1. To study the trend and composition of capital formation in Indian economy.
2. To study the trend and composition of capital formation in Indian agriculture.
3. To analyse the structural composition within 'agriculture and allied' sector in India.

Data and Methodology

The trend and composition of capital formation was studied using Central Statistical Organisation (CSO) on National Accounts Statistics (NAS) data pertaining to the years from 1980-81 to 2010-2011. Simple percentages and ratios were worked out to find the share of different sectors in total gross capital formation, composition of net capital stock in agriculture and rate of investment in agriculture. The nature of statistical system and the quality of data available are highly debated among scholars. Also, as rightly noted by Sawant *et al* (2002), past studies in agricultural capital formation had differential coverage of economic activities. Some of them restricted their analysis to agriculture (*i.e.*

*Research Scholar, Department of Economics, University of Madras, Chennai. email: sarada.rgk@gmail.com
**Professor and Head, Department of Economics, University of Madras, Chennai. email: kjothisiva24@gmail.com

crop and livestock production activities) including government irrigation system (for example, Rath 1989, Shetty 1990; Mishra 1996; Wagle 1996) but many others were based on the aggregate of three sectors namely (1) Agriculture, (2) Forestry and Logging, and (3) Fisheries (for example, Mishra and Chand 1995; Chand 2000; Purohit and Reddy 1999), henceforth called as 'agriculture and allied' sector.

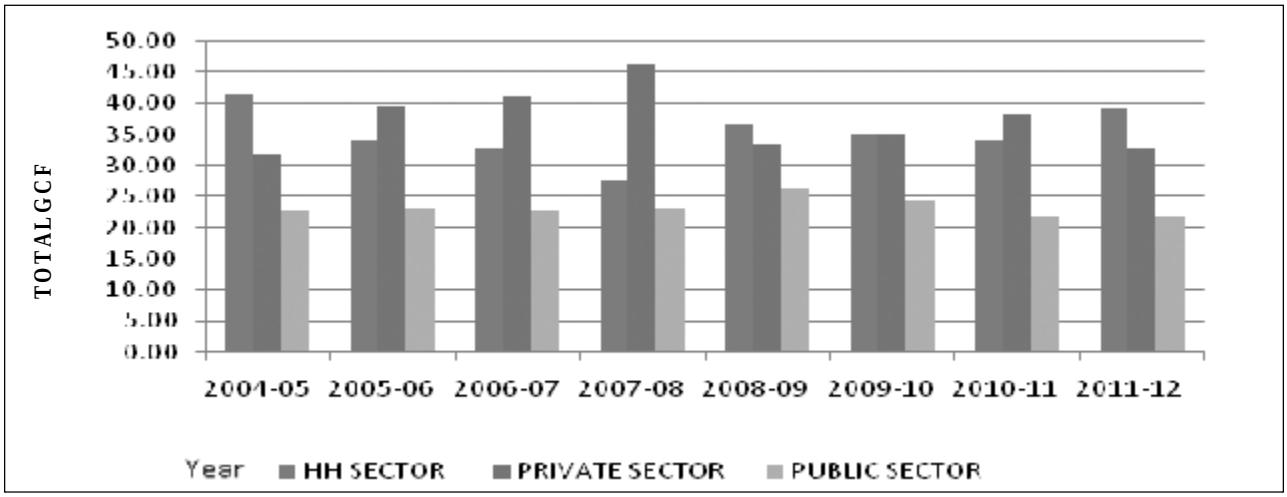
While analyzing temporal trends in agricultural capital formation it is better to take agriculture alone instead of combining all the three sectors stated above. This is because within the sector, proportions of public and private capital formation are remarkably different and even temporal trends in total and component wise capital formation have not been uniform. Almost the entire investment in forestry has been public investment. But in fisheries sector, the situation is diametrically opposite and the entire capital formation in the sector since the eighties is private capital formation and the share of public investment has been close to zero.

So, in this analysis, care has been taken and the results are presented separately for agriculture and allied, agriculture, forestry and fisheries separately wherever necessary.

Results and Discussion

Capital Formation by Assets and Institutions

Figure 1: Composition of Total Gross Capital Formation (at 2004-05 prices)



(Source: Computed from CSO data)

From the Figure 1, it can be inferred that the share of private sector in total Gross Capital Formation is gaining prominence and reached the peak in 2007-08. Interestingly, the average share in capital formation between private and household sector remains at 36 per cent, one balancing for another but the share of public sector in total capital formation remains more or less stagnant at an average of 23 per cent.

Table:1 Share of Different Sectors in Overall Gross Domestic Product of the economy 2004-05 prices

(At constant prices)

Year	Public sector GDP in Total GDP (%)	Private Sector GDP in total GDP	Agri. & allied GDP in total GDP	Agri. GDP in total GDP (%)	Agri. GDP in Agri. & allied GDP (%)	Forestry & Logging GDP in Agri.& allied GDP	Fisheries GDP in Agri. & alloed GDP(%)
1	2	3	4	6	7	8	9
1981-1982	20.76	79.24	35.35	29.60	83.74	17.42	2.92
1982- 1983	22.16	77.84	34.25	28.72	83.86	17.13	2.90
1983- 1984	21.84	78.16	34.97	29.49	84.34	15.06	3.15
1984- 1985	22.51	77.49	34.17	28.79	84.25	14.88	3.31
1985- 1986	23.53	76.47	32.91	27.69	84.15	14.93	3.41
1986- 1987	24.28	75.72	31.42	26.44	84.17	14.80	3.44
1987- 1988	24.96	75.04	29.86	25.10	84.05	14.76	3.59

1	2	3	4	6	7	8	9
1988- 1989	24.20	75.80	31.35	26.62	84.93	12.70	3.39
1989 -1990	24.75	75.25	29.89	25.18	84.26	13.79	3.73
1990- 1991	24.05	75.95	29.53	24.94	84.47	13.08	3.76
1991- 1992	25.05	74.95	28.54	24.02	84.16	13.45	3.97
1992- 1993	24.41	75.59	28.89	24.41	84.48	12.31	4.04
1993- 1994	24.09	75.91	28.24	23.83	84.37	11.86	4.35
1994- 1995	24.36	75.64	27.80	23.46	84.39	11.63	4.42
1995- 1996	24.70	75.30	25.73	21.65	84.15	11.66	4.68
1996- 1997	23.63	76.37	26.19	22.14	84.51	10.77	4.60
1997- 1998	24.92	75.08	24.47	20.59	84.15	11.32	4.80
1998- 1999	24.80	75.20	24.39	20.68	84.78	10.78	4.29
1999- 2000	25.44	74.56	23.27	19.68	84.57	10.96	4.47
2000- 2001	24.47	75.53	22.31	18.76	84.06	11.25	4.68
2001- 2002	24.52	75.48	22.42	18.92	84.42	10.94	4.64
2002- 2003	24.83	75.17	20.13	16.72	83.03	11.79	5.17
2003- 2004	23.72	76.28	20.32	17.15	84.40	10.69	4.91
2004- 2005	22.90	77.10	19.03	16.04	84.30	10.90	4.80
2005- 2006	22.09	77.91	18.27	15.46	84.61	10.55	4.84
2006- 2007	21.89	78.11	17.37	14.69	84.59	10.46	4.95
2007- 2008	21.25	78.75	16.81	14.29	85.02	10.03	4.95
2008- 2009	21.93	78.07	15.77	13.36	84.71	10.21	5.08
2009- 2010	22.75	77.25	14.64	12.35	84.38	10.42	5.20
2010- 2011	22.82	77.18	14.59	12.42	85.11	9.82	5.07
2011- 2012	22.80	77.20	14.37	12.26	85.37	9.53	5.10
2012- 2013	NA	NA	13.95	11.85	84.95	9.66	5.39
Average	23.56	76.44	24.72	20.85	84.40	12.17	4.31

(Source: Computed from CSO data)

The share of public sector’s GDP in total GDP, private sector's GDP in total GDP, share of agriculture & allied sector's GDP in total GDP and agriculture, forestry & logging and fisheries sector's GDP in total GDP is given in Table 1.

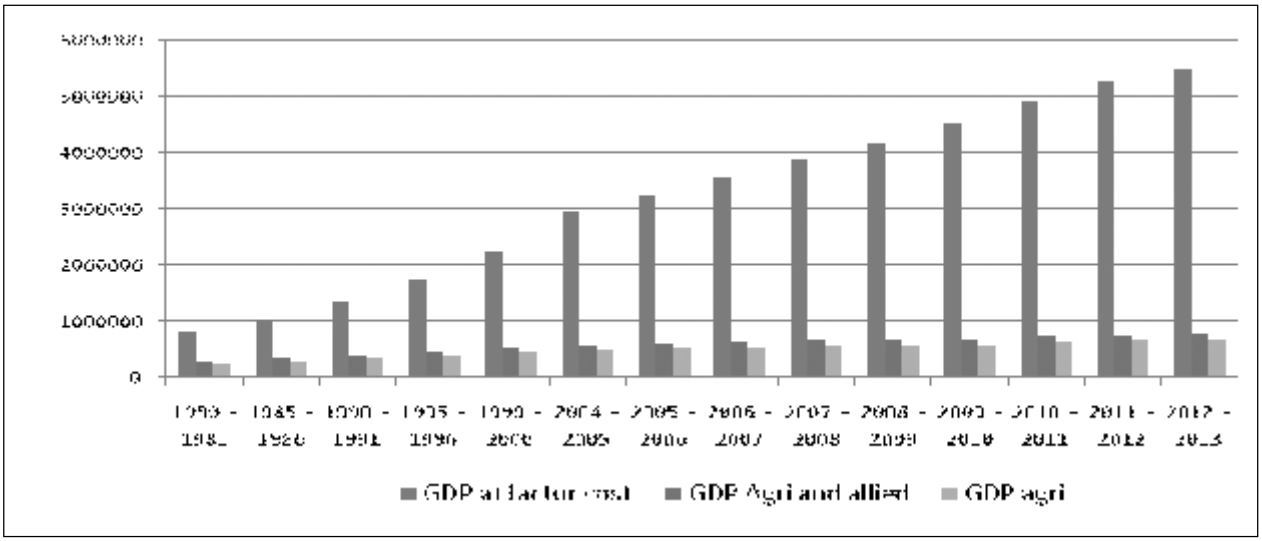
From the table it can be inferred that the share of public sector's GDP in total GDP averages to 24 per cent and the rest is the private sector's GDP contribution. It can also be noted that public sector's share was rising steadily from 1980-81 till 1991-92 with the highest of 25 per cent and then fell marginally with the exception in 1999-2000 where it was again 25 per cent and then almost remains stagnant at 22 per cent.

The share of agriculture and allied sector's GDP in total GDP had a consistent fall with 35 per cent in 1981-82 to almost 14 per cent in 2012-13 and averaging to 25 per cent. The same trend is noticed in the share of agricultural sector also. The year 1988-89 is an exception in the declining trend and showed a marginal increase (31 per cent) and afterwards has a steep fall.

The share of agriculture in 'agriculture and allied' sector remains more or less the same and averages to 84 per cent right from 1980 onwards. But the share of forestry and logging in 'agriculture and allied' sector shows a declining trend. It was the highest in 1981-82 with 17 per cent and then shows a consistent decline around 10 per cent in 2000s. In contrary, the share of fisheries sector in agriculture and 'allied sector' shows an increasing trend. This was 2.9 per cent in 1981-82 and then increasing consistently with 5.39 per cent in 2012-13.

This shows that there are structural changes within 'agriculture and allied sector'.

Figure 2Trend in GDP, GDP in Agriculture and Allied Sector and GDP in Agricultural Sector



(Source : Computed from CSO data)

Figure 2 shows the share of agriculture and allied sector's GDP, and agriculture sector's GDP in overall GDP of the country. From the figure it can be noted that the GDP of the country has been steadily increasing from 1981-82 onwards (at constant prices) but agriculture& allied sector and agricultural sector remained stagnant. This clearly shows that the rate of growth in agriculture is not in pace with the rate of growth in the overall economy.

Table 2 The Rate of Investment in Agriculture in India 2004-05 prices

(At constant prices)

Year	GCF(AA)/ GDP(AA)	GCF (AA)/ GDP	GCF (A)/ GDP (A)	GCF(A)/ GDP
1	2	3	4	5
1981 - 1982	9.34	3.30	10.72	3.17
1982 - 1983	9.80	3.36	11.20	3.22
1983 - 1984	9.81	3.43	11.03	3.25
1984 - 1985	8.98	3.07	10.12	2.91
1985 - 1986	8.51	2.80	9.65	2.67
1986 - 1987	9.06	2.85	10.22	2.70
1987 - 1988	11.20	3.35	12.67	3.18
1988 - 1989	8.95	2.81	10.00	2.66
1989 - 1990	8.93	2.67	9.96	2.51
1990 - 1991	12.84	3.79	14.52	3.62
1991 - 1992	9.12	2.60	10.22	2.46
1992 - 1993	11.00	3.18	12.36	3.02
1993 - 1994	9.13	2.58	10.17	2.42
1994 - 1995	8.11	2.25	9.00	2.11
1995 - 1996	8.06	2.07	8.92	1.93
1996 - 1997	7.93	2.08	8.73	1.93
1997 - 1998	8.64	2.11	9.45	1.95
1998 - 1999	9.21	2.25	9.97	2.06
1999 - 2000	13.12	3.05	14.21	2.80
2000 - 2001	11.88	2.65	12.88	2.42
2001 - 2002	14.57	3.27	15.69	2.97
2002 - 2003	14.20	2.86	15.43	2.58
2003 - 2004	12.39	2.52	13.15	2.26
2004 - 2005	13.46	2.56	14.51	2.33
2005 - 2006	14.57	2.66	15.66	2.42
)06 - 2007	14.87	2.58	15.93	2.34
)07 - 2008	16.14	2.71	17.37	2.48
)08 - 2009	19.39	3.06	21.14	2.82
)09 - 2010	20.15	2.95	21.97	2.71
)10 - 2011	18.49	2.70	19.85	2.47
)11 - 2012	20.85	3.00	22.44	2.75
)12 - 2013	21.20	2.96	22.78	2.70

GDP, GDP (AA), GDP(A)

ource: Computed from CSO data)

AA - Agriculture and allied

A - Agriculture

Table 3 Decadal averages for the Rate of Investment in Agriculture in India

Year	GCF(AA)/ GDP(AA)	GCF (AA)/ GDP	GCF (A)/ GDP (A)	GCF(A)/ GDP
1980-81 to 2012-13	12.31	2.81	13.50	2.62
1980-81 to 1990-91	9.74	3.14	11.01	2.99
1990-91 to 2000-01	9.62	2.48	10.59	2.31
2001-02 to 2012-13	16.69	2.82	17.99	2.57

Source: Computed from CSO data

AA - Agriculture and Allied

A- Agriculture

The rate of investment in agriculture in India from 1980-81 to 2013-14 is given in table 2. The ratio of Gross Capital Formation in 'agriculture and allied' sector to Gross Domestic Product in 'agriculture and allied' sector averages to 12.3 per cent and it has been increasing over the years. Decadal average for the year 1981-82 to 1990-91 was 9.74 per cent and it was 9.62 and 16.69 per cent for 1991-92 to 2000-01 and 2001-02 to 2013-14 respectively.

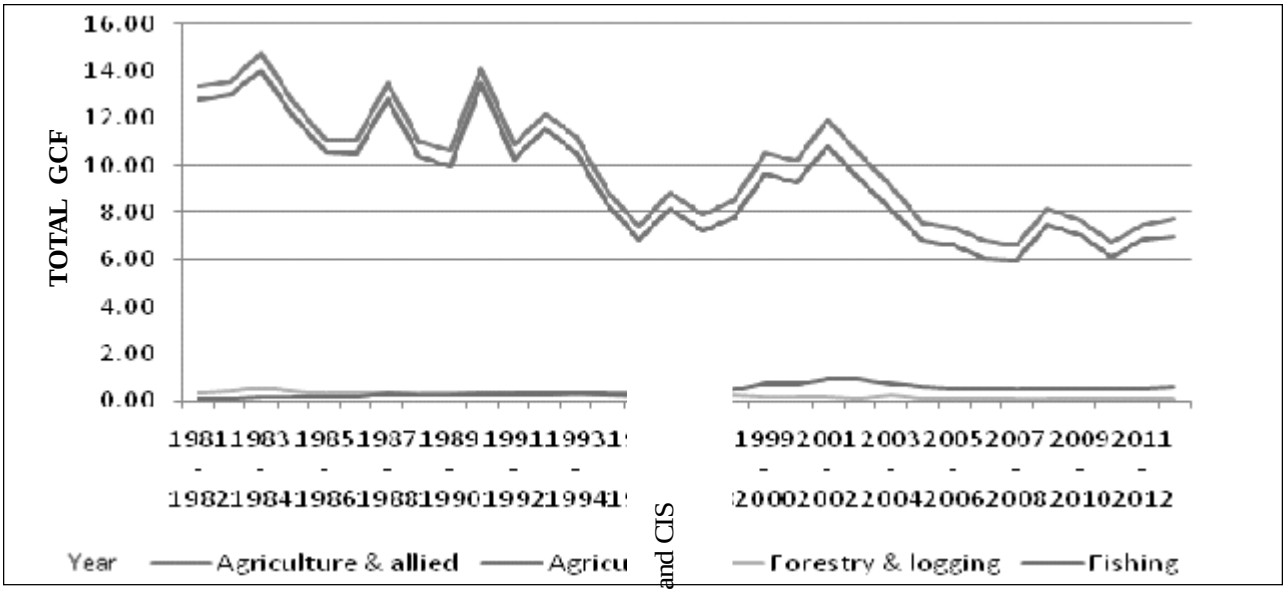
The share of Gross Capital Formation in 'agriculture and allied' to Gross Domestic Product was highest in the decade 1981-82 to 1990-91 (3 per cent), with a low in 1991-92 to 2000-01 (2.4 per cent) and then a moderate rise in 2001-02 to 2013-14 (2.8 per cent). The same trend was noticed in the rate of investment in agricultural sector also.

Capital Formation in Agricultural Sector in India

Capital Formation by Industry of Use

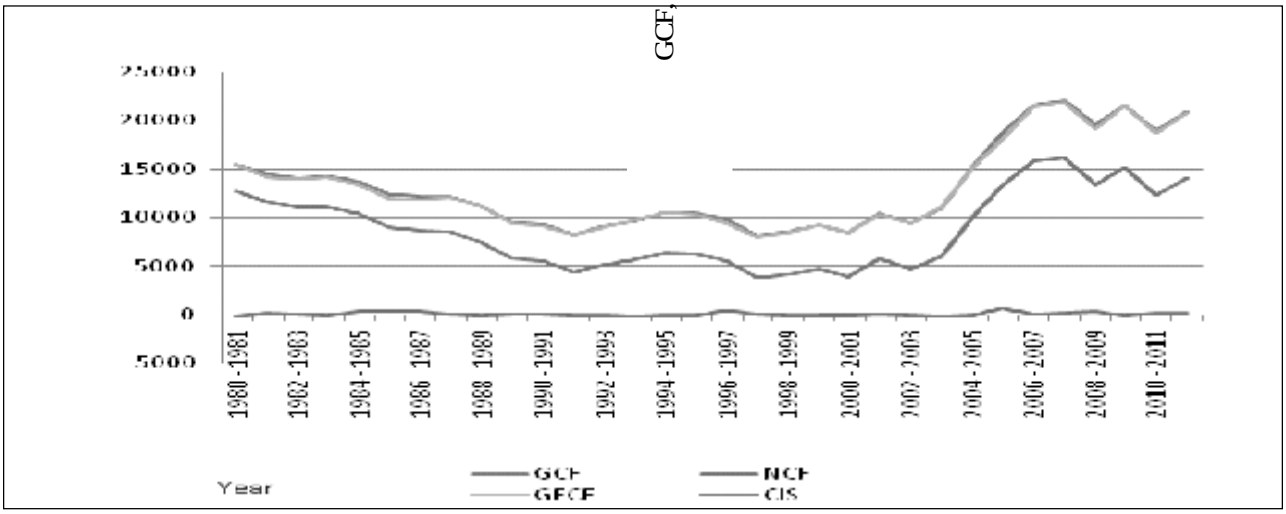
Figure 3 shows the Gross Capital Formation by industry of use. The share of agriculture and allied sector in total Gross Capital Formation has been declining steadily from 13 per cent in 1981-82 to 7.6 per cent in 2012-13, with exceptional years particularly 1991-92 (14 per cent) and 2008-09 (8 per cent). The share of agricultural sector also follows the same trend. The share of Forestry & logging and Fisheries sector remains less than one per cent. The share of agriculture in total Gross Capital Formation averages to 9 per cent. Within the sectors, the trend has been declining in Forestry & logging sector but it has been increasing in Fisheries sector with the peak in the year 2001-02.

Figure 3 Share of Different Sectors in Total Gross Capital Formation



(Source: Computed from CSO data)

Figure 4 Trend in Capital Formation in Agricultural Sector in India



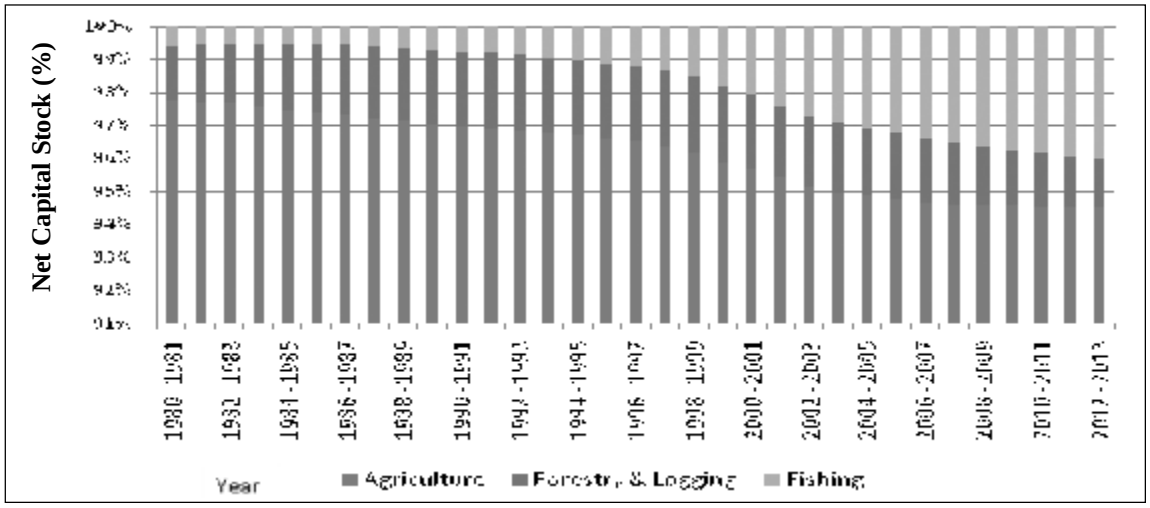
(Source: Computed from CSO data)

The trend in Gross Capital Formation (GCF), Net Capital Formation (NCF), Gross Fixed Capital Formation (GFCF) and Change in Stock (CIS) can be studied from the Figure 4. Gross Capital Formation was declining from 1980-81 onwards till 1990-91 and then shows a mixed trend until 2002-03. There was a steep increase from 2003-04 onwards and reached the peak in 2007-08 and after that fluctuating.

From figure-4, it can be observed that almost all the Gross Capital Formation was contributed by the Gross Fixed Capital Formation and change in stock was almost uniform for the entire study period.

Composition of Net Capital Stock in Agriculture and Allied Sectors in India

Figure 5 Composition of Net Capital Stock in Agriculture and Allied Sectors



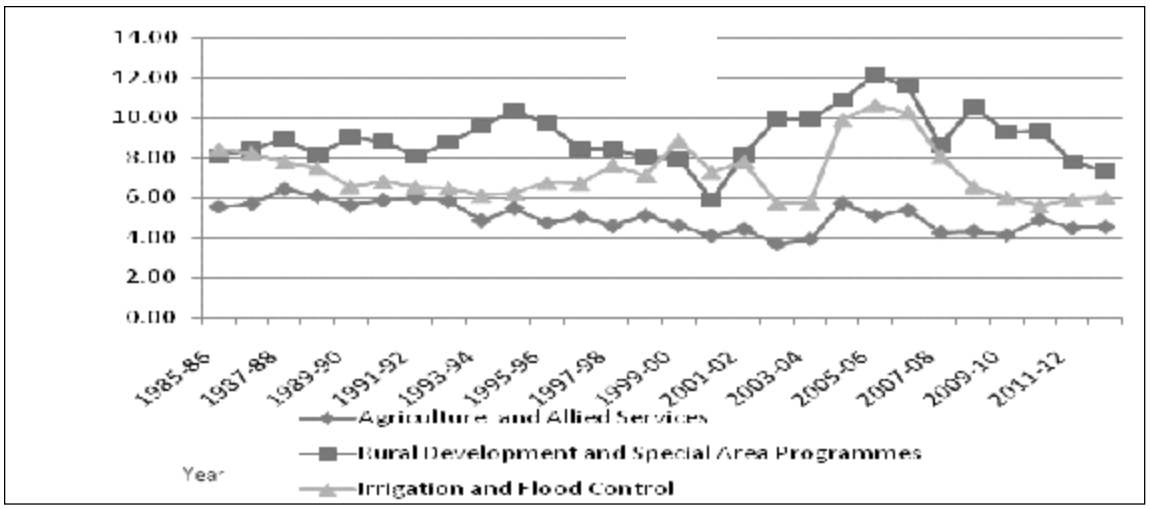
(Source: Computed from CSO data)

Figure 5 gives the share of Net Capital Stock in Agriculture, Forestry and logging and Fisheries sectors. It can be noted from the figure that the share of net capital stock in agriculture has been declining from 1980-81 onwards ore prominent after 1990-91. At the same time, re of Fisheries in net capital stock has been ing.

Public Sector Outlay

Trend in Share of Public Sector Outlay

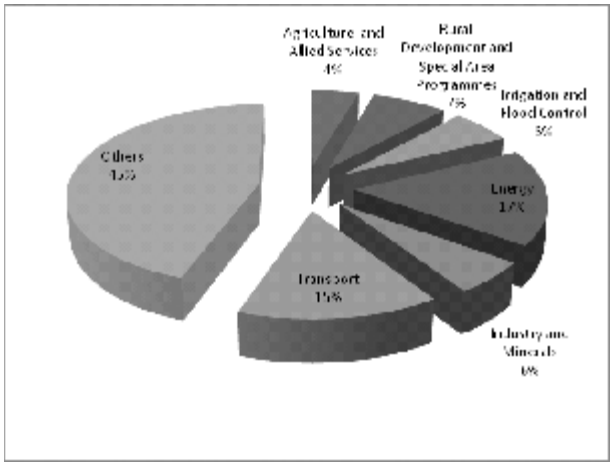
Figure 6 Trend in Share of Public Sector Outlay for Select Sectors



(Source: Computed from CSO data)

Trend in share of public sector outlay for three closely related and competent heads are given in the Figure 6. From the figure it can be inferred that agriculture and allied sector's share declined over the years till 2003-04 and then had a marginal increase. Irrigation and flood control had higher share than agriculture and there was a steep increase in 2003-04. The trend continued till 2006-07 and then started declining. Rural development and special area programmes received more attention except in 2000-01 and 2007-08.

Figure 7 Public Sector Outlay for Select Sectors (2012-13)



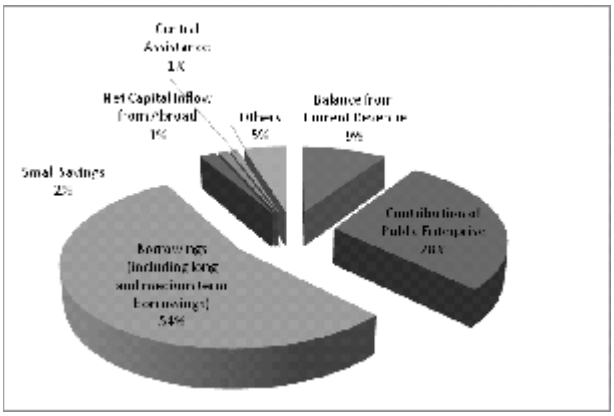
(Source: Computed from CSO data)

Public Sector Outlay

Comparative share of public sector plan outlay among different sectors for the year 2012-13 is presented in the Figure 7. Agriculture and allied sectors, Irrigation and flood control, and Rural development had their shares of 4 per cent, 6 per cent and 7 per cent respectively. Other sectors namely, Industry and Minerals, Transport and Energy share 6 per cent, 15 per cent and 17 per cent respectively.

Sources of Finance

Figure 8 Financing of Public Sector Plan (2012-13)



(Source: Computed from CSO data)

Major source of finance for public sector plan for the year 2012-13 is presented in the Figure 8. More than 50 per cent of the finance was sourced from borrowing (including long and medium term) and 28 per cent from contribution of public enterprises. Others include balance from current revenue, small savings, central assistance and net capital inflow from abroad.

Conclusion and Policy suggestions

The share of agriculture and allied sector's GDP shows a decreasing trend from almost 35 per cent in 1981-82 to 13.95 per cent in 2012-13. The share of agriculture in 'Agriculture and Allied' sector remains more or less the same but the share of forestry and logging in 'Agriculture and Allied' sector shows a declining trend. In contrary, the share of fisheries sector in 'Agriculture and Allied' sector shows an increasing trend.

Composition of net capital stock in agriculture has been decreasing, remains the same in forestry and logging. In fisheries sector, net capital stock has been increasing. These results show that there are structural changes within 'agriculture and allied sector'.

The trend in share of public sector outlay shows that rural development and special area programmes continues to attract more attention from the policy makers. Gross Domestic Product (GDP) growth in agriculture has been shown to be at least twice as effective in reducing poverty as growth originating in other sectors. The regions of the world where hunger and poverty are most widespread today have seen stagnant or declining rates of agricultural investment in agriculture over the past three decades. (FAO, 2008). This calls for substantial increase in public investment in agriculture.

References

Chand, Ramesh (2000), "Emerging trends and Regional variations in Agricultural Investments and their implications for Growth and Equity", Policy Paper, New Delhi: *National Centre for Agricultural Economics and Policy Research.*

Food and Agriculture Organisation (FAO) http://www.fao.org/investment-in-agriculture/en/

Mishra, S. N. (1996), "Capital Formation and Accumulation in Indian Agriculture since Independence", *Indian Journal of Agricultural Economics, January-June.*

Mishra, S. N. and Ramesh Chand (1995), "Public and Private Capital Formation in Indian Agriculture: Comments on Complementarity Hypothesis and Others", Economic and Political Weekly, Vol 30, No. 25, June, pp. A64-A71+A74-A79.

Purohit, B. C. and V. Ratna Reddy (1999), "Capital Formation in Indian Agriculture: Issues and Concerns", Occasional Paper 8, NABARD, Mumbai.

Rao, V.K.R.V. (1953), "Deficit Financing, Capital Formation and Price Behaviour in an Underdeveloped Economy", Eastern Economists Pamphlets:3.

Rath, Nilakantha (1989), "Agricultural Growth and Investment in India", *Journal of Indian School of Political Economy,* Vol. 1, No.1, January - June.

Sawant, S. D., Vaidehi Daptardar and Sandhya Mhatre (2002), "Capital Formation and Growth in Agriculture - Neglected Aspects and Dimensions", *Economic and Political Weekly,* Vol 37, No.11 (Mar 16-22), pp. 1068-1072.

Shetty, S. L. (1990), "Investment in Agriculture - Brief Review of Recent Trends", *Economic and Political Weekly,* Vol 25, No. 7/8, February 17-24, pp. 389-398.

Tostlebe, A. S. (1957), "Capital in Agriculture - Its Formation and Financing since 1870", Princeton University press, Princeton: 6.

Wagle, M P (1996), "Estimates of Aggregate Functions for Demand for Fertilizer and Private Investment in Agriculture", *Indian Journal of Agricultural Economics*, Vol 49, No. 1, Jan- March.

Agro-Economic Research

An assessment of the extent of food processing in various food Sub-sectors*

Promoting food processing could strengthen the linkage between agriculture and industry and help to generate more farm income employment and also to generate wastage of agricultural products. A strong database is required for pursuing a policy towards this end currenly, as the data is inadequate and is based mostly on insights, this study is an attempt to initiate the process of estimating the extent of processing agricultural food products in India, based on methods that are deliberated, transparent and available for further debate and development. This measure would serve as a key signal in the assessment of the linkage industry and agriculture.

Indian Agriculture and the potential for Agro-processing

The wide range of topography, soil quality and climatic conditions that describes India, makes her agriculturally advantageous for producing a large number of crop and non-crop products. Agriculture also remains the key source of livelihood in India but the income generating capacity of the occupation is known to be low. Structural transformations within agriculture, development of new marketing channels and changes in dietary habits owing to globalization, urbanization and the dynamics in social codes however create new opportunities for agriculture to emerge as a leading economic sector.

Many of the farm products especially animal based products, horticultural products and also some of the traditional crop products are amendable for processing into food products or other end uses. Technological development of food processing complemented by skill, experience and marketing can be a way to nutrient preservation, added flavour, taste and convenience in food. Wastage of food and thereby the wastage of natural resources used for producing that food will also be minimized.

While food shortage is one of the biggest problems of a society, it is also observed that when enough food is supplied, people would give more importance to food security & safety. Food security begins to encompass a comprehensive connotation that includes along with sufficiency, the quality, content, presentation and convenience embodied in the food. Food processing is an emerging science and technology. Defined as a 'synergic application of different physical processes to transform raw animal or plant materials into consumer-ready products' Food processing could be one of the instruments for addressing the country's food security concerns in the coming decades.

Objective and data

The objective of the study is to make representative estimates of the extent of processing of agricultural products in contemporary India based on available data and scientific and well deliberated methodology. The study's coverage transcends food products only. The term 'food' in the title relates to edible items from agriculture, which enter as input in different industries though the finished output may or may not be edible.

Certain products, however, are not covered for various reasons like lack of data, time and consensus on methodology. The estimates are derived from secondary but unit level data collected by official statistical agencies CSO and NSSO, under the Ministry of Statistics and Programme Implementation and data collected by the Ministry of Agriculture available in the electronic form (2013). A literature review on the subject of similar estimation at the global level is also made.

The transition of Food in society

Food provides calories and other nutrients for growth and activity of human body, but food is hardly a composite and homogenised item needed to meet the requirement for staying alive today. With growing scientific knowledge on nutrition, it is admitted that one man's food is another's poison. Need for foods are highly differentiated for biochemical processes associated with physiology, race, gender, occupation, age and heredity and its consumption intimately determines a person's life style. Increasingly, the type of food consumed is seen as a critical determinant of the quality of life and life expectancy. Yet food is also cultural and ethnic, carved out from commonality of history, geography and as also need practices arising from external shocks coming with invasion, public policy changes, communication and globalization.

In India. inadequacy of food is no longer a burning concern but constraints on distribution are far from solved. Issues of food safety and the accessibility to choose ones food are emerging of great significance currently. Convenience also becomes important as more and more men and women join the economic workforce. The

*Institute of Economic Growth, Delhi

developments of the technologies for food processing and that in the managerial practices of food industries also constitute an impact on the food systems of the people because it affects the quality of the food and way it is delivered.

A driving force behind food processing activities was the discovery of a relationship between water contained in food and spoilage of food. Heating, the conventional method of preserving food is associated with undesirable alterations in food such as loss of vitamins and other nutrients and undermining of flavour, taste and colour. Many new technologies based on pressure, micro-wave and physical and bio-chemical interventions developed in the laboratories in the last five decades to make food more lasting, nutritious and palatable.

To ensure food safety, strict protocols are building up. The food processing industry survives on suitable technological training and effective information system. Organizational factors are also becoming important. Vertical cooperation with farmers, for example by contracts, is a way to ensure input quality suitable for production. Consumer acceptance and health implications are corner stones of sucesss for commercial food processing. The protection of consumers' interests which accompanies the information revolution is a social upheaval affecting food. Consumer courts to allow arbitration and adjudication of complaints, penalties on non-compliance, strictures on advertisement and ethical practices monitored both governments and the civil society contributes to facilitate the regulation process. The survival of a food processing industry is therefore reliant on suitable technological training and an effective information system.

Background and methods available in Literature

Developed more for military needs than to meet consumer demand, the modern technologies for processing food possibly dates back only to the middle of the 20th century. Over the years, processing of food aimed at preventing negative changes in food quality and also adapting satisfactorily to meet the requirements of wide demographic cultural variety and also to deliver convenience and also to help household members in rising commercial gains. The rise of the food industry, an aborted endeavor in the cold war era, has resumed and emerging countries also join the fray to compete in the export market.

Food processing evolved as commercialization of making farm produce edible and palatable. In earlier literature, the concept is implicit in Chayanov's idea of vertical cooperation conceptualized as harmonious economic relationships between agriculture and its later stages of food production and in Davis and Goldberg (1957)'s composite idea of 'agribusiness' and more recently in terminology covering ‘food chain’, ‘agrofood-system’, ‘agricultural commodity chain', 'agri-food complex' gaining global currency. While in the US, the food business is large, privatized and highly regulated, in most countries, especially the emerging countries. In Asia, food processing is conducted mostly by small medium sized industries who operate informally and with traditional technology and managerial practices. Marking the potential of the sector as a driver of growth in these countries, literature especially generated by the large volume of analysis found in the reports of international development and financial agencies have been discussing the character, prospects and requisites of the food processing sector.

While the level and potential of food processing has been discussed widely in literature, in reality; attempts to work out estimates of the level of processing are visibly few. Discussions have cited certain estimates but the source of data, the precise specification of food processing, the coverage of items and the methodology hardly find any space for elaboration. For instance, both in reference to Russia and China, it is suggested that one-third of agro-products have been processed. There is also an indication in the literature that the level of processing in the western countries like the US and the EU is very high relative to the Asian and the African countries, but certainly more rigorous assessments are need to establish these facts. Websites like those of the USDA and OECD do not officially post any data on the extent of processing till date.

Estimated measures of the level of processing world over can serve as benchmarks to show competitive performances, indicate regional specializations and provide signals on demand and supply in the international markets while the methodologies followed help to set the tone for measurement protocols for greater reliability and mutual comparability. The food Balance Sheet (FBS) published in the open domain by the FAO in Faostat is a potent source of data for the purpose although, presenting a comprehensive picture of the pattern of a country's food disposition during a specified reference period, the FBS basically offers a way to assess nutritional adequacy of different countries. Using this data we find that levels of processing are low in respect of cereals and fruits and high for oil crops and sugarcanes and India's rank is relatively low among the countries Brazil, Malaysia, China, Philippines and Thailand (Table A1). Similar estimates work out to reasonably high values in France (Fruits, Wheat and Oilcrops), USA and Russia (Cereal).

Besides it is apparently also common to work out crude estimates founded purely on insights and insider information from processing industries. While estimates of these natures have served well for policy making, given the lack of clear specification, underlying methodological rigour and of uniformity across countries, as food processing emerges as an important driver of growth, employment and trade, the need for more objective information that is presentable for public scrutiny can no longer be procrastinated.

Food processing in India

India has a Ministry of Food Processing Industries (MOFPI) to implement and monitor schemes for promoting

commercial food processing. Assessments from official data and literature on Indian food processing suggest that the major growth segments in Indian FPI are identified to be fruits and vegetables (pulps, juices, ready to serve beverages, jams, squashes, pickles), dairy (packed milk, ethnic sweets, curd products, ghee and milk powder), meat and poultry (buffalo meat, mutton, lamb, poultry), marine products (fresh fish, frozen shrimps, fins, cattle fish and squid) and beverages alcoholic (beer, wine Indian made foreign liquors) and malted.

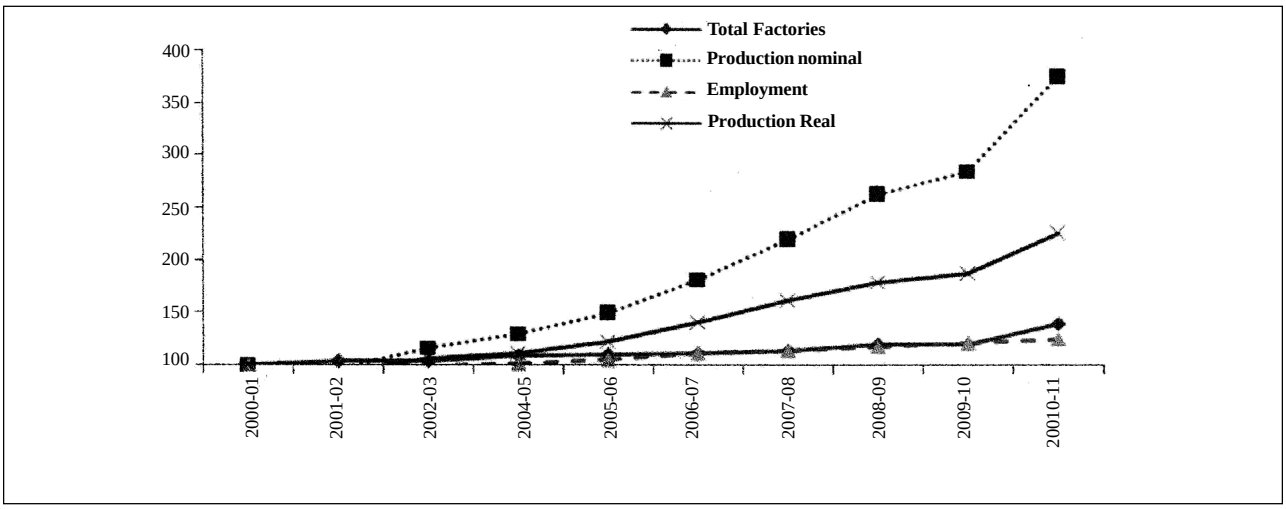


Figure 1: Growth (Index) of Organised sector in Food processing in decade 2000s. Source: ASI data

Interestingly, although a very large number of unregistered units of fairly small sizes engage in processing food, the bulk of the product and value generated are churned out in registered factories. Over time after liberalization, the factories are found to be showing strong performance (Figure 1) in production growing much faster than employment and the number of units, while in the unorganized sector both the number of units and the employment of workers declined (Figure 2). The unorganized enterprises have a spatial diffusion more scattered than the organised sector in which four states Andhra Pradesh, Tamil Nadu, Punjab and Maharashtra account for over half the total number of enterprises while the largest numbers of unregistered units are located in Uttar Pradesh, West Bengal and Odisha.

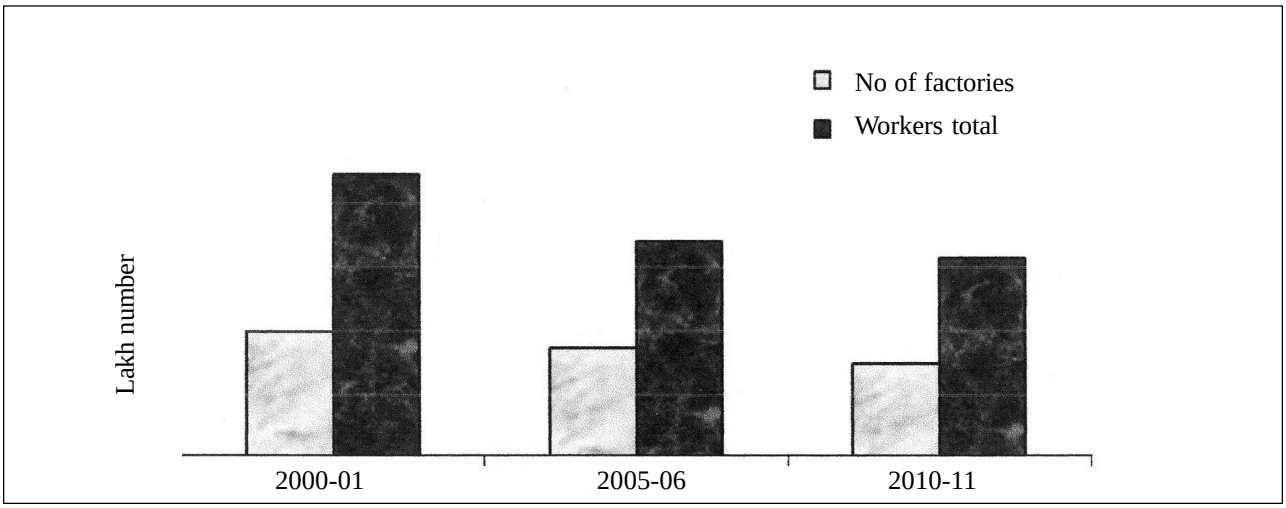


Figure 2: Food processing sector in the Unorganized sector in 2000s Source: NSSO data

Methodology

The primary requirements are for data on the following: (i) quantities of domestically produced agro-inputs processed in industry, (ii) quantities of same agro-inputs produced in Indian agriculture and also (iii) wholesale prices of the same items. The sources of data are respectively Annual Survey of Industries (ASI) for agro-input data from organized (registered) factories and National Sample Survey (NSS) for agro-input data from unorganized enterprises outside the factory sector. Production and price data of the items are taken from the Ministry of Agriculture (MOA) sources appearing either

as printed publications or through websites. Besides, to arrive at net production in the economy, allowances are made for seed, feed and wastage. The allowances (in percentage of production) made for seed and feed used by farmers are as advised by the MOA. Estimates made by CIPHET (2010) are used as allowances for wastage.

Since our specific interest concentrates on items only of agricultural origin, the relevant code for a Standard Industrial Commodity Classification Code (ASICC 2004-05) varies from 11101 to 16000. Although food processing activities mostly fall under 2 digit National Industrial Classification (NIC) code 15, we did not confine our activity coverage, keeping our domain inclusive of all other activities. Validation of the date is treated with utmost seriousness because the reliability of certain data contained in the ASI database has not been beyond question, support from data published by the Ministry of Agriculture was taken.

Estimation

For the purpose of analysis, a concept of Net production is visualized as a reference bench mark against which processing is assessed.

Net production = Production - Wastage - Seed - Feed..... (1)

where, Production is as reported by MOA; wastage is the total post harvest losses estimated by CIPHET, seed and feed are farm level retentions as advised by MOA.

The extent of processing of agro-products (EPA) is calculated as quantity processed divided by the quantity produced in agriculture with due allowances.

EPA = Input Consumed/Net Production... (2)

Where, Input Consumed is equal to the input Quantity derived as in equation (3). The derived quantity is used instead of the reported quantity because of data limitations as discussed below. The EPA is expressed as a percentage represents the proportion of the net agricultural production that goes for industrial processing.

Limitations of data and Approximations used

The validation of the data used is an important exercise arousing some skepticism about the reported data on physical quantities of the materials consumed in industries. By deflating the purchase value of inputs by the quantities, we can derive implicit prices of inputs that signify the average prices at which the factories or processing units procure different agro-inputs. Comparing this imputed price data with the Wholesale Price data reported by the Ministry of Agriculture, we found that the two series largely consistent but there were serious concerns arising both in context of the ASI and the NSSO data on physical quantities.

In case of the organized sector, on close inspection of the imputed prices obtained using ASI data, there arises instances of severe mismatches only in post-2005-06 doubts on the quanlity of data or on the reliability of the units of measurement supplied by the data agency, occur. On the other hand, the value of output and input reported by ASI has been subjected to larger academic review. It was felt and further recommended by CSO that the value data from ASI rather than the quantity data should be used with confidence. A derived quantity of an input is thus obtained by the formula in equation (3).

Quantity derived = Value/price.... (3)

where quantity derived is the ratio of the value of input consumed as reported to its price. The Wholesale price of the same item reported officially by the MOA is used for the price variable for the organized sector involving a presumption that prices paid by the organized processors would be close to the Wholesale prices although there are rational reasons to expect limited divergencies[1].

In case of the unorganized sector, the data seemed to be more in line with expectations but nevertheless, a handful of respondent enterprises reported the quantities of inputs measured in codes that appeared meaningless and erroneous. To overcome this limitation, equation (3) is used again for this sector but the price is generated from the NSSO data. The price of any agro-input used as input by the unregistered processor is represented by the average of the imputed prices (Value/Quantity) paid by the enterprises that reported their quantities of inputs in measurement units with acceptable codes (measurement is in kilogram). Comparing the Ministry of Agriculture reported Wholesale prices with the imputed prices in 2004-05, it can be stated that the factory in the organized sector appeared to enjoy an advantage relative to the unregistered one which is transacting more in informal ways.

The absence of codes to identify the agro-items used as inputs for unorganized processing units in the latest NSSO data 2010-11 raised another serious problem. Without considering the unorganized sector, the ASI data only helps to provide a partial picture of the economy. To make crude estimates for the year, projections for quantities of agro-inputs processed in the unorganized sector are attempted using certain assumptions which are seen to be reasonable under given information.

The minimum information apart from the estimate of EPA for the unorganized sector in 2005-06, is that between the two years 2005-06 and 2010-11, the total number of units under food processing activities (NIC 15) in the unorganized sector fell by 13.89% whereas the number of registered factories increased by 27.5%. The employment also fell by 8% in the unorganized sector, suggesting though

[1] Prior contracts on prices, bulk buying agreements, differences in transport cost and qualitative variations could be some of the reasons.

not confirmatively, that chances of an increase in the average size of a firm or its scale of production are low during the period. Four alternative projections are made of the growth of the scale of units for the purpose of projecting the growth of the quantity produced (g). The scale is measured by material input consumption that could closely approximate the outputs per enterprise if we assume a fixed coefficient production relation.

(i) The first option could be to assume that between the years 2005-06 and 2010-11, the quantity processed in the unorganized sector grew by the same percentagte rate (g) as in the organized sector, involving a strong assumption about the growth of the scale of production. This assumption is expected to generate the maximum value of projected input quantity.

(ii) A more moderate increase in the scale can be assumed to balance the fall in the number of units, so that there is no growth in the quantity of materials consumed in the unorganized sector or g=0

(iii) A further moderate increase in the average scale of unit by 10% would allow a fall in the quantity of material inputs at the rate g = -3.89%, uniform across subsectors

(iv) Finally, we may assume that the scale remains unchanged over time, in which case, the material inputs at the rate g = 13.89%, the rate at which the number of units decreased. This would generate the minimum projected quantity.

There is a priori basis to place our confidence on any of the assumptions at the level of the industry, but assumption in (ii) where g=0 is reported as the most plausible one because no presumptions are made on the movement of the scale of production. The quantity processed in 2010-11 for any agro-input is assumed to be same as in 2005-06 in the unorganized sector in the baseline scenario taken as most plausible.

Coverage, Definition and Specifications

Food processing in this exercise is conceptualized as constituted of commercial activities in which the agro-products enter as purchased inputs and the processor is seen to sell them in a different (value-added) form after adding value. In other words, processing is seen as a manufacturing activity and not as a service providing activity. For millers, who provide grain milling services to consumers or other entities, the raw grain (paddy, wheat, oilseed) does not appear as an input and grains are not reported as purchased materials in their accounts.

Discussion at various forums and consultations with experts strengthened our conceptualization of processing as 'alteration by heat, pressure, chemicals, or freezing temperatures[2]'. Agriculture generated food items are first categorized into 5 broad groups and further into 15 subgroups identified as food sub-sectors inclusive of semi-processed subgroups-oil and sugar. Focus is placed on different selected items falling under the 15 subgroups and five different groups (Table 1). The selection is guided not only by their importance in the market within the respective groups but also by the availability of necessary data on prices and production. Above all, the selection of items for focused analysis is made to avoid conceptual and computational complexities as explained below.

Various groups of commodities undergo alterations in terms of form, quantity, composition and presentation between their natal stage in farms and final consumption through a range of activities occurring often in succession creating complexity for estimation. The same agro products appear in various forms (raw, primary processed, semi-processed) as inputs in the data and what is input in one enterprise can be the output in another calling for caution about their additivity. Among the processing activities done commercially outside the farm, many are primary in nature) involving milling, crushing, grinding and squashing). Some of these activities are essential for human consumption and constitute basic processing. Covering these activities in our estimates may amount to triviality. In principle, both to avoid triviality and to prevent overcounting, not all amendments should be taken into account for measuring the extent of processing. We first attempt to count basic processing by specifying the selected items in focus with care. Thus milled grains, pulses, oils and sugar are retained among selected items instead of their raw forms.

Table 1 Selected major Agricultural items and product groups consumed by processing industries (15 subsectors and 5 broad groups)

Subgroup	Agricultural products
Group 1: Animal Products	
1. Meat	Chicken, Bacon, Beef, Buffalo meat, Mutton, Poultry, veal meat
2. Fish	Inland fish: Pimphret, cattle fish, sardine, ribbon fish, hilsa, fish-not processed n.e.c.; Marine fish; squid, lobsters, prawns, shrimps, crabs, mackerel, crustaceans-not processed n.e.c
3. Milk	Fresh milk) combination of buffalo milk, cattle milk, and milk n.e.c)
4. Eggs	Eggs all types

[2] USDA is known to publish acreage and production data on fresh and processing, generally by defining them as:

(i) Fresh: if it is sold to be consumer in an unaltered state. Lettuce that is picked, shredded, and bagged in the field is considered fresh.

(ii) Processing: if it is sold to the consumer after it has been altered by heat, pressure, chemcials (like pickling), or freezing temperatures.

Subgroup	Agricultural products
Group 2: Horticulture	
5. Fruits	Grapes, Mango (Fresh and Pulp), Papaya, Orange
6. Vegetables	Onion, Potato, Tapioca, Tomato, Chilli
7. Spices	Ginger, Garlic, Dry Chilli, Dhanya, Cumin seed, pepper, Turmeric, Cardamom
Group 3: Cereals and Pulses	
8. Pulses (Milled)	Arhar, Moong, masur, Gram, Urad
9. Coarse cereals (Milled)	Bajra, Jowar, Maize (fried seed-popcorn, corn flour, maize atta/maida/sooji/flour, maize starch)
10. Rice (Milled)	rice (par boiled, raw, basmati and broken)
11 .Wheat (Milled)	Atta, Maida, Broken wheat
Group 4: Nuts and Oil	
12. Groundnut (excluding oilseeds)	Unshelled, Kernel, Shelled
13. Soyabean	
Group 5: Oil and sugar	
14. Oil	Groundnut, Rapeseed, Mustard, Linseed
15. Sugar	Raw Sugar, Sugar candy, refined

Note: Items are selected on the basis of reliable data availability on prices and production and the significance of the items in Indian agriculture.

Not all primary processing is, however basic processing, because some products can be eaten both in raw or in primary processed forms (such as pulses). Also, even the raw items that require basic procfessing can have other uses, mostly for non-food purposes. They signify cases when raw agro-products like grains are used for generating energy, manufacturing craft and useful household items like mats and brooms and as subsidiary inputs in other manufacutring processes. Although owing to these complexities such processing activities are also not estimated under the general umbrella of food processing of selected subgroups, they too deserve attention. Even after the eliminations, to determine our focus, there remains a possibility of differentiation between processing that is primary and value added processing of more sophisticated character. This differentiation applies to both milled and unmilled products.

While we focus on a few selected items in this assessment, we also move beyond this ambit to estimate the levels of processing of other items, keeping in view the importance of different types of processing, different forms of products, different uses and the sophistication in technology. Figure 3 demonstrates the value addition chains that qualify consumption practices of a common product in India that also demands basic processing. Paddy is the basic item from farm, consumed mostly as rice. Milling can be perceived to be basic processing (brown) but a part of the raw paddy may also be used outside the rice industry (green). A third part is purchased in raw form by the consumer (orange) who then buys milling services. Rice can be processed further (green). Figure 4 gives a generic flow diagram that will be followed in the analysis to distinguish primary and value added processing.

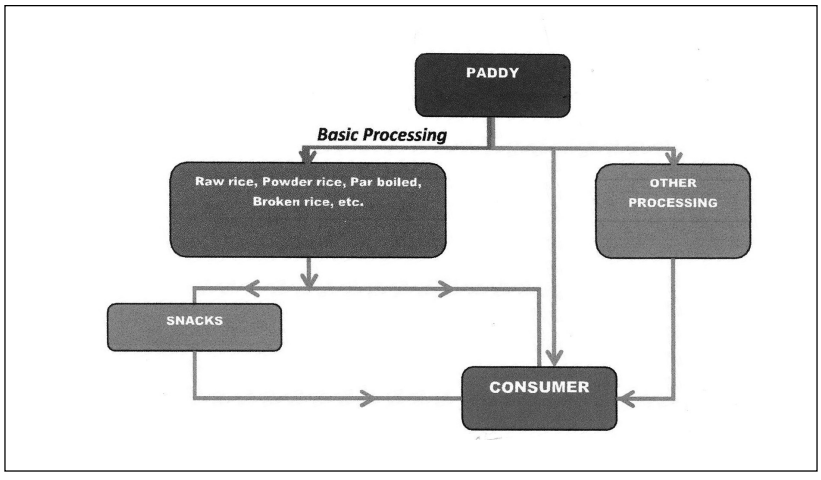


Figure 3. Paddy: Flow diagram for understanding basic processing, primary processing and value added processing of select products (Green: included in food processing, Brown: basic processing not included and Orange: direct purchase of raw product by consumer not included.

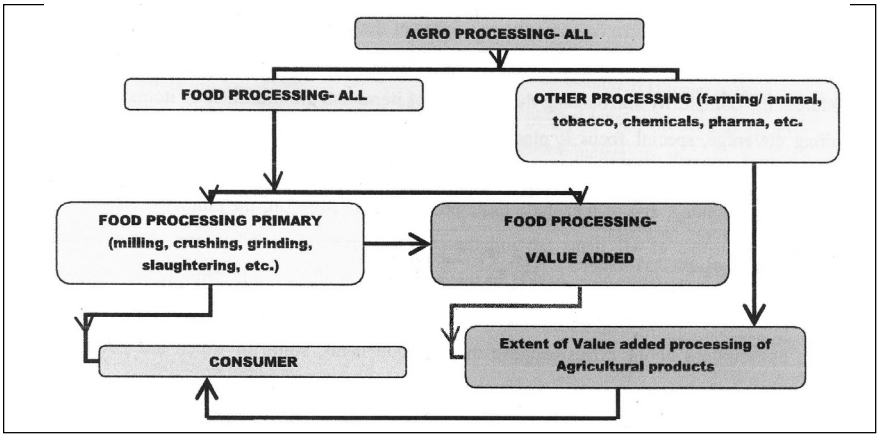


Figure 4. Flow diagrm for understanding agro-processing of any Agro-item

Grouping of Result

In order to address the dominant objective, we have reported the extent of processing under the umbrella of all agro-processing activities and in addition we also report limited estimates for the value added processing activities constituted as a sub-set of activities. We retain inputs both in raw and primarily processed forms in the coverage of agro-inputs. Most grains and pulses appear in milled and unmilled forms reported as inputs like oilseeds, seeds and oilcakes and processed oils and further refined oils. The multiple purposes make addition difficult and require caution. The exclusion of all unmilled products even paddy and wheat would mean loss of information because inputs in the raw form are used in value addition such as in producing snack products (*namkeens*) from unmilled pulses, flaked cereals with fibre for breakfast (wheat or rice flakes) or making snack bars (chikkis) from oilseeds, generation of energy and because consecutive stages of processing are also integrated in the same firm which does not report the intermediate inputs. Also, the addition of inputs to both raw and primarily processed will lead to over-counting as certain units will be used as inputs the primarily processed products that come out of other enterprises that in turn consume the raw forms of the same products as inputs.

To address the complexity surrounding the coverage of items and the multitude of items actually requiring coverage, special focus has been placed on selected items in Table 1 as mentioned. The selected items thus cover milled components such as milled rice, milled wheat, milled pulses to pre-empt over counting, and also exclude basic processing. In addition, the estimates for the 15 subgroups, exhaustive of all items beyond the selected ones, are worked out and reported separately, taking care of the problems of over counting. In this computation, all possible items under the sub groups reported by ASI and NSSO are included. Derivation of the input quantities (equation 3) involves assumptions about prices because they include items, some of which are not even identified (classified as n.e.c. or not elsewhere classified), for which the data of price or production are not separately available. For each exhaustive subgroup, a weighted average price is therefore worked out taking only the selected items in the subgroup using their value shares in the organized sector as weights. These weights appear to be representative on close inspection[3]. The weighted average price of the selected items under any subgroup is assumed to be a proxy for the average of the price of the whole subgroup though at the cost of some imprecision[4]. For composite items, (such as unmilled cereals and pulses) which are not considered in the select subgroups, the weighted average price is worked out in a manner analogous to the selected items. Since both ASI and NSSO data are available for 2005-06, a more detailed analysis for organized, unorganized and combined sector is possible for that year and also for 2010-11, using projected data for the unorganized sector. For 2005-06 estimates, all agro processing and value added processing are reported for different agro products inclusive of unmilled items.

Likewise, primary processing conducted as manufacturing activity that is largely essential for consumption is also, treated separately as 'basic processing' constituteed of activities specified as milling or crushing to render the raw product edible, identified by relevant NIC codes (2004). It is pertinent to note that despite the skepticisms about triviality, by our conceptualization the extent of basic processing of these raw items may not turn out to be 100%. This is because not all of the basic processing occurs as commercial manufacturing. Farmers retain a substantial part of those products (say, raw wheat) with themselves for home consumption (farmer is the consumer) and consumers would purchase both the semi-processed (atta) product and the raw products (wheat) from wholesalers,

[3] It is observed that within any subgroup, certain selected items are used more intensely as inputs in all activity categories in the organized and unorganized sectors.

[4] To some extent that the selected items are disproportionately less costly in the entire group, deflation by the weighted average price could result to overestimated quantities.

retailers and public distribution outlets. In the latter cases, the millers provide the same 'basic' processing services (converting wheat to atta using a machine) at a cost incurred by the consumer. The cost of the raw product (wheat) does not appear as a cost to the miller who sells the service only because the raw product (wheat) is a consumer good and not an intermediate input. Yet basic processing too merits some considerations. These activities may also be technologically modern and independent of other subsequent transformations. Estimates of basic processing for a few relevant items are therefore also furnished as a separate category outside our specified ambit of food processing activities.

Reporting of Estimates

To maintain perspecitve, (1) we designate the products that are already 'basic processed' (milled products) as inputs in the select items list, (2) consider all agro-processing (primary and value added processing) of raw and semi processed products, (3) value added processing and also (4) basic processing separately for few select cases. The specifications of primary, value added and basic processing are given in Table A2.

In the foregoing discussion, results are draw from reports of EPA on (1) selected items for organized and unorganized sectors (Figure 5, Table 2), (2) selected items only in organized sector (Table A 3.1), (3) exhaustive of items in same sector (Table A 3.2), (4) exhaustive of items in both sectors as all agro-processing and only value added processing (Table A4), (5) basic processing (Table 3) and (6) average of select exhaustive subgroups (Figure 5).

Discussions

Though reliable sources and due caution underlie the exercises, the results are unquestionably sensitive to the assumptions and specifications made. The results considering selected items suggest (figure 5) that milled cereals, apart from coarse cereals, are processed only to a small extent. Possibly, this is at least partly explained by the government's procurement policy that bars the grains from reaching commercial processor even at the basic level. Subsistence use of grain by farmers for their own food security also restricts a very large section of people of India from availing of processors' products. Unmilled and milled grains also find use in value added activities but to a small extent only as seen later (Table A 3.2). Milling essentially remains a service to the consumer.

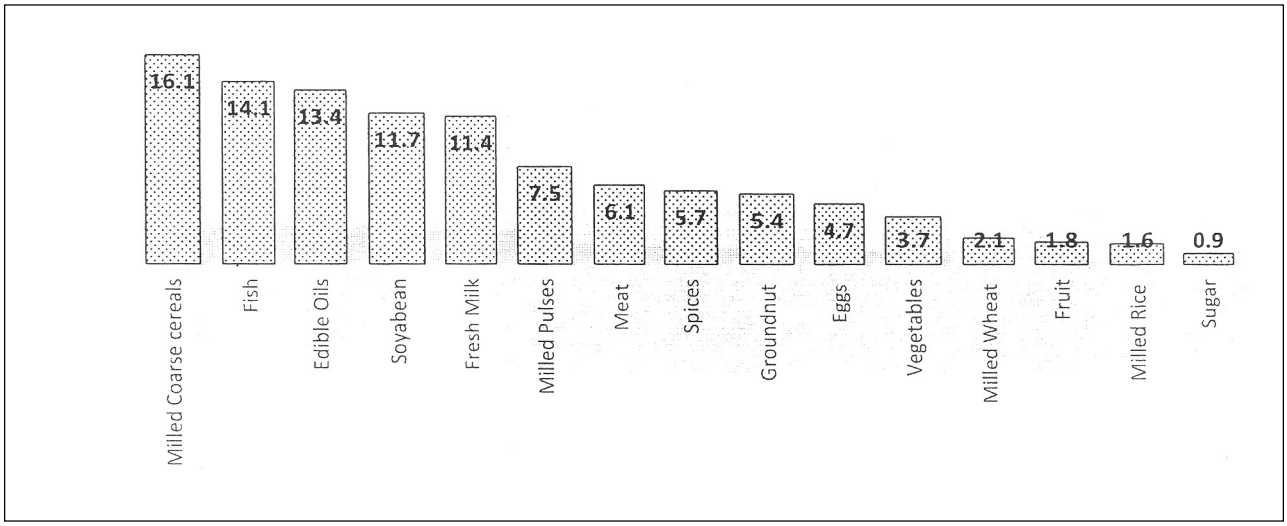


Figure 5. Exstent of all Agro-processing (%) of various selected items in subsectors for 2005-06, in the combined sector (Organized and Unorganized). Source: Computed from ASI and NSS unit level data and MOA data..

The extent of processing is also low for a number of other products, but milled pulses, soyabean, edible oil, fish, milk, meat and spices are processed to a perceptible extent. Between 2005-06 and 2010-11, the extent of processing increase only for a few products, coarse cereals being the most outstanding example (Table 2). Maize, because of government's minimum operation and its multifarious uses is seen to be the most outstanding of the cereal products that is processed commercially (Table A4). Processing of milled pulses is 7.5% in 2005-06 but is high at 33.6% for unmilled pulses (Table A4) because of the inclusion of the primary (but not basic) processing in th activity range. Processing of soyabean and edible oil is found unstable (Table A3.1) over time possible responding to vacillating trade policies and substitution possibilities among oils, a sharp rise witnessed in 2007-08. Table 2 clearly shows the minor role of the unorganized sector in food processing with the EPA being less than in the organized sector and of very low mangnitude, further the estimate would be lower under alternative assumption about this scale (Table A5). Only in the cases of milled pulses, groundnut and egg, the EPA is 1% or more.

Table 2 Extend of Processing (%) of select items in the Organized sector, Unorganized sector and combined sector (Organized and Unorganized) in 2005-06 and 2010-11)

Select Groups	2005-06 Organised	2005-06 Unorganised	2005-06 Combined sector	2010-11 Organised	2010-11 Unorganised	2010-11 Combined sector
Milled Rice	1.24	0.36	1.59	1.46	0.33	1.80
Milled Wheat	1.55	0.50	2.05	2.65	0.43	3.08
Milled Coarse cereals	15.99	0.15	16.15	23.08	0.15	23.23
Milled Pulses	5.89	1.62	7.51	10.48	0.89	11.37
Groundnut	4.43	1.00	5.43	4.61	1.21	5.82
Soyabean	11.63	0.03	11.65	34.88	0.02	34.89
Edible-Oils	13.25	0.18	13.43	10.15	0.14	10.29
Fruit	1.73	0.02	1.75	2.40	0.02	2.42
Vegetables	3.66	0.02	3.69	2.25	0.02	2.27
Spices	5.23	0.44	5.67	10.27	0.40	10.67
Fish	13.54	0.54	14.08	7.24	0.41	7.66
Fresh Milk	10.93	0.48	11.41	4.74	0.38	5.12
Eggs	1.68	2.99	4.67	2.82	2.35	5.17
Sugar	0.74	0.11	0.85	0.04	0.09	0.13
Meat	6.11	0.00	6.12	11.37	0.00	11.37

Source: ASI, NSS unit level data, MoA data.

It is not surprising that estimates of basic processing are far less than 100% in case of subsistence crops paddy and wheat where government intervenes and for sugarcane over 90% is milled (Table 3). The reduction noted in case of wheat and paddy may be explained by the further expansion of public operations over the years which was more remarkable for wheat whose procurement went up from 25% to 34% of the production. The growing role of the customs milled rice or the CMR5 route (direct purchase of paddy from farmers by government agencies) of procurement of paddy[6], expands the scope of rice milling as a service. Basic processing at the commercial level, though essential in nature, declined in respect of paddy and wheat and increased for oilseeds. Commercial processing of unmilled and milled grains manufactured by more sophisticated processes than basic and primary processing is relatively low (Table 3, A4).

Table3 Extent and nature of processing (%) of unmilled cereals Paddy and Wheat 2005-06 and 2010-11 (Projected)

Nature of processing	Activity sector	Nature of Organization	Raw Wheat (2005-06)	Paddy (2005-06)	Raw Wheat (2010-11)	Paddy (2010-11)
Basic processing	Manufacturing sector	Organized	15.54	21.08	7.37	20.63
		Unorganized	1.31	3.38	1.02	3.28
		Combined	16.85	24.45	8.39	23.92
Value added	Manufacture	Organized	0.19	0.60	1.25	0.40
Proceeding	sector	Unorganized	0.08	0.16	0.05	0.15
		Combined	0.27	0.76	1.30	0.56
Other Primary processing	Manufacturing sector	Combined	0.47	0.78	0.46	5.73
Milling (Residual)	Service sector	Combined	82.41	74.01	89.85	69.79
Total			100	100	100	100

Note: Estimate for 2010-11 in unorganized sector constituted of unregistered processors and combined sectors making up the total ecomomy are baseline estimates assuming g1 to hold true (see Chapter 4 Section 4.3.1) The residual of production over seed feed wastage and over all processing done as manufacturing activity reported by data sources are assumed to be illing as a service activity. Source Computed from ASI, NSS unit level data, MOA data.

[6]The government procures paddy from farmers at pre-announced minimum support price (MSP) and as levy from rice millers as rice.

Considering all items in the subgroup (transcending the select items and including items classified as n.e.c.) the extent of processing varied marginally from the same subgroups covering only the selected items. The EPA in 2005-06 for fruits is less at 1.05% against 1.75% that is estimated covering select items only, less at 1.23% for vegetables against 3.69%, less at 5.44 for milled pulses against 7.51%, but higher at 17.71 for coarse cereals against 15.16% higher at 8.53% for speices against 5.67% and higher at 8.3% for meat against 6.12%.

There is hardly any alternative measure available in the literature to test the robustness of these estimates. Compared to available citation of estimates of food processing, our estaimate is small at 1.1% for fruits and vegetable considered as an exhaustive macro-group less compared to the widely quoted estimates of 2%. 2.1% and 2.2% (NSDC, 2010, D Essence Consulting 2009, KPMG-MoFPI-FICCI, 2007, respectively). Analogous estimates worked out using the Food Balance Sheet of FAOSTAT also exceed our estimates though by a smaller margin (Table A1). Similarly our other estimates stand lower than the alternative estimates, from KPMG-MoFPI-FICCI report or those computed using FAOSTAT data (Table 4) except for milled cereals in which maize makes a difference. The difference is most striking for milk where our estimate is 11%, while other estimates surpass 30% but the methodology may be different. Milk products are in practice output of milk processing although these are likely to appear as inputs (condenses milk, powder milk, favoured milk etc.) in many processing activities. The method of managing the complexity by other agencies is not clear, National Dairy Development Board (NDDB, 2009) provides an another set of estimates of milk processing as 'butter, milk powder and western type manufactured products' and in the form of 'traditional products' without further elaboration, and their measures indicate that between 8% and 25% of fresh milk is processed.

Table 4 Comparison with alternative Estimates cited in literature (% of previous year's net production)

Year	2007	2009-10	2003-04 to 2009-10 (Avg)
Category/ sources	KPMG-MoFPI FICCI	FAOSTAT	Our
Fruits & Vegetbles	2.2	0.19	1.1*
Milk**	35.0	49.49	11.59
Meat	21.0	0.14	5.67
Poultry Products	6.0	not reported	2.05 (eggs)
Milled cereals	-	0.246	4.24

Sources: KPMG, FICCI, MOFPI (2007); computed from FAOSTAT (website 2013) and ASI unit level data, MoA.
Note: * 2.13% if only select items are considered. **KPMG-MoFPI-FICCI specified as Mils & Daire, FAOSTAT as whole Milk and our estimates is for fresh milk only to avoid over counting. FAOSTAT and our estimates as expressed as percentage of net production accounting for wastage. The method of estimation is not clarified in KPMG study.

Maize is the only crop responsible for the significantly high estimate in respect of cereals. Interestingly, like maize among cereals, marine products among fish, buffalo meat among meat, mango among fruits stand out. over all, the linkage between agriuclture and industry as refected by our estimates appear promising though still very weak. Only promotional policy and financial incentives to the industries are however not enough to strengthen the link. The government's procurement policies, commercialization and market orientation of farming and farm households, farm employment generation, wastage reducing technology, trade-policy are some of the factors that can shape this linkage. Taking into account all items covered by this study, the average extent of food processing works out to 5.4%, if only quantities are considered in weights and to 6.8% if the values of products are taken as weights. Most of the processing takes place in the organized sector (Table 5).

Table 5 Average Extent of Processing of Agro-products% (Exhaustive of 12 subgroups) in the Organized sector, Unorganized sector and Combined sector (Organized and Unorganized)

Sector	Weighted by Production Quantity		Weighted by Production Value	
	2005-06	2010-11	2005-06	2010-11
Total Economy	5.34	5.30	6.42	6.62
Organized Sector	5.01	5.03	6.03	6.28
Unorganized Sector	0.33	0.27	0.39	0.33

Source: ASI, NSS unit level data, MOSPI (CSO), MoA data. Unweighted or Production Quantity-weighted average in the sum total quantity processed divided by total net quantity produced in agriculture. Quantity is measured in weight. Value-Weighted average is the average of the extents of processing weighted by the shares of the sub-groups in the total value of output produced. The values of output are at 2004-05 prices. The 12 sub-groups considered are milled coarse cereals, milled rice, milled wheat, milled pulses, fruits & vegetables, species groundnut, soyabean, meat, fish milk, eggs.

Undoubtedly, there is scope for moderation and improvement of the estimates because the assumptions and specifiations are specific and sometime subjective. However, another serious hindrance to the analysis was the inadequacy of data of the right quality. Over time, as NSSO and CSO move towards reporting codes, units and data with more care and user friendliness, the need for making assuptions and projections will diminish. The secondary data based assessment can be supplemented with primary data obtained mostly by interacting with processors both in the registered and unregistered sector. More importance should be given to internal consistency across official data sources on production, consumption, storage, trade, marketing and processing to assure the researcher about the credibility and reliability of the data and estimates.

Appendix

Table A1 Share of available agro-products processed in developing countries (% based on FAOSTAT-FBS

Crops		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Milled	Brazil	6.90	6.71	6.63	6.26	6.53	6.75	7.04	7.32	8.32	8.51
Cereals	Thailand	4.55	4.26	4.05	4.83	5.77	5.26	6.19	6.03	6.23	5.67
	China	2.08	2.13	2.16	2.22	2.53	2.75	2.97	3.10	3.29	2.91
	Malaysia	2.00	2.10	2.19	2.12	2.21	2.22	2.30	2.47	2.30	2.34
	Phillipines	1.49	1.47	1.49	1.45	1.43	1.40	1.42	1.36	1.34	1.41
	India	0.24	0.24	0.22	0.21	0.23	0.22	0.22	0.23	0.25	0.26
	China	8.35	7.58	7.78	7.68	7.37	7.28	7.01	6.97	6.70	6.24
Fruits	Brazil	2.25	2.83	2.25	2.10	2.92	2.48	1.67	2.42	2.41	2.17
	Thailand	0.72	0.82	0.77	1.04	1.17	1.25	1.29	1.13	1.41	1.49
	Malaysia	0.01	0.01	0.64	1.15	1.12	1.14	1.26	1.28	1.23	1.25
	India	0.43	0.39	0.41	0.40	0.39	0.27	0.47	0.47	0.47	0.46
	Phillipines	0.44	0.47	0.30	0.35	0.33	0.33	0.37	0.23	0.21	0.20
Oil crops	Malaysia	91.25	91.87	91.63	94.38	94.22	94.76	95.45	94.44	94.53	96.09
	Brazil	90.19	90.26	88.53	89.16	88.89	88.4	88.22	88.63	88.32	89.58
	China	81.94	83.42	85.15	86.65	86.76	87.03	88.52	88.36	88.40	88.82
	Phillipines	76.97	81.44	76.46	79.81	79.71	79.12	80.08	71.70	71.35	70.66
	India	77.24	75.49	72.86	76.12	77.29	78.99	75.12	77.05	77.73	76.30
	Thailand	43.94	44.22	45.72	41.33	46.30	47.92	52.83	50.74	51.70	55.95
Sugar crops	China	99.81	99.86	99.87	99.89	99.93	99.93	99.94	99.95	99.95	99.95
	Brazil	99.37	99.71	99.72	99.74	99.51	99.52	99.47	99.50	99.54	99.55
	Phillipines	99.50	99.52	99.56	99.57	99.57	99.54	99.51	99.57	99.57	99.17
	Thailand	99.32	99.18	99.45	99.51	99.44	99.35	99.17	99.43	99.46	99.33
	India	96.14	96.06	96.18	96.17	95.27	95.65	95.65	98.91	96.38	95.86
	Malaysia	92.94	93.23	92.42	91.29	90.61	90.67	90.94	90.89	89.64	89.51

Note: The countries are ranked by the average extents of processing in the year 2000 to 2009 Source: Computed using FAO's Food balance sheet (FBS) data. This data was taken from website in March, 2014.

Table A2.1 Activities included in Agro-processing: PRIMARY (5 digit NIC 2004 in brackets)

Activity Group	Activities
Production, Processing and Preservation of Meat and Meat Products	Mutton slaughtering (15111), Beef slaughtering (15112), Pork slaughtering (15113), Poultry and other slaughtering (15114), preservation of meat except by canning (15115), rendering and refining of lard and other ediable animal fats (15117), production of flours & meals and meat & meat offals (15118)
Production, Processing and Preservation of Fish and fish Products	Sun drying of Fish (15121)
Processing and Preservation of Fruits and Vegetables	Sun drying of fruits and vegetables (15131), fruit and vegetable preservation n.e.c. (15139)

Activity Group	Activities
Manufacture of Dairy Products	Manufacture of Pasteurized milk whether or not in bottles/polyethene packs, etc. (plain or favoured) (15204)
Manufacture of Grain mill products	Flour milling (15311), rice milling (15312), dal milling (15313), processing and grinding of grain (15314), vegetable milling flour or meal of dried leguminous vegetables (except dal), of roots or tubers, or of edible nuts (15315), other grain milling and processing activities (15319)
Manufacture of Starches and Starch Products	Manufacture of starch (15321), manufacture of sago and sago products (15322), Manf. of glucose and glucose syrup, maltose (15323), manf. of gluten (15324), manf. of tapioca substitutes prepared from starch (15325), manufacture of corn oil (15326), manfg of other starch products (15329).
Manufacture of Prepared Animal Feed	Manufactured of cattle feed (15331), Manufacture of poultry feed (15332), Manufacture of other animal and bird feed (15339)
Manufacture of Sugar	Manufacture and refining of sugar (15421), Manufacture of Gur from sugarcane and other sources (15422 ,15425), manf. of boora from sugarcane and other sources (15426, 15427), manf. of molasses (15428), manf. of other indigenous sugarcane/ sugar beet/palm juice products (15429).
Manufacture of Spices	Grinding and processing of spices (15495)
Manufacture of Beverages	Manf. of country liquor (15511)

Table A2.2 Activities included in Agro-processing: VALUE ADDED (5 digit NIC 2004 in brackets)

Activity Group	Activities
Production, Processing and Preservation of Meat and Meat Products	Processing and canning of meat (15116); Production, processing and preserving of other meat, meat products, n.e.c. (15119)
Production, Processing and Preservation of Fish and fish Products	Artificial dehydration of fish and sea food (15122); Radiation preservation of fish and similar food (15123); Processing and canning of fish (15124); Manufacturing of fish meal (15125); Processing and canning of frog legs (15126); Processing and preserving of fish crustacean and similar foods (15127); Processing & preserving of other fish and fish products, n.e.c (15129)
Processing and Preservation of Fruits and Vegetables	Artificial dehydration of fruit and vegetables (15132); Radiation preservation of fruit and vegetables (15133); Manufacturing of fruit/vegetable juices and their concentrates (15134), squashes and powder; Manufacture of sauces, jams, jellies and marmalades (15135); Manufacture of pickles, chutneys, murabbas etc. (15136); Canning of fruit and vegetables (15137); Manufacture of potato flour & meals and prepared meals of vegetables (15138); Fruit and vegetables preservation n.e.c (including preservation by freezing and roasting of nuts.) (15139)
Manufacture of Vegetable and animal Oil and fats	Manufacture of cakes & meals incl. residual products, e.g. Oleostearin, Palmstearin (15146)
Manufacture of Dairy Products	Manufacture of milk powder, ice-cream powder and condensed milk except baby milk foods (15201); Manufacture of baby milk foods (15202); Manufacture of butter, cream, ghee, cheese and khoya etc. (15203); Manufacture of ice-cream and kulfi etc. (15205); Manufacture of other dairy products, n.e.c. (15209)
Manufacture of Grain mill products	Manufacture of breakfast foods obtained by roasting or swelling cereal grains (15316); Manufacture of prepared, blended flour, wet flour for food preparation and dough for bread, cake, etc. (15317); Manufacture of other readymade mixed powders like idli, gulabjamun etc. (15318); Other grain milling and processing activities like manufacturing of poha/muri etc. n.e.c. (15319)
Manufacture of bakery products	Bread making (15411); Manufacture of biscuits, cakes and pastries (15412); Manufacture of other bakery products n.e.c. (15419)

Activity Group	Activities
Manufacture of cocoa, chocolate and sugare confectionery	Manufacture of cocoa products (15431); Manufacture of sugar confectionery (except sweetmeats) (15432); Manufacture of sweetmeats (15433); Manufacture of chewing gum (1434); Preserving in sugar of fruits, nuts, fruit peals and other parts of plants (15435); Other activities relating to manufacture of cocoa, chocolate and sugar confectionery n.e.c. (15439)
Manufacture of macaroni, noodles, couscous and similar farinaceous products	Manufacture of macaroni, noodles, couscous and similar farinaceous products (15440)
Manufacture of other food products n.e.c.	Processing and blending of tea including manufacture of instant tea (15491): Coffee curing, roasting, grinding and blending etc. including manufacture of instant coffee, chicory and other coffee substiutes, essence of concentrates of coffee (15492); Processing and edible nuts (15493); Manufacture of malted foods including food for infants and invalids (15494); Manufacture of papads appalam and similar food products (15496); Manufacture of vitaminised high protein flour, frying of dals & other cereals (15497); Other semi-processed, processed or instant foods n.e.c. except farinaceous products and malted foods and manufacturing activities like manufacture of egg powder, sambar powder etc. (15499)
Manufacture of beverages	Distilling, rectifying and blending of spirits, ethyl alcohol production from fermented materials n.e.c. (other than soft drinks, mineral water & wine) (15519); Manufacture of wines (15520); Manufacture of beer (15531); Manufacture of malt liquors other than beer (15532); Manufacture of malt (15533); Manufacture of malt liquors and malt n.e.c. (15539); Manufacture of aerated drinks (15541); Manufacture of synthetic flavored concentrates and syrups (15542); Manufacture of soft drinks (15545); Manufacture of other non-alcoholic beverages n.e.c. (15549)
Manufacture of tobacco products	Manufacture of cigarette and cigarette tobacco (16003); Manufacture of cigars and cheroots (16004); Manufacture of pan masala and related products. (16008)
Manufacture of Chemicals and Chemical Products	Manufacture of basic chemicals (241); Manufacture of other chemical products (242); Manufacture of man-made fibers (243).
Production, collection and distribution of electricity	Generation and distribution of bio-gas energy (40107); Generation of electricity from other non-conventional sources. (40108)

Table A2.3 Activities included under Basic Processing

Commodity	NIC(2004)	Description
Paddy	15312	Rice milling
Wheat, raw	15311	Flour milling
Sugarcane	15421	Manufacture and refining of sugar (vacuum pan sugar factories)
	15422	Manufacture of 'gur' from sugar cane
	15424	Manufacture of 'khandsari' sugar from sugar cane
	15426	Manufacture of 'boora' and candy from sugar cane
	15428	Manufacture of molasses
Oilseeds	15141	Manufacture of hydrogenated oils and vanaspati ghee etc.
	15142	Manufacture of vegetable oils and fats (excluding corn oil)
	15143	Manufacture of vegetable oils and fats through solvent extraction process

Table A3.1 Extent of processing in Organized sector of selected agro-products (%) over time in 2000s

Crops	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Milled Rice	0.97	0.86	1.24	1.86	2.39	0.47	1.05	1.46
Milled Wheat	1.80	1.21	1.55	1.94	3.55	1.54	3.40	2.25
Milled Coarse Cereals	14.05	12.70	15.99	14.14	12.64	13.31	17.29	23.08
Milled Pulses	4.16	2.08	5.89	1.71	6.14	2.85	7.81	10.48
Groundnut	4.48	3.18	4.43	4.59	6.07	6.15	3.04	4.61
Soyabean	51.28	31.02	11.63	29.05	10.70	47.49	44.78	34.88
Edible Oil	8.57	8.15	13.25	15.72	51.14	13.90	10.23	10.15
Fruits	0.77	1.10	1.73	1.32	1.81	3.06	2.12	2.40
Vegetables	2.91	2.52	3.66	2.13	2.25	1.88	2.54	2.25
Spices	8.55	6.93	5.23	12.66	10.14	9.02	9.29	10.27
Fish	11.00	9.25	13.54	11.19	11.64	9.92	12.79	7.24
Fresh Milk	9.29	8.76	10.93	12.6	12.25	11.09	11.57	4.73
Egg	1.83	1.97	1.68	3.72	1.34	1.88	1.95	2.82
Sugar	0.37	0.54	0.74	0.77	0.56	0.51	0.00	0.04
Meat	2.04	2.37	6.11	5.66	10.21	7.48	5.79	11.37

Note: All agro-processing considered. For selected items see Table 4.3. Source: Computed from ASI unit level data and MOA date.
Recently ASI 2011-12 Vol. 2 reported that a value of Rs. 140 billion of fresh milk was processed in 2011-12, dividing by the WSP at Rs. 26 per kg as prevailing in 2010-11, the level of processing works out to be 4.4% which is less than 4.73% we report using 2010-11 data.

Table A3.2 Estimated Extent of processing of all** Agro-products under the subgroups in the Organized sector(%)

Crops	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Coarse Cereals milled	14.74	14.96	17.41	15.70	13.55	15.65	19.65	26.17
Paddy*	0.66	0.07	0.60	0.33	0.29	0.32	0.93	0.50
Wheat, Raw*	4.98	0.44	0.19	0.00	1.06	0.00	1.27	1.25
Bajra Unmilled*	0.47	0.24	0.61	0.93	0.08	0.48	0.45	0.14
Unmilled Pulses*	2.77	0.24	0.32	1.60	1.22	1.23	1.62	0.96
Milled Cereals	3.52	3.69	4.31	4.37	4.71	3.75	5.33	6.05
Milled Pulses	4.04	2.34	4.17	2.10	6.02	2.98	7.13	8.42
Oil	22.85	13.89	17.29	17.39	39.41	21.78	15.45	29.14
Fruits	0.39	0.50	1.03	0.75	0.03	0.02	1.47	1.43
Vegetables	1.80	1.49	1.16	1.58	0.77	1.38	2.22	2.03
Spices	4.24	4.37	7.86	7.52	9.03	9.83	16.44	24.84
Animal live*	11.23	67.69	3.13	6.36	17.15	60.60	16.79	12.59
Meat	1.86	3.39	8.30	4.47	9.13	9.19	8.45	9.53

Note:*Estimates for value-added processing only. **The coverage extends to items not among selected items. See tables A4.2.1, A4.2.2 for specification of activities. Source: Computed from ASI unit level data and MOA data.

Table A4 Estimated extent of Processing of Agricultural products of different types and exhaustive groups in 2005-06

Items	Extent of Agro-processing%			Extent of only Value added processing%		
	Organized sector	Unorganized sector	Total economy	Organized sector	Unorganized sector	Total economy
All Meat	8.3	0.006	8.31	4.86	0	4.86
Inland Fish	12.28	0.19	12.47	10.81	0	10.81
Marine Fish	15.07	0.95	16.02	14.9	0.52	15.42
All fish	13.54	0.54	14.08	12.66	0.24	12.9
Fresh Milk	10.93	0.5	11.41	4.14	0.4	4.55
Eggs (all types)	1.68	3	4.67	1.52	0.6	2.11
All Fruit	1.03	0.01	1.05	0.76	0.01	0.77
All vegetable	1.16	0.06	1.23	0.65	0.02	0.67
Groundnut Shelled	3.35	0.91	4.26	0.88	0.36	1.24
Soyabeans	11.63	0.03	11.66	0.41	0	0.41
All Spices	7.86	0.67	8.53	3.8	0.13	3.93
Unmilled pulses	16.06	17.57	33.63	0.32	0.15	0.47
All Pulses milled	4.17	1.27	5.44	0.37	0.14	0.51
Unmilled cereals	19.81	2.64	22.45	0.49	0.19	0.68
Milled Coarse Cereals	17.41	0.30	17.71	3.82	0.15	3.97
Maize	27.55	0.29	27.84	1.2	0.01	1.21
Rice milled	1.24	0.36	1.6	0.34	0.07	0.41
Wheat milled	1.55	0.5	2.05	1.34	0.42	1.76
Oilseeds total	16.95	0.13	17.08	0.5	0	0.5
Edible Oils Total	17.29	0.45	17.74	2.64	0.29	2.93
Sugar	0.74	0.53	1.27	0.4	0.31	0.71

Sources: Computed from unit level data of ASI and NSSO, MOA data. Estimates may exceed unity if processing is more than currently produced/purchased quantity. Agro Processing includes-basic, vlaue added and other processing.

Table A5 Extent of quantity processed (%) in combined sector (Organized and Unorganized) for all activities of select agro-products in 2005-06 and 2010-11 (projected).

Items/crops	2005-06	2010-11(projected)		
		Baseline	Minimum	Maximum
Milled Rice	1.59	1.80	1.75	1.89
Milled Wheat	2.05	3.08	3.02	3.52
Milled Coarse Cereals	16.15	23.23	23.21	23.30
Milled Pulses	7.51	11.37	11.25	13.37
Groundnut	5.43	5.82	5.65	5.77
Soyabean	11.65	34.89	34.89	34.96
Edible Oil	13.43	10.29	10.27	10.29
Fruits	1.75	2.42	2.42	2.42
Vegetables	3.69	2.27	2.26	2.27
Spices	5.67	10.67	10.62	11.12
Fish	14.08	7.66	7.53	7.64
Fresh Milk	11.41	5.12	4.95	5.11
Egg	4.67	5.17	4.84	7.82
Sugar	0.85	0.13	0.05	0.13
Meat	6.12	11.37	11.37	11.37

Source: Computed from ASI and NSS unit level data, MOA data.

Highlights

1. Modern Food processing (FP) draws on scientific methods and is open to critical reviews and regulatory impositions. It helps to reduce negative changes in food over time, please the consumer with flavor, taste and colour, cater to cultural values, empower women and provide choice, information and convenience to the health conscious consumers. It can be a potent tool to reduce food wastage.

2. In India, the growth of FP sector can be an indication of a strong linkage between industry and agriculture, so that investment in the industry may improve production and returns from agriculture. More employment is likely to be generated in agriculture and industry. By reducing food wastage, FP can help to conserve resources.

Empirical Results

3. Estimates of the extent of FP can be a measure of the linkage between agriculture and industry. Those are useful for monitoring the performance of the sector and devising policy. While the potentials of the sector are discussed widely, little effort is made to generate credible statistics world over. Casually cited estimates appearing in literature are not backed by authenticate sources or rigorous methodology.

4. We estimate the extent of FP as a manufacturing activity using official data and based on a transparent methodology involving minimal assumptions where required to overcome data constraints.

5. The Extent of processing of agricultural products (EPA) of the combined sector (Organised and Unorganised) for the sub-sectors exhaustive of all items are estimated for 2005-06 under assumptions made about prices. They are 1.05% for fruits, 1.23% for vegetables, 5.4% for milled pulses, 17.7% for milled coarse cereals, 8.5% for spices, 8.3% for meat, 1.6% for milled rice, 2.05% for milled wheat and 14.1% for fish.

6. The EPA for average for the years 2003-04 to 2009-10 in the organized sector considering only select major items is high for Soyabean (30%), Coarse Cereals 12%), Fish (11%) and Fresh Milk (11%). The EPA has gone up between 2005-06 and 2010-11 for only a few products such as maize, is unstable for oils and declined for milk. The organized sector dominates in FP despite the large number of unregistered food processors.

7. The estimated EPA differs from those cited in literature (KPMG et al.) and those using FAO's Food Balance Sheet. In particular, our EPA for Milk is considerably less than these alternative estimates though closer to NDDB's estimate (8%-25%).

8. The estimates of EPA for Milled Cereals are low barring Maize probably due to its multiple uses as well as government intervention and the importance of self-consumption by farmers in Rice and Wheat markets. Working out the extent of basic processing (milling) for 2005-06, only 24% of Paddy and 17% of Raw Wheat are found to be processed and these estimates declined over time. The intensification of Wheat procurement and increasing incidence of public purchase of Paddy from farmers for custom milling may be responsible for the phenomena in which milling is done as a service.

9. The average extent of food processing covering all items in 2010-11 is 5.3% if simple average is used and 6.62% if value weighted average is used.

Effect of Farm Mechanization on Agricultural Growth and Comparative Economics of Labour and Machinery in India*

Abstract

The level of mechanization in the study states of the eastern region is very low. All the three states in the study region are below of the national average of farm power availability. Orissa and Bihar are way below the national average, while West Bengal is closer to the average. The total share of the three eastern study states in tractor sales is quite low between 1997-98 and 2012-13—less than 10% of the total national sales.

The crop duration index (CDI) is less than 50% in the study period in both the study states. This indicates that more than 50% of the land remains uncultivated. The scope to increase land utilization by the use of increased mechanization needs to be explored.

The percentage of farmers using machinery ranges from 21% to 100% for different types of machinery, whereas the percentage of farmers owing such machinery ranges from 7% to 50%. This underlines the importance of the hire market for agricultural machinery in Bihar. The cost of machinery is disproportionately high in West Bengal probably because of the lack of custom hiring facilities. Farmers also indicated that hire facilities are either not available or are quite expensive when available.

Machines are mainly used for only three operations—ploughing, irrigation and marketing. Also, there is a discrepancy between the preference for tools and machines for many operations—particularly for ploughing, irrigation, harvesting, threshing and marketing—and their actual use. Efforts should be made to provide the appropriate and preferred tools and machinery to the farmers.

The growth trends in the costs of machinery and labour indicate some scope for substitution of labour with machinery in Bihar for pulses. In West Bengal, the share of machine labour in total input costs is quite low. The paddy and potato farmers in this state are operating at mere subsistence level; the gross revenue covers only the operational costs.

Econometric analysis shows that machines play only a minor role in increasing gross cropped area (GCA) or yield. The results show that the major determinants are irrigation, seed and fertilizer. Irrigation (GIA) and fertilizer use (NPK) are significant in explaining GCA. Mechanization shows no effect (or negative effect). The variable significantly affecting yield is irrigated area.

Introduction

The present study intends to assess the effect of this increased focus on mechanization on agricultural growth in the eastern region. Its specific objectives are to assess the

1. pattern of mechanization at the crop and operation level;
2. comparative economics of labour and machinery in the region; and
3. impact of recent mechanization on agricultural growth, if any.

The study has undertaken an analysis of secondary data at the national and state level, supplemented by in-depth primary data surveys all over the country to understand the situation at the ground level and farmers' perspective.

Methodology:

Secondary and primary data sources are used in the study. The major data sources for the study are the primary data surveys in the study states. These are supplemented with the data from Cost of Cultivation Studies, which will give operation-wise labour use details, for secondary data analysis. Secondary data are collected from published sources such as *Cost of Cultivation of Principal Crops in India, Agricultural Statistics at a Glance,* etc. Tabular analysis, supplemented with econometric analysis, is the broad methodology followed.

Results

Results based on Secondary Data

The Study States that:

1. The level of mechanization in states is very low. All the three states in the study region are below the national average of farm power availability. Orissa and Bihar are way below the national average. The total share of the three eastern study states in tractor sales was less than 10% of the total national sales between 1997-98 and 2012-13. This is quite low, and shows the poor state of tractorization in these states.
2. As per the cost of cultivation statistics (CoC), the share of machinery costs in total input costs is much higher in Bihar than in West Bengal. The growth trends in the costs of machinery and labour indicate some scope for substitution of labour with machinery in Bihar for pulses.

*Institute of Economic Growth, Delhi.

In West Bengal, the share of machine labour in total input costs is quite low. The paddy and potato farmers in this state are operating at mere subsistence level, with gross revenue covering only the operational costs.

3. Econometric analysis shows that machines play only a minor role in increasing area or yield. The results show that the major determinants are irrigation, seed and fertilizer. Irrigation (GIA) and fertilizer use (NPK) are significant in explaining GCA. Mechanization shows no effect (or negative effect). The variable significantly affecting yield is irrigated area.

Results based on Household Surveys (primary data)

1. CDI is less than 50% in all three study years in both the study states, indicating that more than 50% of the land remains uncultivated. The scope to increase land utilization by the use of increased mechanization, along with other input and output policies, may be urgently explored. Results indicate that there exists scope for increasing the use of machinery in Bihar.

2. The percentage of farmers using machinery in Bihar ranges from 21% to 100% for different types of machinery, whereas the percentage of farmers owing such machinery ranges from 7% to 50%, underlining the importance of hire market for agricultural machinery in Bihar. This is also indicated by farmers in both states, indicating that the major problems are the lack of hiring facilities and the expensiveness of such facilities, when available.

3. Machines are used for mainly three operations—ploughing, irrigation and marketing. The percentage of farmers using machines is higher for these operations, but the proportion of expenditure is lower for ploughing. Therefore, greater use of tractors and power tillers may be encouraged in ploughing. Also, there is a discrepancy between the preference for tools and machines for many operations—particularly ploughing, irrigation, harvesting, threshing and marketing—and their actual use. Efforts should be made to provide the appropriate and preferred tools and machinery to the farmers.

Policy Implications

1) Given the very low level of mechanization in the two states and the low CDI, mechanization needs to be promoted through appropriate policies supplemented with suitable input and output policies.

2) Custom hiring centres need to be established, as many farmers said that the lack of such facility was a major problem.

3) Provision of other inputs, particularly irrigation, seed and fertilizers, needs to be improved, as our econometric results show that these inputs affect the area and yield levels more than the machinery use.

Commodity Reviews

Foodgrains

During the month of April, 2015 the Wholesale Price Index (Base 2004-05-100) of pulses increased by 2.44%, cereals & Foodgrains increased by 0.22% and 0.64% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base: 2004-2005-100)

Commodity	Weight (%)	WPI for the Month of April, 2015	WPI for the Month of March, 2015	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	234.0	233.6	234.1	0.17	-0.04
Wheat	1.116	216.4	215.5	212.9	0.42	1.64
Jowar	0.096	282.6	280.7	284.5	0.68	-0.67
Bajra	0.115	247.5	244.4	258.7	1.27	-4.33
Maize	0.217	246.8	249.3	245.7	-1.00	0.45
Barley	0.017	227.8	238.6	214.6	-4.53	6.15
Ragi	0.019	334.4	329.2	334.8	1.58	-0.12
Cereals	3.373	231.4	230.9	230.6	0.22	0.35
Pulses	0.717	264.1	257.8	231.4	2.44	14.13
Foodgrains	4.09	237.1	235.6	230.7	0.64	2.77

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 April, 2015.

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

Procurement of Rise

1.70 million toness of Rice (including paddy converted into rice) was procured during April 2015 as against 1.43 million tonnes of rice (including paddy converted into rice) procured during April 2014. The total procurement of Rice in the current marketing season *i.e.* 2014-2015, up to 30.04.2015 stood at 25.80 million tonnes, as against 25.84 million tonnes of rice procured, during the corresponding period of last year. The details are given in the following tables:

PROCUREMENT OF RICE

(In Thousand Tonnes)

State	Marketing Season 2014-15 (upto 30.04.2015)		Corresponding Period of last Year 2013-14		Marketing Year (October-September) 2013-14		2012-13	
	Procure-ment	Percentage to total	Procure-ment	Percentage to total	Procure-ment	Percentage to total	Procure-ment	Percentage to total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	2178	8.44	4276	16.55	3722	11.76	6464	19.00
Chhatisgarh	3355	13.00	4285	16.58	4290	13.56	4804	14.12
Haryana	2009	7.79	2405	9.31	2406	7.60	2609	7.67
Maharashtra	138	0.53	132	0.51	161	0.51	192	0.56
Punjab	7781	30.16	8106	31.37	8106	25.62	8558	25.16
Tamil Nadu	6	0.02	59	0.23	684	2.16	481	1.41
Uttar Pradesh	1635	6.34	1108	4.29	1127	3.56	2286	6.72
Uttarakhand	15	0.06	386	1.49	463	1.46	497	1.46
Others	8686	33.66	5084	19.67	10678	33.75	8129	23.89
Total	25803	100.00	25841	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 April, 2015 is 17.15 million tonnes against a total of 18.18 million tonnes of wheat procured during last year. The details are given in the following tables:

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

State	Marketing Season 2015-16 (upto 30.04.2015)		Corresponding Period of last Year 2014-15		Marketing Year (April-March) 2014-15		2013-14	
	Procure-ment	Percentage to total	Procure-ment	Percentage to total	Procure-ment	Percentage to total	Procure-ment	Percentage to total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	5496	32.05	5424	29.83	6495	23.20	5873	23.41
Madhya Pradesh	4383	25.56	4521	24.86	7094	25.34	6355	25.33
Punjab	6374	37.17	7416	40.79	11641	41.58	10897	43.43
Rajasthan	473	2.76	731	4.02	2159	7.71	1268	5.06
Uttar Pradesh	380	2.22	89	0.49	599	2.14	683	2.72
Others	44	0.26	2	0.01	6	0.02	16	0.06
Total	17150	100.00	18183	100.00	27994	100.00	25092	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseed & Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 207.0 in April, 2015 showing an increase of 1.4 percent over the previous month. However, it is lower by 3.1 percent over the previous year. The WPI of Groundnut seed (4.6 percent), Cotton Seed (4.4 percent), Safflower seed (3.9 percent), Niger Seed (3.5 percent), Soyabean (1.8 percent), and Rape & Mustard Seed (0.6 percent), increased over the previous months. However, the WPI of Gingelly seed (7.1 percent), Copra (0.7 percent) and Sunflower Seed (0.2 percent) decreased over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood at 144.6 in April, 2015 showing a decrease of 0.6 percent and 0.5 percent over the previous month and year, respectively. The WPI of Groundnut Oil (1.3 percent) Copra oil (0.8 percent), Mustard Oil (0.2 percent) and Soyabean Oil (0.1 percent) increased over the previous month. However, the WPI of Gingelly Oil (1.0 percent) and Sunflower Oil (0.4 percent) decreased over the previous month. The WPI of Cotton seed Oil remained unchanged during the month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 242.1 in April, 2015 showing an increase of 4.4 percent and 2.9 percent over the previous month and year, respectively.

Potato

The Wholesale Price Index (WPI) of Potato stood at 135.2 in April, 2015 showing a decrease of 11.5 percent and 33.5 percent over the previous month and year, respectively.

Onion

The Wholesale Price Index (WPI) of Onion stood 309.6 in April, 2015 showing a decrease of 6.9 percent over the previous month. However, it is higher by 39.6 percent over the previous year.

Condiments Spices

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 310.2 in April, 2015 showing a decrease of 0.3 percent over the previous month. However, it is higher by 17.0 percent over the previous year. The WPI of Black Pepper increased by 1.6 percent over the previous month. However, WPI of Chillies (Dry) and Turmeric remained unchanged over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 190.3 in April, 2015 showing an increase of 6.7 percent over the previous month. However, it is lower by 22.1 percent over the previous year.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 308.1 in April, 2015 showing a decrease of 0.3 percent over the previous month. However, it is increased by 11.3 percent over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

Commodity	Latest	Month	Year	%Variation Over	
	April, 2015	March, 2015	April, 2014	Month	Year
Oil Seeds	207.0	204.2	210.8	1.4	-3.1
Groundnut Seed	232.7	222.4	207.0	4.6	11.3
Rape & Mustard Seed	203.9	202.7	186.4	0.6	8.7
Cotton Seed	164.4	157.4	169.8	4.4	-7.3
Copra (Coconut)	178.1	179.4	173.5	-0.7	3.4
Gingelly Seed (Sesamum)	349.1	375.9	477.1	-7.1	-21.2
Niger Seed	241.4	233.3	177.1	3.5	31.7
Safflower (Kardi Seed)	126.6	121.8	187.4	3.9	-35.0
Sunflower	186.6	186.9	186.3	-0.2	0.3
Soyabean	200.9	197.4	243.7	1.8	-19.0
Edible Oils	144.6	145.4	146.1	-0.6	-0.5
Groundnut Oil	182.5	180.1	162.3	1.3	11.0
Cotton Seed Oil	172.1	172.1	180.1	0.0	-4.7
Mustard & Rapeseed Oil	161.1	160.8	154.2	0.2	4.3
Soyabean Oil	151.3	151.1	157.8	0.1	-4.2
Copra Oil	156.1	154.8	122.2	0.8	26.7
Sunflower Oil	124.9	125.4	127.9	-0.4	-2.0
Gingelly Oil	167.5	169.2	193.5	-1.0	-12.6
Fruits & Vegetables	242.1	232.0	225.4	4.4	2.9
Potato	135.2	152.8	229.7	-11.5	-33.5
Onion	309.6	332.5	238.2	-6.9	39.6
Condiments & Spices	310.2	311.1	266.0	-0.3	17.0
Black Pepper	703.2	691.8	662.4	1.6	4.4
Chillies (Dry)	313.2	313.3	266.4	0.0	17.6
Turmeric	256.3	256.4	214.4	0.0	19.6
Raw Cotton	190.3	178.3	228.8	6.7	-22.1

Statistical Tables

Wages

1. 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	Jan, 15	8	275	237.5	325	NA	200	NA	300	NA	NA
	Guntur	Tadikonda	Jan, 15	8	275	200	275	NA	250	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	Dec, 14	8	275	225	NA	NA	NA	NA	275	250	NA
Karnataka	Bangalore	Harisandra	Oct, 14	8	250	200	300	225	300	225	350	350	NA
	Tumkur	Gidlahali	Oct, 14	8	250	180	300	180	300	180	300	250	NA
Maharashtra	Nagpur	Mauda	Feb, 12	8	100	100	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Feb, 12	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	April, 12	8	100	100	NA	90	90	NA	58	58	NA

1.1 Daily Agricultural Wages in some states (Operation-Wise)

(*In Rs*.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Block Smith	Cobbler
Assam	Barpeta	Laharapara	Dec, 14	M	8	250	250	250	250	250	200	350	250	350
				W	8	NA	NA	200	200	200	NA	NA	NA	NA
	Muzaffarpur	Bhalui Rasul	June, 12	M	8	130	120	80	130	150	120	200	180	250
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Shekhpura	Kutaut	June, 12	M	8	NA	NA	185	NA	185	NA	245	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ChhattishgarhDhamtari		Sihaba	Jan, 15	M	8	400	100	100	NA	100	150	250	100	100
				W	8	NA	100	80	NA	80	100	150	100	80
	Rajkot	Rajkot	Dec. 14	M	8	219	214	156	183	150	184	428	428	344
				W	8	NA	163	147	178	139	NA	NA	NA	NA
Gujarat*	Dahod	Dahod	Dec. 14	M	8	207	164	164	164	136	NA	271	221	221
				W	8	NA	164	164	164	136	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Jan, 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
	Kozhikode	Koduvally	Jan, 15	M	4-8	1030	600	NA	600	807.5	NA	700	NA	NA
				W	4-8	NA	NA	450	450	500	NA	NA	NA	NA
Kerala	Palakkad	Elappally	Jan, 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
	Hoshangabad	Sangarkhera	Oct, 14	M	8	200	200	200	200	150	150	350	350	NA
				W	8	NA	200	200	200	150	150	NA	NA	NA
Madhya Pradesh	Satna	Kotar	Oct, 14	M	8	280	150	150	150	200	150	300	300	300
				W	8	NA	150	150	150	150	150	NA	NA	NA
	Shyopurkala	Vijaypur	Oct, 14	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bhadrak	Chandbali	Feb, 15	M	8	250	NA	250	250	250	250	300	NA	NA
Odisha				W	8	NA	NA	200	200	200	200	NA	NA	NA
	Ganjam	Aska	Feb, 15	M	8	300	200	200	250	200	200	400	400	400
				W	8	NA	100	100	150	100	100	NA	NA	NA

1.1 Daily Agricultural Wages in some states (Operation-Wise)

(*In Rs*.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Plou-ghing	Sow-ing	Weed-ing	Harve-sting	Other Agri Labour	Herd-sman	Skilled Labours		
												Carpe-nter	Block Smith	Cob-bler
Punjab	Ludhiyana	Pakhowal	June, 13	M	8	265	270	270	270	260	NA	325	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Barmer	Kuseep	Jan, 15	M	8	NA	NA	NA	NA	NA	300	700	500	NA
				W	8	NA	NA	NA	NA	NA	200	NA	NA	NA
Rajasthan	Jalore	Sarnau	Jan, 15	M	8	350	350	350	350	NA	NA	400	400	400
				W	8	NA	NA	NA	350	NA	NA	NA	NA	NA
Tamil Nadu*	Thanjavur	Pulvarnatham	Jan, 15	M	8	NA	300	NA	300	304.92	NA	NA	NA	NA
				W	8	NA	100	112.86	122.5	117	NA	NA	NA	NA
	Tirunelveli	Malayakulam	Jan, 15	M	8	NA	NA	NA	NA	415.63	NA	NA	NA	NA
				W	8	NA	NA	159.09	130	300	NA	NA	NA	NA
Tripura	State	Average	Mar. 12	M	8	238	201	203	209	207	199	253	235	240
				W	8	NA	154	152	154	154	149	NA	NA	NA
	Meerut	Ganeshpur	Apr, 12	M	8	250	231	231	NA	234	NA	365	NA	NA
				W	8	NA	181	196	181	191	NA	NA	NA	NA
Uttar Pradesh*	Aurraiya	Aurraiya	Apr., 14	M	8	NA	NA	NA	NA	150	NA	250	NA	NA
				W	8	NA	NA	NA	150	150	NA	NA	NA	NA
	Chandauli	Chandauli	Apr, 14	M	8	NA	NA	200	200	200	NA	350	NA	NA
				W	8	NA	NA	200	200	200	NA	NA	NA	NA

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

Prices

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

(Month end Prices in)

Commodity	Variety	Unit	State	Centre	Apr-15	Mar-15	Apr-14
Wheat	PBW 343	Quintal	Punjab	Amritsar	1600	1600	NA
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1550	1615	1420
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1352	1500	1519
Jowar	-	Quintal	Maharashtra	Mumbai	2300	2225	2600
Gram	No. III	Quintal	Madhya Pradesh	Sehore	3650	3150	2560
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1415	1400	1315
Gram Split	-	Quintal	Bihar	Patna	4600	4500	4480
Gram Split	-	Quintal	Maharashtra	Mumbai	4050	4200	4500
Arhar	-	Quintal	Bihar	Patna	7310	7140	6800
Arhar	-	Quintal	Maharashtra	Mumbai	7300	7300	7400
Arhar	-	Quintal	NCT of Delhi	Delhi	6335	6330	6340
Arhar	Sort II	Quintal	Tamil Nadu	Chennai	9400	8800	6400
Gur	-	Quintal	Maharashtra	Mumbai	3200	3400	3400
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	3800	3800	-
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2400	2275	2475
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3450	3355	3215
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3750	3850	3450
Mustard Seed	-	Quintal	West Bengal	Kolkata	4100	4000	3500
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4200	4100	4115
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1600	1300	1500
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2000	2000	-
Castor Seed	-	Quintal	Andhra Pradesh	Hyderabad	3600	3700	3550
Seasamum Seed	White	Quintal	Uttar Pradesh	Varanasi	-	-	6250
Copra	FAQ	Quintal	Kerala	Alleppey	9800	9750	10550
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	4500	4500	-
Groundnut	-	Quintal	Maharashtra	Mumbai	6000	6000	6000
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1223	1203	1230
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1275	1245	1200
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1425	1425	1095
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1545	1395	1275
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	-	1380	1455
Castor Oil	-	15 Kg.	Andhra Pradesh	Hyderabad	1163	1215	1223
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1855	1850	2245
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2325	2325	2730
Coconut Oil	-	15 Kg.	Kerala	Cochin	2093	2070	2310
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	1860	1815	1825
Groundnut Cake	-	Quintal	Andhra Pradesh	Hyderabad	3286	3143	3143
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	3950	3600	4600
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	3706	-	4016
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	3275	3195	2985

2. Wholesale Prices of Certain Agricultural Commodities and Animal Husbandry Products at Selected Centres in India — (*Contd.*)

Commodity	Variety	Unit	State	Centre	Apr-15	Mar-15	Apr-14
Jute Raw	W 5	Quintal	West Bengal	Kolkata	3225	3145	2955
Oranges	-	100 No.	NCT of Delhi	Delhi	500	458	542
Oranges	Big	100 No.	Tamil Nadu	Chennai	370	360	650
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	750	750	NA
Banana	-	100 No.	NCT of Delhi	Delhi	333	375	375
Banana	Medium	100 No	Tamil Nadu	Kodaikkanal	497	498	455
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	64000	64000	58000
Almonds	—	Quintal	Maharashtra	Mumbai	71000	72000	63000
Walnuts	—	Quintal	Maharashtra	Mumbai	68000	68000	65000
Kishmish	—	Quintal	Maharashtra	Mumbai	24000	24000	14000
Peas Green	—	Quintal	Maharashtra	Mumbai	3900	4100	4600
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1550	1600	1400
Lady finger	—	Quintal	Tamil Nadu	Chennai	2300	1600	1800
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1700	1300	1500
Potatoes	Red	Quintal	Bihar	Patna	650	680	1400
Potatoes	Desi	Quintal	West Bengal	Kolkata	560	520	1280
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	1470	1456	—
Onions	Pole	Quintal	Maharashtra	Nashik	1000	1150	850
Turmeric	Nadan	Quintal	Kerala	Cochin	12000	12000	10000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	8000	8300	9800
Chillies	—	Quintal	Bihar	Patna	9190	9185	8500
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	56500	53000	66500
Ginger	Dry	Quintal	Kerala	Cochin	22000	23000	35000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	105000	101000	126000
Cardamom	Small	Quintal	West Bengal	Kolkata	110000	110000	98000
Milk	Cow	100 Liters	NCT of Delhi	Delhi	NA	NA	NA
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3600
Ghee Deshi	Deshi No. 1	Quintal	NCT of Delhi	Delhi	29682	29348	28681
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	43000	43000	34500
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	—	34200	31250
Fish	Rohu	Quintal	NCT of Delhi	Delhi	9100	8100	10000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	33500	32000	32500
Eggs	Madras	1000 No.	West Bengal	Kolkata	3600	3700	3500
Tea	—	Quintal	Bihar	Patna	21050	21000	20100
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	35000	34000	—
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	30200	30500	—
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	15500	15000	—
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	5050	5000	4400
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3650	3625	3600
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3900	3900	3900
Rubber	—	Quintal	Kerala	Kottayam	10500	10300	13100
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29900	29900	29700

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

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	Mar.	Apr.	May
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T.	12000.00	12000.00	12000.00	12000.00	12000.00
				Rs./Qtl	74160.00	74100.00	75396.00	75948.00	
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/lbs	3.60	3.62	3.64	3.68	
				Rs./Qtl	49034.59	49267.11	50405.74	51332.75	
	Spot U.K. 320s	U.K.	—	Dollar/MT	7877.32	7932.59	7644.65	8194.35	
				Rs./Qtl	48681.84	48983.74	48031.34	51862.04	
Castor Oil	Any Origin ex tank Rotterdam	Netherlands	—	Dollar/M.T.	1700.00	1525.00	1434.00	1434.00	
				Rs./Qtl	10506.00	9416.88	9009.82	9075.79	
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T.	4100.00	4100.00	4100.00	4100.00	
				Rs./Qtl	25338.00	25317.50	25760.30	25948.90	
Cloves	Singapore	Madagascar	—	Dollar/M.T.	10500.00	10500.00	10500.00	10500.00	
				Rs./Qtl	64890.00	64837.50	65971.50	66454.50	
Coconut Oil	Crude Phillipine/ Indonesia	Netherlands	—	Dollar/M.T.	1080.00	1140.00	1040.00	1085.00	
				Rs./Qtl	6674.40	7039.50	6534.32	6866.97	
Copra	Phillipines CIF Rotterdam	Phillipine	—	Dollar/M.T.	679.50	726.00	657.00	682.50	
				Rs./Qtl	4199.31	4483.05	4127.93	4319.54	
Corriander		India	—	Dollar/M.T.	2000.00	2000.00	2000.00	2000.00	
				Rs./Qtl	12360.00	12350.00	12566.00	12658.00	
Cummin Seed		India	—	Dollar/M.T.	2250.00	2250.00	2250.00	2250.00	
				Rs./Qtl	13905.00	13893.75	14136.75	14240.25	
Ginger	Split	Nigeria	—	Dollar/M.T.	2250.00	2250.00	2250.00	2250.00	
				Rs./Qtl	13905.00	13893.75	14136.75	14240.25	
Groundnut kernels	US 2005, 40/50	European Ports	—	Dollar/M.T.	1350.00	1350.00	1350.00	1320.00	
				Rs./Qtl	8343.00	8336.25	8482.05	8354.28	
Groundnut Oil	Crude any origin CIF Rotterdam	U.K.	—	Dollar/M.T.	1200.00	1200.00	1200.00	1200.00	
				Rs./Qtl	7416.00	7410.00	7539.60	7594.80	
Maize		U.S.A. Chicago		C/56 lbs	373.25	375.75	395.00	372.50	
				Rs./Qtl	906.53	911.86	975.34	926.52	
Oats		Canada Winnipeg		Dollar/M.T.	365.75	341.64	352.54	315.21	
				Rs./Qtl	2260.34	2109.63	2215.01	1994.96	
Palm Kernal Oil	Crude Malaysia/Indonesia	Netherlands	—	Dollar/M.T.	945.00	1070.00	980.00	990.00	
				Rs./Qtl	5840.10	6607.25	6157.34	6265.71	
Palm Oil	Crude	Netherlands	—	Dollar/M.T.	630.00	678.00	658.00	655.00	
				Rs./Qtl	3893.40	4186.65	4134.21	4145.50	
Pepper (Black)	Sarawak Black lable	Malaysia	—	Dollar/M.T.	10000.00	11000.00	11000.00	11000.00	
				Rs./Qtl	61800.00	67925.00	69113.00	69619.00	
Rapeseed	Canola	Canada Winnipeg		Can Dollar/M.T.	449.80	458.50	460.60	445.10	
					2204.02	2264.53	2319.12	2318.97	
	UK delivered rapeseed delivered	U.K.	—	Pound/M.T.	242.00	240.00	233.00	242.00	
				Rs./Qtl	2254.96	2285.04	2175.06	2305.29	
Rapeseed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	577.00	586.00	601.00	587.00	
				Rs./Qtl	5376.49	5579.31	5610.34	5591.76	
Soyabean Meal	UK produced 49% oil & protein	U.K.	—	Pound/M.T.	334.00	319.00	317.00	306.00	
				Rs./Qtl	3112.21	3037.20	2959.20	2914.96	
Soyabean Oil		U.S.A.	—	C/lbs Rs./Qtl	30.34	31.71	31.04	31.56	
					4132.53	4315.64	4298.34	4402.34	
Soyabean Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	756.00	611.00	593.00	558.00	
				Rs./Qtl	7044.41	5817.33	5535.66	5315.51	
Soyabeans	US No. 2 yellow	Netherlands Chicago		Dollar/M.T.	420.90	409.40	418.00	392.80	
				Rs./Qtl	2601.16	2528.05	2626.29	2486.03	
		U.S.A.	—	C/60 lbs	970.25	1007.75	978.75	970.50	
				Rs./Qtl	2200.59	2283.79	2256.86	2254.22	
Sunflower seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	664.00	656.00	665.00	672.00	
				Rs./Qtl	6187.15	6245.78	6207.78	6401.47	

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	Mar.	Apr.
Tallow	High grade delivered	U.K.	London	Pound/M.T.	295.00	295.00	290.00	330.00
				Rs./Qtl	2748.81	2808.70	2707.15	3143.58
Wheat		U.S.A.	Chicago	C/60 lbs	505.25	497.75	519.00	498.75
				Rs./Qtl	1145.94	1128.01	1196.74	1158.47

Source: Public Ledger

Exchange Rate	Jan.	Feb.	Mar.	Apr.
US Dollar	61.80	61.75	62.83	63.29
CAN Dolalr	49.00	49.39	50.35	52.10
UK Pound	93.18	95.21	93.35	95.26

Crop Production

4. Sowing and Harvesting Operations Normally in Progress during June, 2015

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Winter Rice, Jowar (K), Bajra Maize (K), Ragi (K), Small Millets (K), Tur (K), Urad (K), Mung (K), other Kharif Pulses, Ginger, Groundnut, Sesamun, Cotton, Turmeric.	Autumn rice.
Assam	Winter Rice, Castorseed.	Autumn Rice, Summer Potato (Hills)
Bihar	Autumn Rice, Jowar (K) Bajra, Maize,Ragi, Small Millets (K) Tur (K) Sesamum, Cotton, Jute, Mesta, Sannhemp.	Summer Rice
Gujarat	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K) Tur (K) Urad (K) Mung (K), Other Kharif Pulses, Ginger, Chillies (Dry), Groundnut, Sesamum, Cotton, Turmeric, Sannhemp.	—
Himachal Pradesh	Summer Rice, Maize, Ragi, Small Millets(K) Urad (K) Mung (K) Other Kharif Pulses, Ginger, Chillies (Dry), Tobacco, Groundnut, Sesamum Turmeric.	Wheat, Winter Potato (Hills) Onion.
Jammu & Kashmir	Autumn Rice, Jowar (K) Bajra, Maize, Ragi, Small Millets (K), Urad (K) Mung (K) Other Kharif Pulses, Potato Chillies (Dry), Tobacco, Groundnut, Sesamum (Late) Jute, Sannhemp.	Wheat, Barley, Small Millets (R) Tobacco, Rapeseed and Mustard, Onion.
Karnataka	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K) Tur (K), Urad (K) Mung (K) Other Kharif Pulses, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cottion, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca.	—
Kerala	Autumn Rice, Ragi, Tur (K), Urad (K) Mung (K), Other Kharif Pulses, Sweet Potato.	Tapioca.
Madhya Pradesh	Autumn Rice, Jowar (K) Bajra, Maize, Small Millets (K), Tur(K), Urad (K), Mung (K) Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp.	Onion
Maharasthra	Winter Rice, Jowar (K) Bajra, Maize, Ragi Small Millets (K), Tur (K) Urad (K) Mung (K) Other Kharif Pulses, Chillies (Dry) Groundnut, Castorseed, Sesamum, Cotton Mesta, Turmeric, Sannhemp, Nigerseed.	—
Manipur	Autumn Rice, Winter Rice, Tur(K) Groundnut Castorseed Sesamum Cotton	—
Orissa	Autumn Rice, Winter Rice, Jowar(K) Bajra, Maize, Ragi, Small Millets (K) Chillies (Dry), Tobacco, Groundnut Castorseed Cotton, Jute, Mesta	Summer Rice, Chillies (Dry.)

4. Sowing and Harvesting Operations Normally in Progress during June, 2015 — (*Contd.*)

(1)	(2)	(3)
Punjab and Haryana	Autumn Rice, Summer Rice, Jowar (K) Bajra, Maize, Ragi, Small Millets (K) Tur (K) Urad (K), Mung(K), Other Kharif Pulses, Chillies Dry, Groundnut, Castorseed, Cotton, Sweet Potato Turmeric, Sannhemp.	Wheat, Potato (Hills), Summer Potato, Tobacco, Onion.
Rajasthan	Jowar (K), Bajra, Maize, Small Millets(K), Tur(K), Urad(K), Mung(K), Other Kharif Pulses, Chillies (Dry) Tobacco, Groundnut, Castorseed, Cotton Sannhemp.	Small Millets (R)
Tamil Nadu	Autumn Rice, Jowar (K), Bajra, Ragi Small Millets(K), Summer Potato (Hills) Sugarcane, Chillies (Dry), Castorseed, Seasamum, Cotton, Turmeric, Sannhemp Onion, Tapioca.	Summer Rice, Jowar (R), Sugar Chillies (Dry), Cotton, Sannhemp, Onion.
Tripura	Winter Rice, Urad(K), Mung(K), Sesamum Mesta.	—
Uttar Pradesh	Autumn Rice, Winter Rice, Jowar(K), Bajra Maize, Ragi, Small Millets (K) Tur(K), Urad(K) Mung(K), Ohter Kharif Pulses (Moth) Ginger, Chillies (Dry), Groundnut, Castorseed, Cotton Jute Mesta, Sweet Potato, Sannhemp, Nigerseed.	Sugarcane, Onion.
West Bengal	Autumn Rice, Maize, Tur(K), Ginger, Chillies (Dry) Mesta.	Chillies (Dry), Sesamum,
Delhi	Jowar(K), Bajra, Cotton.	
Andaman & Nicobar	Autumn Rice, Winter Rice.	

(K)—Kharif. (R)— Rabi

GMGIPMRND—1214AGRI—15-06-2015

ISSN 0002-167
Regn.No.:840

P. Agri. 21-05-2015
600

List of other Publications of the Directorate

Periodicals

Agricultural Prices in India

Agricultural Statistics at a Glance

Agricultural Wages in India

Cost of Cultivation of Principal Crops

District-wise Area and Production of Principal crops in India

Farm Harvest Prices of Principal crops in India

Glimpses of Indian Agriculture

Land Use Statistics at a Glance

Copies are available at:
The Controller of Publications, Civil Lines, Delhi-110054

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