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Agricultural Situation in India

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Contents

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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 & Farmers Welfare's monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. Good articles in Hard Copy as well as Soft Copy (agri.situation@gmail.com) in MS Word, not exceeding five thounsand words, may be sent in duplicate, typed in double space on one side of foolscap paper in Times New Roman font size 12, addressed to the Editor, Publication Division, Directorate of Economics and Statistics, M/o Agriculture & Farmers Welfare, C-1, Hutments Dalhousie Road, New Delhi-110 011 along with a declaration by the author(s) that the article has neither been published nor submitted for publication elsewhere. The author (s) should furnish their e-mail address, Phone No. and their permanent address only on the forwarding letter so as to maintain anonymity of the author while seeking comments of the referees on the suitability of the article for publication.

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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.

We are pleased to inform that our monthly journal *Agricultural Situation in India* has been accredited by the National Academy of Agricultural Sciences (NAAS) and it has been given a score of 2.76 out of 6. The score is effective from January, 2016 onwards. The score may be seen in the following website: www.naasindia.org

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

Farm Sector News

India Leading in Coconut Production and Productivity in the World- ShriRadha Mohan Singh

Union Minister of Agriculture and Farmers Welfare, ShriRadha Mohan Singh, on 2nd September, 2016, addressed the farmers on World Coconut Day and National Award presentation ceremony in Bhubaneswar. On the occasion, the Minister said that India is a leading country in coconut production and productivity in the world. Our annual coconut production is 2044 crore coconut from 19.8 lakh hectare area and the productivity per hectare is 10345 coconuts. The contribution of coconut in country's GDP is about Rs. 20,000 crore. In 2015-16, from our country, coconut products of Rs. 1450 crore value have been exported. He also said that over one crore people in our country are dependent on coconut crop for their livelihood.

Shri Singh informed that to operationalize the Horticulture Mission in Odisha state, an amount of Rs. 54.45 crore for the year 2015-16 and in 2016-17 so far, Rs. 26.83 crore have been released. In this year, the state is to obtain a sum of Rs. 49.91 crore from the centre. The state could not spent Rs. 4.15 crore in the last year. The Minister expressed hope that this year the entire amount received from the center would be spent by the state's Horticulture Mission. He also said that nearly a quarter of the mission's budget should be on the post-harvest infrastructure management, especially to build the cold supply chain and to link farmers' producers directly to market should be spent.

In the last 2 years, National Horticulture Board has provided assistance of Rs. 6.50 crore to develop horticulture in the Odisha state, which includes important plans like greenhouse, polly house, cold storage. Several cashew promotion units have been established in Odisha'sKoraput and Gunjm district. At the same time, assistance for the development quality plant to create modern nursery seedlings has been provided.

Coconut is a major crop of Orissa state and here coconut is cultivated in 50679 hectares and coconut production is 32.4 crore. In the state 6404 coconut per hectare is being produced. Five districts of Odisha, namely,Puri, Ganjam. Kttk, Nyagd and Khurda produce more than 60 percent of the total coconut production in the state.

Agriculture Minister said the Coconut Development Board has a huge contribution towards the achievement made in the coconut industry in the country. By coconut value (value addition) only; the coconut farmers can be taken towards prosperity. For it, the Technology Mission on coconut under the Board has established 402 coconut processing units have been in India and in these processing units, 242 crores coconut per year are processed.

The Minister also stressed that the new initiative launched by the Coconut Development Board, has given him a chance to know in detail. So far, 9720 coconut committees, 700 coconut producer federations and 61 coconut producer companies have been formed across the country. I hope that through these farmer groups, board's plan would be operationalized and in processing, marketing and export of coconut products, farmers would hold their share.

Third Advance Estimates for 2015-16 of Area and Production of Horticulture Crops Released

The Department of Agriculture and Farmers Welfare has released the Third Advance Estimates for 2015-16 of area and production of horticulture crops. These estimates are based on the information received from different State/ UTs in the country. The total production of the Horticulture crops in the country is estimated to be around 283.36 million tonnes during 2015-16.

The following table summarises the All-India Final Estimates: 2014-15 and Third Advance Estimates: 2015-16:

(Area in '000 Hectare)
(Production in '000 MT)

Total Horticulture	2014-15 Final	2015-16 Third Advance Estimate
Area	23410	23787
Production	280986	283360

Highlights:-

- The total horticulture production of the country is estimated to be around 283 million tonnes during 2015-16 which is 0.8% higher than the previous year.
- Production of fruits is estimated to be 91 million tonnes which is 2% higher than previous year.

- Production of vegetables is estimated to be around 167 million tonnes which is almost same as the previous year.
- Production of spices is estimated to be around 6 million tonnes which is 4% higher than the previous year.
- Production of onion is estimated to be around 210 lakh tonnes which is 11% higher than the previous year.
- Production of potato is estimated to be around 437 lakh tonnes which is 9% lower than the previous year.
- Production of tomato is estimated to be around 184 lakh tonnes which is about 12 % higher than the previous year.

India Declares itself Free from Avian Influenza (H5N1)

The Department of Animal Husbandry, Dairying and Fisheries in the Ministry of Agriculture and Farmers welfare has declared India free from Avian Influenza (H5N1) from 5th September, 2016.

India had notified outbreak of Avian Influenza (H5N1) on 09.05.2016 at Humnabad, Bidar district, Karnataka. There has been no further outbreak reported in the country thereafter.

The following are control measures adopted in the radius of one Km around outbreak location are included:

1- Stamping out of entire poultry population including destruction of eggs, feed, litter and other infected materials, restriction on movement of poultry and poultry products to and from the area of outbreak, disinfection and cleaning up of infected premises and the Post Operation Surveillance Plan (POSP) from 6th June, 2016

2- Surveillance was carried out throughout the country. Surveillance around the areas of the outbreaks since completion of the operation (including culling, disinfection and clean -up)

Post the surveillance the state has shown no evidence of presence of Avian Influenza. India has declared itself free from Avian Influenza (H5N1) from 5th September, 2016 and notified the same to OIE.

Rabi conference will provide a platform for result-oriented discussions and sharing of experiences/skills to prepare for the ensuing rabi season - ShriRadha Mohan Singh.

The Union Agriculture and Farmer Welfare Minister ShriRadha Mohan Singh inaugurated a two-day National Rabi Conference in New Delhi on 15th September, 2016. Speaking on the occasion, ShriRadha Mohan Singh said that the conference will provide a platform for result-oriented discussions and sharing of experiences/skills to prepare for the forthcoming rabiseason.Shri Singh said that the two-day National Conference will provide opportunity to fix crop wise targets, to put in place a robust arrangement of supplies to different states and to introduce new technologies and new practices in the agriculture sector.

Shri Singh stated that in the Union Budget for 2016-17, the Union Finance Ministry has allocated Rs.35,984 Cr to the Agriculture Sector for the welfare of the farmers. The Government has resolved to double the farmers' income by 2022. This would be possible only with the cooperation of the State Governments. In India, the average yield of all the major crops is far less than the world yield average and substantial variation in productivity is visible amongst the States. The officers and scientists of the Central and the State Governments should deliberate and formulate a concrete strategy to increase the farmers' income two-fold.

The Union Agriculture and Farmer Welfare Minister said that the Government of India has given top priority to the agriculture sector and in 2016-17 budget, the sector has been allocated Rs.35,984 Cr for the welfare of the farmers. This allocation is the highest till now. Besides, the Government has set the target of doubling the farmers' income by 2022, which will only be possible with the cooperation of the states.

Minister of State for Agriculture and Farmer Welfare, ShriSudarshanBhagat, while addressing the Conference said that the development and prosperity of the farmers is dependent on increasing agricultural production and in addition to receipt of the fair value of additional yield produced. They face much difficulty in getting Government subsidies and benefits. For this, our government through the schemes like Jan DhanYojna and Direct Benefit Transfer (D.B.T), has provided money transfer to each beneficiary directly in his bank account, which established the relationship of Government-to-People (G 2 P). At present in the country 66 central schemes being implemented through this and the target is to cover all the welfare and subsidy based schemes by March 2017.

Ministry of Agriculture & Farmers Welfare and Ministry of Water Resources, River Development and Ganga Rejuvenation Signed a MoU to Promote Organic Farming on the Banks of River Ganga

The Ministry of Agriculture & Farmers Welfare, on 16th September, 2016, signed a Memorandum of Understanding (MoU) with Ministry of Water Resources, Water Development and Ganga Rejuvenation to promote organic farming on the banks of river Ganga. According to this agreement, villagers situated on the banks of river Ganga will be encouraged for organic farming.

As per agreement, under the NamamiGange project 1657 gram panchayats situated along the course of river Ganga starting from Uttarakhand to West Bengal, organic farming will be developed in 1657 clusters under the ParamparagatKrishiVikasYojana (PKVY). Under this project, Ministry of Agriculture along with cluster formation will provide training on Integrated Nutrient Management and micro-irrigation techniques.

To promote organic farming on the banks of river Ganga, clusters of gram panchayats will be formed, awareness campaigns will be launched and self help groups will be formed by the Ministry. Apart from this, related information will be provided through mobile applications and awareness will be created among the masses about the side-effects of using chemicals, fertilizers and insecticides in farming will be created. Initiatives will be taken to promote the improved ways of irrigation for water rejuvenation in Ganga valley. Also, organic farming and livestock based livelihood will be promoted on the banks of Ganga river. Ministry of Agriculture is promoting organic farming under the Paramparagat Krishi Vikas Yojana throughout the country especially in north-eastern states.

BRICS Agriculture and Agrarian Development Ministers to Meet on 23rd September, 2016

The 6th meeting of BRICS on Agriculture and Agrarian Development began in New Delhi on Thursday, 22nd September, 2016 with an official level meeting followed by a Ministerial meeting the next day. The two day conference was hosted by the Ministry of Agriculture and Farmers' Welfare and centredon the five priority areas of cooperation in the BRICS Action Plan for 2012-2016. The areas of cooperation include creating basic agricultural information exchange system, strategy for ensuring access to food for the most vulnerable population, reducing negative impact of climate change on food security and adaptation of agriculture to climatic changes, enhancing agricultural technology cooperation and innovation, trade and investment promotion.

The agenda of the BRICS meetings has considerably widened over the years encompassing global issues such as climate change, food and energy security, Strategic Development Goals (SDGs), International Economic and Financial Situation etc.

Detailed discussions were also held on the BRICS Agricultural Research Centre which is likely to be set up in India. The centre worked on Agricultural Science, Policy Research and Development Extension, Technology Transfer, Training and Capacity Building and Scientific Information Sharing. The centre was acted as a forum for academicians, scholars, researchers and students for agricultural in advancement.

Agriculture is the mainstay of the economy of all BRICS countries being the major producers, consumers and exporters of Agricultural, Horticultural and Meat products. BRICS countries enjoy strength in the form of knowledge, expertise and research facilities and capabilities in agriculture. These strengths need to be converged and galvanized for ensuring global food security.

India-Brazil Agree to Promote South-South Cooperation in their Basic Requirements

The Union Minister of Agriculture and Farmers Welfare, ShriRadha Mohan, on 21st September, 2016, held a meeting with the Brazilian Minister for Agriculture, Livestock and Supply, ShriBlairo Maggi. Both the Ministers discussed on various issue related to Agriculture, Livestock and Trade during the interaction. ShriBlairo Maggi visited India for the BRICS Agriculture Ministers meeting.

The two Ministers committed to further develop friendly and cooperative relations between the two countries and to promote South-South cooperation in order to assist developing economies in meeting their basic requirements, and also to forge closer relations, cooperation and coordination in the multilateral arena.

They also agreed that both countries need to work together to explore ways and means for enhancing bilateral trade between the two countries and committed to work expeditiously for early resolution of sanitary and phytosanitary issues for providing the required boost to bilateral trade.

India's request for Market access of seeds of pearl, millet, sorghum, corn seeds, rape seeds and cotton for which technical information for conducting pest risk analysis was already submitted in July, 2012 as well as Brazil's request of market access for cotton, maize, soybean, grapes, apples, oats and avocado into Indian market were also discussed.

The proposed MoU between agencies of the two countries on sharing technical information on Indian cattle breeds that form the mainstay of the Brazilian livestock population, was also discussed and it was agreed, that a technical group can sit together to resolve outstanding issues.

Kharif Crop Sowing Crosses Normal Sowing Area

The total sown area as on 23th September, 2016 as per reports received from States, stands at 1067.53lakh hectare as compared to 1030.89 lakh hectare at this time last year and total normal area of 1062.50 lakh hectare.

It is reported that rice has been sown/transplanted in 387.04 lakh ha, pulses in 145.84 lakh ha, coarse cereals in 189.58 lakh ha, oilseeds in 189.16 lakh ha, sugarcane in 45.77 lakh hectare and cotton in 102.55 lakh ha.

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

(In Lakh hectare)

Crop	Area sown in 2016-17	Area sown in 2015-16
Rice	387.04	377.35
Pulses	145.84	112.93
Coarse Cereals	189.58	183.59
Oilseeds	189.16	183.71
Sugarcane	45.77	49.60
Jute & Mesta	7.59	7.73
Cotton	102.55	115.98
Total	1067.53	1030.89

India Working to Improve Income of Farmers: ShriRadha Mohan Singh

The BRICS Agriculture Ministers meeting in New Delhi, on 23rd September, 2016, has agreed to set up a platform for developing and sharing models for sustainable agriculture. The platform which will be a virtual facility aims to promote food security, sustainable agricultural development and poverty alleviation through cooperation amongst the members. The meeting held under India's Chairmanship for the first time and presided over by the Minister for Agriculture and Farmers' Welfare, ShriRadha Mohan Singh also resolved to promote climate resilient agriculture technologies and improve capacity for exchange of information. In a joint statement issued at the end of the two -day meeting of the BRICS Agriculture and Agrarian Development Ministers the participating countries agreed to declare year 2016 as the International Year of Pulses in line with the declaration made by the UN General Assembly. The BRICS meeting was attended by the Agriculture Ministers from Brazil, Russia, India, China and South Africa.

Earlier addressing the BRICS summit in the morning, the Agriculture and Farmers' Welfare Minister, ShriRadha Mohan Singh spoke about India's effort in reducing the input costs of farmers through Soil Health card Scheme and the PM KrishiSinchaiYojna(micro-irrigation). Besides soil health card and micro irrigation, the Minister also underlined the importance given to organic farming by the NDA Government.

The Minister said in order to take on the adverse effects of climate change, India has embarked upon a slew of initiatives by undertaking a National Action Plan on Climate Change. Another initiative in this direction is National Mission for Sustainable Agriculture to transform Indian Agriculture into a Climate Resilient Production System through suitable adaptation and mitigation measures such as promoting location specific integrated/ composite farming systems, soil and moisture conservation measures, comprehensive soil health management, efficient water management practices and main streaming rain fed technologies.

Union Agriculture and Farmers Welfare Minister inaugurates the Pandit Deen Dayal Upadhyay Krishi Unnati Mela at Mathura

The Union Agriculture and Farmers Welfare Minister, ShriRadha Mohan Singh,on 26th September, 2016, inaugurated the four day Pandit Deen Dayal Upadhyay Krishi Unnati Mela - 2016, in Mathura, UP. On this occasion, he said that Pandit Deen Dayal Upadhyay was born in Mathura but he gave a new direction to the entire country through his thoughts and works. He said that Pandit Deen Dayal was a great philosopher, economist, social reformer, fearless journalist and political thinker. He said that the country has shown gratitude to him by opening Uttar Pradesh Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishvidyalaya and Cow Research Institute after his name at his birth place, Mathura.

On this occasion, Agriculture Minister said that during last two years, there was drought like situation in the country but in spite of it food grains production was more than 250 million ton during 2015-16. During these years the production of milk was also record high at 160 million ton in the country. He said that the credit of food grains production goes to new agriculture technique and hard work of farmers. He further said that horticulture, particularly in fruit and vegetables, is getting continuous enhancement and it has crossed the figure of 280 million ton. He said that food security of the country has become strong. Country is self dependent in food grains and from this it has generated a new trust among all stakeholders of agriculture sector.

On this occasion, he also said that due to good monsoon in 2016-17 sowing area of main crops is around 1060 lakh hectare, while last year it was 1023 lakh hectare. This year sowing area of pulses is around 145 lakh hectare, while last year it was 112.43 lakh hectare. It is estimated that this year food grain production will be more than record 270 million ton in which pulses production will be likely 21 million ton as compare to last year's 17 million ton.

The Agriculture Minister laid foundation stone of first Gokul Gram Project in Mathura. On this occasion he

said that government has prepared a plan to establish 14 Gokul Gram in the country under Gokul Mission. The first Gokul Gram is going to be established in PanditDeenDayalUpadhyay's birth place, Mathura. Gokul Gram will work as a centre for development of native breed cattle and it will work to supplement resources of cattle of farmers in breeding areas. Earlier the Agriculture Minister inaugurated a waste sewage water treatment plant in Mathura. This plant has developed a unique indigenous technique facility for treatment & recycle of sewage water into irrigation water by Indian Council of Agricultural Research.

General Survey of Agriculture

Important Policy decisions taken during the month of September, 2016

The 1st Advance Estimates of production of major kharif crops for 2016-17 have been released by the Department of Agriculture, Cooperation and Farmers Welfare on 22nd September, 2016.

The estimated production of major kharif crops during 2016-17 is as under:

Food grains - 135.03 million tonnes (record)

Rice - 93.88 million tonnes (record)

Coarse Cereals - 32.45 million tonnes

Maize - 19.30 million tonnes (record)

Pulses - 8.70 million tonnes (record)

Tur - 4.29 million tonnes (record)

Urad - 2.01 million tonnes (record)

Oilseeds - 23.36 million tonnes

Soyabean - 14.22 million tonnes

Groundnut - 6.50 million tonnes

Castor seed - 1.73 million tonnes

Cotton - 32.12 million bales (of 170 kg each)

Sugarcane - 305.25 million tonnes

Total production of Kharif rice is estimated at 93.88 million tonnes which is a new record. This year rice production is higher by 1.1 million tonnes than previous record production of 92.78 million tonnes achieved during 2011-12. Production of Kharif rice is also higher by 4.16 million tonnes and 2.57 million tonnes over the average production of the last five years and the last year's Kharif rice production respectively.

Total production of coarse cereals in the country is estimated at 32.45 million tonnes as compared to 27.17 million tonnes during 2015-16 (4th Advance Estimates). Production of Maize is estimated at record level of 19.30 million tonnes. This year production of Kharif maize is higher by 4.05 million tonnes than that the last year's production.

As a result of significant increase in the area coverage and productivity of tur and urad, total production of Kharif pulses estimated at record level of 8.70 million tonnes which is higher by 3.16 million tonnes than the last year's production of 5.54 million tonnes. The production of kharif pulses is also higher by 2.54 million tonnes than their last five years' average production.

Total production of kharif oilseeds in the country is estimated at 23.36 million tonnes which is significantly higher than the production of 16.59 million tonnes during 2015-16. This year production of Kharif oilseed is also higher by 2.33 million tonnes than the average production of last five years.

Production of Sugarcane is estimated at 305.25 million tonnes which is lower by 46.92 million tonnes than the last year's production of 352.16 million tonnes. Despite lower area coverage, higher productivity of Cotton has resulted in to higher production of 32.12 million bales (of 170 kg each) as compared to 30.15 million bales during 2015-16. Production of Jute & Mesta estimated at 10.41 million bales (of 180 kg each) is marginally lower than their production of 10.47 million bales during the last year.

Trends in food grain prices

During the month of August, 2016 the All India Index Number of Wholesale Price (2004-05=100) of Food grains increased by 0.68 percent from 280.4 in July, 2016 to 282.3 in August, 2016.

The Wholesale Price Index (WPI) Number of Cereals increased by 0.44 percent from 248.0 to 249.1 and WPI of Pulses increased by 1.41 percent from 432.8 to 438.9 during the same period.

The Wholesale Price Index Number of Wheat increased by 1.14 percent from 227.6 to 230.2 while that of Rice increased by 0.44 percent from 247.4 to 248.5 during the same period.

Weather, Rainfall and Reservoir situation during September, 2016

Rainfall Situation

Cumulative Monsoon Season rainfall for the country as a whole during the period 01st June to 29th September, 2016 has been 3% lower than the Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period has been higher than LPA by 6% in Central India but lower than LPA by 11% in East

& North East India, 7% in South Peninsula and 5% in North-West India.

Out of total 36 meteorological Sub-divisions, 27 subdivisions received excess/normal rainfall and 9 Sub-divisions received deficient rainfall.

Out of 629 districts for which rainfall data are available, 109(17%) districts received excess rainfall, 315(50%) received normal rainfall, 190(30%) districts received deficient rainfall and 15(3%) received scanty rainfall

Water Storage in Major Reservoirs

Central Water Commission monitors 91 major reservoirs in the country which have total live capacity of 157.80 Billion Cubic Metre (BCM) at Full Reservoir Level (FRL). Current live storage in these reservoirs (as on 29th September, 2016) is 117.20 BCM as against 96.45 BCM on 29.09.2015 (last year) and 121.45 BCM of normal storage (average storage of last 10 years). Current year's storage is higher than the last year's storage by 22% but lower than normal storage by 3%.

1. ECONOMIC GROWTH

- As per the estimates of Gross Domestic Product (GDP) for the first quarter (April-June) 2016-17,released by the Central Statistics Office (CSO), the growth rater of GDP in Q1 of 2016-17 was 7.1 per cent as compared to the growth of 7.5 pe cent in Q1 of 2015-16 and 7.9 per cent in Q4 of 2015-16.
- The growth in gross value added (GVA) at constant (2011-12) basic prices in Q1 of 2016-17 was 7.3 per cent, as compared to the growth rate of 7.2 per cent in Q1 of 2015-16. At the sectoral level, agriculture, Industry and services sectors grew at the rate of 1.8 per cent, 6.0 per cent and 9.6 per cent respectively in Q1 of 2016-17 (Table 2).
- In May 2016, CSO had estimated the growth rate of Gross Domestic Product (GDP) at constant (2011-12) prices for the year 2015-16 is estimated at 7.6 per cent as compared to the growth of 7.2 per cent in 2014-15 (Table 1).
- The share of total final consumption in GDP at current prices in 2015-16 is estimated at 70.1 per cent as compared to 68.5 per cent in 2014-15. The fixed investment rate (ratio of gross fixed capital formation to GDP] declined from 30.8 per cent in 2014-15 to 29.3 per cent in 2015-16.
- The saving rate (ratio of gross saving to GDP) for the years 2014-15 and 2013-14 was 33.0 per cent as compared to 33.8 per cent in 2012-13. The investment rate (gross capital formation to GDP) in 2014-15 was 34.2 per cent, as compared to 34.7 per cent, as compared to 34.7 per cent and 38.6 per cent respectively in 2013-14 and 2012-13.

2. AGRICULTURE AND FOOD MANAGEMENT

- **Rainfall:** The country received 797.8 mm of rainfall during the South-West monsoon season (1st June -20th September, 2016) which was 5 per cent below normal. Out of the total 36 meteorological subdivisions, 3 subdivisions received excess season rainfall, 25 subdivisions received normal season rainfall and the remaining 8 subdivisions received deficient/ scanty/no season rainfall.
- **All India production of food grains:** As per the 1st Advance Estimates of production of major Kharif crops for 2016-17, the production of kharif food-grains is estimated to be 135.0 million tonnes for the kharif season as compared to 124.0 million tonnes for the kharif season of 2015-16 (Table 3).
- **Procurement:** Procurement of rice as on 9th September 2016 was 34.2 milion tonnes during Kharif Marketing Season 2015-16 (KMS is under progress) whereas procurement of wheat as on 30th June 2016 was 22.9 million tonnes during Rabi Marketing Season 2016-17 (Table 4).
- **Off-take:** Off-take of rice during the month of April 2016 was 24.2 lakh tonnes. This comprises 22.8 lakh tonnes under TPDS/NFSA (offtake against the allocation for the month of May, 2016) and 1.5 lakh tonnes under other schemes. In respect of wheat, the total offr-take was 21.15 lakh tonnes comprising 19.4 lakh tonnes under TPDS/NFSA (offtake against the allocation for the month of May 2016) and 1.8 lakh tonnes under other schemes. Cumulative off-take of food grains during 2016-17 (till April 2016) is 8.5 million tonnes (Table 5).
- **Stocks:** As on September 1, 2016 stocks of food-grains (rice and wheat) held by FCI were 42.9 million tonnes, as compared to 51.8 million tonnes as on September 1, 2015 (Table 6).

TABLE

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

Sector	Growth			Share in GVA		
	2013-14	2014-15 (1st RE)	2015-16 (PE)	2013-14	2014-15 (1st RE)	2015-16 (PE)
Agriculture, forestry & fishing	4.2	-0.2	1.2	17.5	16.3	15.4
Industry	5.0	5.9	7.4	31.6	31.2	31.3
Mining & quarrying	3.0	10.8	7.4	2.9	3.0	3.1
Manufacturing	5.6	5.5	9.3	17.4	17.1	17.5
Electricity, gas water supply & other utility services	4.7	8.0	6.6	2.2	2.2	2.2
Construction	4.6	4.4	3.9	9.0	8.8	8.5
Services	7.8	10.3	8.9	51.0	52.5	53.3
Trade, hotels, transport, communication and broadcasting services	7.8	9.8	9.0	18.4	18.9	19.2
Financial, real estate & professional Services	10.1	10.6	10.3	20.3	21.0	21.6
Public administration, defence and other Services	4.5	10.7	6.6	12.3	12.7	12.6
GVA at basic prices	6.3	7.1	7.2	100.0	100.0	100.0
GDP at market prices	6.6	7.2	7.6	—	—	—

Source: Central Statistics Office (CSO). 1st RE: First Revised Estimates, PE: Provisional Estimates.

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

Sector	2014-15				2015-16				2015-16
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Agriculture, forestry & fishing	2.3	2.8	-2.4	-1.7	2.6	2.0	-1.0	2.3	1.8
Industry	8.0	5.9	3.8	5.7	6.7	6.3	8.6	7.9	6.0
Mining & quarrying	16.5	7.0	9.1	10.1	8.5	5.0	7.1	8.6	-0.4
Manufacturing	7.9	5.8	1.7	6.6	7.3	9.2	11.5	9.3	9.1
Electricity, gas, water supply & other utility services	10.2	8.8	8.8	4.4	4.0	7.5	5.6	9.3	9.4
Construction	5.0	5.3	4.9	2.6	5.6	0.8	4.6	4.5	1.5
Services	8.6	10.7	12.9	9.3	8.8	9.0	9.1	8.7	9.6
Trade, hotels, transport, communication and services	11.6	8.4	6.2	13.1	10.0	6.7	9.2	9.9	8.1
related to broadcasting Financial, real estate & professional services	8.5	12.7	12.1	9.0	9.3	11.9	10.5	9.1	9.4
Public administration, defence and Other Services	4.2	10.3	25.3	4.1	5.9	6.9	7.2	6.4	12.3
GVA at Basic Price	7.4	8.1	6.7	6.2	7.2	7.3	6.9	7.4	7.3
GDP at market prices	7.5	8.3	6.6	6.7	7.5	7.6	7.2	7.9	7.1

Source: Central Statics Office (CSO).

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

Crops	Production (in Million Tonnes)				
	2012-13	2013-14	2014-15	2015-16 (4th AE)	2015-16 (1st AE)
Total Foodgrains	257.1	265.0	252.0	252.2	135.0
Rice	105.2	106.7	105.5	104.3	93.9
Wheat	93.5	95.9	86.5	93.5	—
Total Coarse Cereals	40.0	43.3	42.9	37.9	32.5
Total Pulses	18.3	19.3	17.2	16.5	8.7
Total Oilseeds	30.9	32.8	27.5	25.3	23.4
Surgarcane	342.2	352.1	362.3	352.2	305.2
Cotton #	34.2	35.9	34.8	30.1	32.1

Source: DEC & FW, M/o Agriculture & Farmers Welfare, 1st AE 1st Advance Estimate of Kharif crops only, 4th AE: Fourth Advance Estimates, # Million bales of 170 kgs. each.

TOTAL 4: Procurement of Crops in Million Tonnes

Crops	2011-12	2012-13	2013-14	2014-15	2015-16	2016-178
Rice #	35.0	34.0	31.8	32.2	34.2[a]	–
Wheat@	28.3	38.2	25.1	28.0	28.1	22.9B
Total	63.4	72.2	56.9	6-.2	62.3	—

Source: DFPD. M/o Consumer Affairs and Public Distribution; # Kharif Marketing Season (October-September), @ Rabi Marketing Season (April-March), A; Position as on 09.09.2016, B Position as on 30.06.2016

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

Crops	2012-13	2013-14	2014-15	2015-16	2016-17 (Till April)
Rice	32.6	29.2	30.7	31.8	4.6
Wheat	33.2	30.6	25.2	31.8	3.9
Total (Rice & Wheat)	65.8	59.8	55.9	63.6	8.5

Source: DFPO, M/o Consumer Affairs and Public Distribution

Table 6: Stocks of Food Grains (Million Tonnes)

Crops	September 1, 2015	September 1, 2016
1. Rice	13.9	16.5
2. Unmilled Paddy#	3.6	3.2
3. Converted Unmilled Paddy in terms of Rice	2.4	2.2
4. Wheat	35.5	24.2
Total (Rice & Wheat) (1+3+4)	51.8	42.9

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

ARTICLES

DRIVERS OF AGRICULTURAL LAND CONVERSION IN KERALA

SHEEBA ANDREWS*

1. Introduction

Agricultural land conversion means changing land use from agriculture to non-agriculture activities. It takes place due to competing uses of land for various purposes such as industry, urbanization, housing and other construction activities which occur at different stages of development. Since land resource is limited, expansion of economic activity encraoches land from agriculture over time which is the primary activity on land. It is thus a land use change from agriculture to non-agricultural activities. Agricultural Land Conversion (ALC) poses a threat to the life supporting system by causing not only environmental problems but also food security issues. Arable land is shrinking at a remarkable rate in many countries following the rapid expansion of population, expansion of industries as well as due to land degradation (Li Xiubin, 1997). The study on drivers of ALC assumes importance as to resolve the problems related to ALC in different countries.

ALC is a major concern in Kerala. It is known for its land scarcity as its percapita availability of land is one of the lowest in the country (0.069 ha/ in 2010). In comparison with the other states in India, the agricultural land declines at faster pace in Kerala. At the same time, the land under Non-agricultural uses is increasing steadily (GOI, 2010). The struggle of redistribution of land has not ended even after half a century after the land reforms. The number of landless people are increasing unlike other parts of the country. However its development plans are in such a way which gives more focus on service sector development that augments ALC. Besides, the paddy land conversion, though it is legally banned, continues unabated.

This gives rise to the degradation and depletion of such ecosystem, which raises concerns of not only the food security of the state but also its ecological balance. This also gives rise to socio-economic problems such as unemployment, poverty and displacement of people from land.

The factors affecting this land use change has been a major concern of different countries in order to restrict agricultural land conversion and to preserve it for agricultural production. Understanding of the drivers that led to a land use change and the factors that influence the systems sustainability is useful to guide appropriate targeting of intervention strategies for improvement (Ebanyat et al., 2010). A pro-ruralist approach that is protection of agricultural land is more rational and rewarding than a pro-urbanist view, especially in Kerala. Moreover, there is fundamental difference in the conversion of agricultural land in Kerala with the rest of India and the world, where land conversion is the product of economic growth of the country. Economic growth in these countries was brought out by industrialization and urbanization and during this growth process, these countries were very cautious about the preservation of agricultural land so that their food security may not be affected. Whereas in Kerala, the agricultural land conversion is caused by commodification of land which is caused by migration and the resultant remittances that is pumped into land which made land as a commodity and the developmental process in Kerala is neither based on industry nor agriculture but a migration induced development which cater to the needs of migrants. This has put more pressure on land. And the consequences of this will be greater once the migration and the remittances stop. The service sector growth pushed by remittances may not be able to sustain the economic growth in the long run and will face a crisis. It is in this context we explore the drivers of ALC in Kerala.

This paper has been arranged in the following manner. In the second section, the data, variable description, sources of variables and the methodology are described. In the third section, the nature of land conversion is analyzed using data on agricultural land and non-agricultural land to prove agricultural land conversion. Fourth section mainly concentrates on the interplay of drivers with regard to Kerala and on the basis of this, a correlation matrix and regression analysis are employed for finding out the drivers of ALC. The fifth section concludes the entire analysis with policy recommendations.

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2. Data and Variable Description

Table 1 Data and Variable Description

Variables	Description of Variables	Source
Agricultural Land (AL),Land under non-agricultural uses (LNA), Barren and unculturable Land (BUL), Permanent Pastures and Other Grazing Land (PPOGL) Total Uncultivated Area minus Forest (TUL-F)	AL includes all the cultivable land, LNA includes all land occupied by buildings, roads and railways or under water, e.g. rivers and canals, and other land put to uses other than agriculture.	Directorate of Economics and Statistics, Ministry of Agriculture, Government of India from 1979-2010-11
Remittances, Urbanization, agricultural income, Density of population, Construction, and Service Sector GSDP.	These are variables hypothesized as drivers of agricultural land conversion in Kerala. The data has been interpolated for remittances, density of population, and urbanization for the analysis	Directorate of Economics and Statistics, Government of Kerala from 1979-2010-11

2.1 Methodology

In order to examine the agricultural land conversion, first a graphical presentation on Agricultural Land (AL) and Land put under Non-agricultural uses (LNA) Barren and Unculturable Land (BUL), Permanent Pastures and Other Grazing Lands (PPOGL) has been made. After which the share of AL and LNA out of the Total Geographical Area Reported was calculated for Kerala and India. A trend growth rate has been calculated to prove agricultural land conversion. A regression analysis is attempted to find out the major drivers of agricultural land conversion. The time series data on urbanization, remittances, population density, service sector GSDP, construction GSDP and the share of agricultural income has been used as independent variables and the dependent variable is taken as the share of land under non-agricultural uses. Before using regression analysis, an association matrix has been calculated to find out the interplay of these drivers of agricultural land conversion. The interplay of endogenous and exogenous drivers in the context of Kerala is depicted in a chart 1. The period of study covers from late 1970 to 2010, since a decline in agricultural land in absolute numbers has been observed from 1979 onwards and the proposed drivers such as migration (which has begun in early 1970s) and the resultant remittances and its impact have been felt from late 1970s onwards.

3. Non-Agricultural Uses of Land vs. Agricultural Land

The analysis of these two categories of data and a comparison between Kerala with All India is given in Table 2.

TABLE 2 Percentage Share of Agri cultural and Non-agricultural Uses of Land in Kerala and All India

Year	Land under Non-Agricultural Uses in Kerala	Land under Non-Agricultural Uses in India	Agricultural Land in Kerala	Agricultural Land in India
1960-61	5.3	5	62.2	60.2
1970-71	7.1	5.4	63	59.9
1980-81	6.9	6.4	62.9	60.9
1990-91	7.7	6.9	63	60.7
2000-01	9.8	7.8	61.6	60.1
2010-11	12.6	8.7	59	59.5

Source: Computed from the land use data given by DES, Ministry of Agriculture, Government of India.

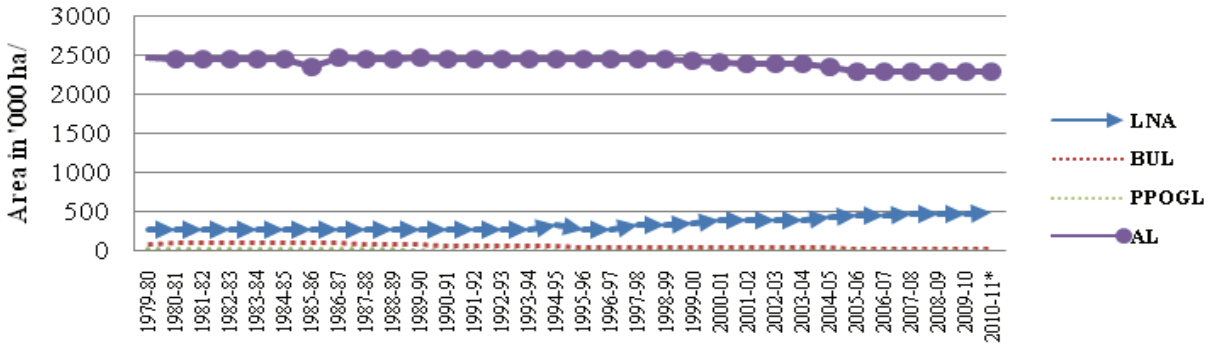
The data reveals that, the share of Land put under Non-Agricultural uses (LNA) was 5.3 percent in 1960 which increased to 7.1 percent in 1970s. Whereas, at all India level, it was just 5 percent of total geographical area in 1960s and it increases mildly to 5.4 percent in 1970. From 1990s, the share of LNA increased from 7.7 percent to 12.6 percent in 2010-11 in Kerala, whereas in India, in 2010-11, only 8.7 percent of the total geographical area of the country is put under non-agricultural uses. This shows that compared to All India level, land conversion

is occurring at faster pace in Kerala. The share of Agricultural Land (AL) in Kerala declined from 62.2 percent in 1960-61 to 59.0 percent in 2010-11, whereas in India, the decline was from 60.2 percent to 59.5 percent during the same period. This clearly shows that agricultural land conversion in Kerala is taking place the faster pace than at all India level.

3.1 Agricultural Land Conversion in Kerala

To find out the significance of ALC, the data on AL and other categories of land uses where a shift to non-agricultural uses can happen are also plotted together to know the dynamism of shift, and themits growth rates are analyzed. Though the official data does not capture the entire dynamism of shift, an attempt is made to understand and draw some conclusions related to shift in land use from agriculture to non-agriculture with the available data. This is shown in figure-1.

Figure 1 : Changes in Land use types



Source: MOSPI, GOI, LNA-Land under Non-Agricultural uses, BUL- Barren and unculturable Land, PPOGL- Permanent Pastures and Other Grazing Lands, AL-Agricultural Land (NAS+CF+FOCF+CW+LMTC)

The graph of the absolute data on AL, and LNA, shows that there is a decline in AL, BUL, PPOGL and a simultaneous increase in LNA. This shows that other things remaining the same, the increase in LNA is caused by AL, BUL and PPOGL. The trend growth rates are alsofound to besignificant concerning these land use categories. This is given in Table 3.

TABLE 3 GROWTH RATES IN LAND USES FROM 1979-2010

Land Use classification	Trend Growth
Agricultural Land	- 0.2***
Land under non-agricultural uses	2.1***
Barren and Unculturable Land	-5.1***
Permanent Pastures and Other Grazing Land	-13.1***
Total Uncultivated Area minus Forest	0.2***

Source: Calculated by the author, *** -significant at 1% level.

The calculated growth rate of these land use categories were found to be significant at 1% level. Table 3 shows that there is significant reduction in AL, which shows a shift of land use from agriculture to non-agricultural uses.Land under Non-Agriculture increases by 2.1 percent on an average every year. There has been a fastest decline in growth rates of BUL and PPOGL. This means that these lands got already converted to non-agricultural or agricultural uses. Once the remaining part of these lands is used up, then one can expect a fast decline in growth of AL. The total uncultivated land[1] minus forest also depicts the dynamism of shift in land use from agriculture to non-agriculture. It shows a significant increase in its growth by 0.2 percent per year. This land is more prone to non-agricultural uses as it is not cultivated.

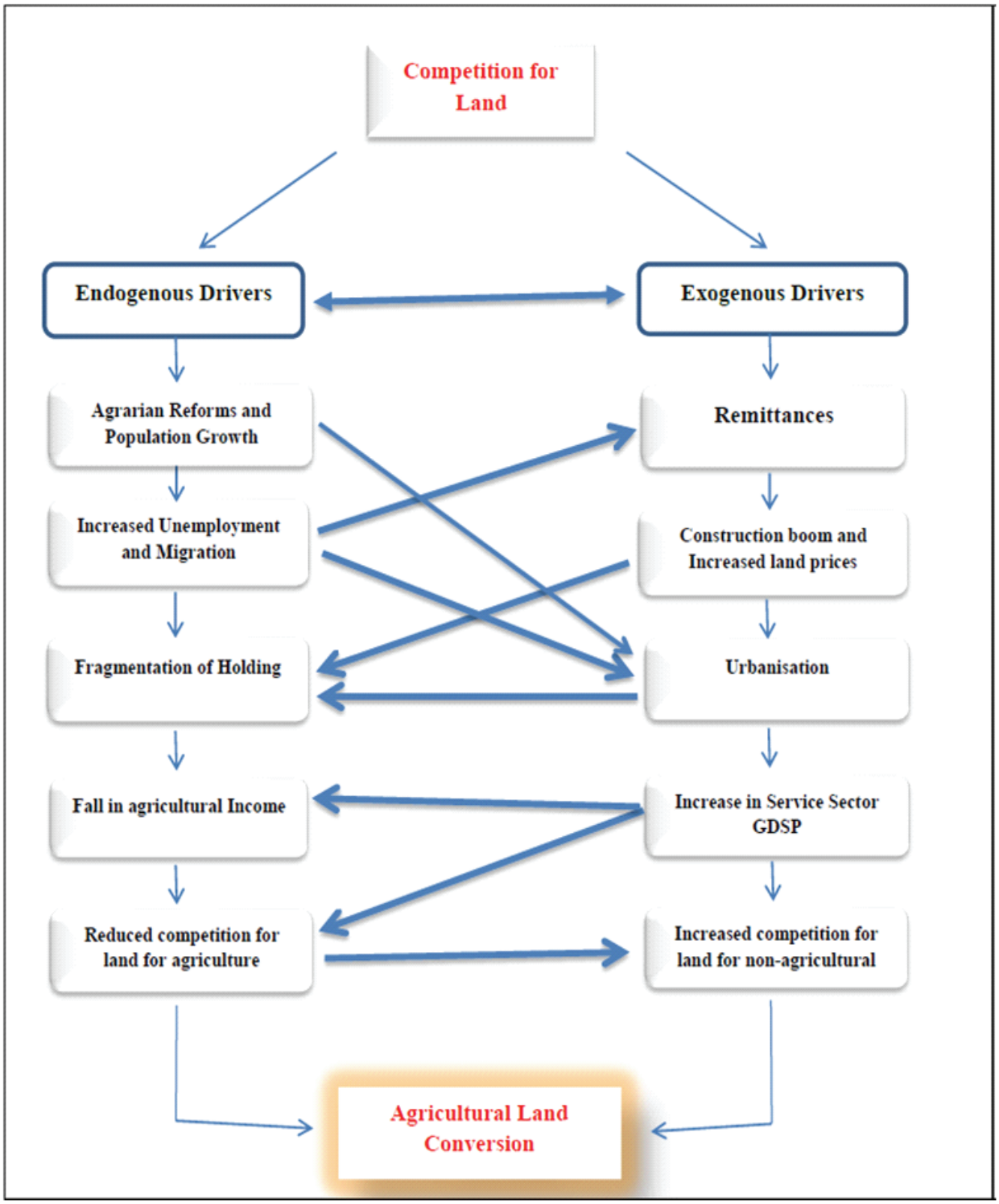
4. Interplay of Drivers in Agricultural Land Conversion

The land conversion from agriculture to non-agriculture has been caused by interplay of many factors triggered by competition for land. The competition for land is influenced by other drivers and pressures (Smith et.al, 2010). The drivers are mainly the underlying causes and the pressures are the direct causes. The drivers of competition for land are identified as i) socio-economic and technological factors, ii) societal trend and iii) institutional factors. The Socio-economic and technological factors include, technology, trade, macroeconomic and infrastructure investments, commodity price, demand changes and market failures. The societal trends include population growth, agricultural intensification, dietary preferences, non-food goods and services, urbanisation, economic development, migration

[1] Uncultivated land by definition is Total Geographical Area Reported minus cultivated land. Cultivated land includes Net Area Sown and Current Fallow. Fromthis cultivated land if we deduct land under forest, we will get the areas which are really prone to non-agricultural uses form the agricultural land. This includes agricultural land also such as FOCF, CW and LMTC. An increase in this land will show that there will be greater conversion in the future.

patterns and cultural factors. The institutional factors are land distribution, land tenure security, land policies, regulations and degree of illegality, institutional capacities and governance. The pressures are identified as natural causes, land transition and land degradation (ibid). In the case of Kerala, we categorize the factors influencing competition for land as endogenous, which means originating from within and exogenous factors which means originating from outside. The interplay of these factors is depicted in chart 1.

Chart 1 Interplay of Drivers of Agricultural Land Conversion



4.1 Endogenous/ supply side Drivers

The endogenous factors are those factors which are originating within the system. The most important endogenous factor driving the conversion of agricultural land to non-agricultural purpose is the decline in the agricultural income. The decline in agricultural income is the result of agrarian reforms which mainly aimed at giving land for all and did not emphasis on the economic size of land holding. The increased fragmentation due to partition of land and population pressure coupled with the enactment of Kerala Agricultural Workers Act, 1974, caused a fall in agricultural income. According to the Land Reform Survey of 1966-67, about 60 percent of the operational holdings were less than one acre size during 1966-67, and the implementation of the land reforms has obviously increased the percentage of operational holdings of less than one acre size and reduced the average size of holding per household as quoted by Radhakrishnan (1981). The new constraint of increased fragmentation of holding reduced the agricultural production and hence the agricultural income (ibid). The fragmentation continued during the coming decades. According to the 1970-71 Agricultural Census, Kerala had 2823 thousand holdings accounting for an operated area of 1606 thousand hectares. By 1976-77, there were 3501 thousand holdings with an operational area of 1719 thousand hectares, and by 1980-81, there were 4181 thousand holdings with an operational area of 1805 thousand hectares. As per the latest census of 2010-11, the operational holding is 5435 thousand holding with an operational area of 1187 thousand hectares (GOI, 2015). The average size of holdingsdeclined from 0.57 hectare in 1970-71 to 0.49 hectare in 1976-77 and further to 0.43 hectare in 1980-81 (George, 1986). The average size of holding at present is o.22 hectare (GOI, 2015). Moreover, the Agrarian Reforms actually benefited the rich tenants and not the agricultural and landless labourers as the latter category got a tiny piece of homestead land (Eswaran, 1990).The intermediary class who had already other source of income were not interested in agriculture. Those who desired to cultivate were really agricultural labourers but their employment scope within agriculture was almost limited and this led them to look for another source of livelihood (Eswaran, 1990). Apart from land reforms, there are other interlocking sets of historical factors such as commercialisation of agriculture, migration, modern education and salaried employment, demographic pressures have played a major role in the transformation of land ownership which led a marketization of land and made land as a speculative asset (Scaria, 2010). This reduced competition for land within agriculture. Hence, there was increased land transaction in which the supply comes mainly from farmers when income from farming are inadequate to maintain the land for agriculture purpose (Freshwater, 2009). The recent study on land market also showed that there are increased land transactions but land transacted for agriculture is less (Hari and Sumayya, 2009). The imperfect land rental market which leads to inefficient allocation of land, as it is argued that an economy with perfect land rental market, even the unskilled farmers who demand land simply as a store of value, can lease out them to be cultivated by skilled peasants which will increases the overall agricultural output and thus establishes efficient resource allocation (Assuncao (2005). The uses of land as a productive asset is being limited by supply scarcity and rising price of land which has affected not only agriculture and allied sector but also the industrial sector (see Harilal (2002) in Kumar, 2005). Amidst all these dynamism, lack of perspective plan to protect the agricultural land and the comprehensive long term plan and implementation for the development of agriculture, dwindled the competition of land for agricultural production.

4.2 Exogenous/Demand side factors

The existing slow rate of conversion of agricultural land during 1970s is reinforced by exodus of unemployed people to gulf and the remittances they brought or sent to their families. The impact of migration is felt in every aspect of life in the state such as social, political economical and even religious and almost all families seems to have affected by gulf migration (Zechariah et al., 2002). The major impact of migration was on housing sector. The studies revealed that the economic impact of migration was urbanization, as the return emigrants preferred to live in towns. (Zachariah and Rajan, 2011), Boom occurs in the construction industry, especially for residential houses and the increase in land prices due to it (Azeez and Begum, 2009). Besides these, the construction of international airports, especially those of Cochin and Calicut, and Kannur succumbed to the easy flight of migrants, the development in the commercial complexes such as jewellery outlets, hotels, and hospitals etc. during 1980s and 1990s are the visible signs of gulf migration that caused an increased competition for land for non-agricultural uses.

Moreover, the increase in vocational education and training opened up other institutions to provide the need based training to gulf migrants. The migration, especially after the economic reform period was to improve the economic status which gets reflected in their consumption standards, quality of housing property and income (Zachariah et al., 2002). The demonstration effect associated with migration as the non-migrants wanted to imitate the lifestyle of migrants to increase their standard of living. All these have increased the pace and rate of conversion of agricultural land. Thus, the major driver of ALC is remittances and instead of channelizing the remittances to productive ventures, such as development of agro-based industry which could have prevented land loss in agriculture, the state paved way for a migration induced development of Kerala as it is seen today.

4.3 Association between main Drivers

The drivers of non-agricultural uses of land have been examined by many scholars in different countries. The major drivers according to these studies have been urbanization and economic growth. Within India, the major cause of agricultural land conversion is due to the sale of agricultural land to non-agricultural purposes and smaller the size of land greater the chance for converting it to housing and other non-agricultural purpose (Mani and Pandey, 2000, Patil and Marothia, 2009). However, these studies do not look into the underlying drivers of agricultural land conversion. In Kerala, several micro studies have proved that brick manufacturing industries, mining, and real estate business have encroached agricultural lands, especially paddy lands (Devi et al., 1991; Sreenivasan, 2010; Suraj, 2013; Kannan et al., 2008). These studies also do not highlight the driving force behind the changes in land use from agriculture to non-agriculture. Interplay of many drivers causes agricultural land conversion in Kerala. Taking into consideration the dynamic role played by migration and the resultant remittances, we have hypothesized that as remittances increases, the non-agricultural land also increases in association with other variables such as urbanization, density of population, construction, service sector growth and the agricultural income. All the above variables except agricultural income are assumed to have a positive correlation with the land under non-agricultural uses. The agricultural income is said to have a negative association with LNA. The correlation matrix was computed to see their association among each other and also with LNA. We found that their correlation as expected with expected signs and all are highly significant. The correlation matrix is given in Table-4.

Table 4 Correlation Matrix of drivers of agricultural land conversion

	Remittances	Services GSDP	Construction GSDP	Density of Population	Share of Urban Population	Share of agricultural Income	Share LNA
Remittances	1						
Services GSDP	0.99***	1					
Construction GSDP	0.76***	0.76***	1				
Density of Population	0.88***	0.89***	0.78***	1			
Share of Urban Population	0.95***	0.96***	0.81***	0.90***	1		
Share of Agricultural Income	-0.86***	-0.87***	-0.79***	-0.96***	-0.89***	1	
Share of LNA	0.96***	0.97***	0.71***	0.93***	0.92***	-0.91***	1

Note:*** signifies significance at 1% level. The correlation matrix is calculated using Eviews. LNA means Land under Non-Agricultural uses and GSDP means Gross State Domestic Product calculated at 2004-05 constant prices. Share of Agricultural income also was calculated at 2004-05 constant prices.

All the variables have expected signs. It is interesting to note that there is a very high positive correlation between remittances and service sector GSDP (0.99). This reveals that increasing remittances is associated with increase in service sector GSDP as it is explained above. The remittances helped the growth of trade, hotels and restaurants, transport, finance and real estate sectors, led to the growth of education and health sectors most of these are in private sector (George, 2011). The highest correlation is seen among these two variables.

The density of population is also highly correlated with remittances (r= 0.88) but not as much as with service sector GDSP. A high correlation of remittances with urban share of population (r = 0.95) which also gives a hint that the urbanization is associated with remittances. Migration helped in urbanization as villages were transformed into small towns with travel agencies, gold jewellery shops, video libraries and small department stores and vehicles too increases (Kurien, 2008). This also brings out the characteristics of urbanization in Kerala which do not have any industrial base. Urbanization, Service sector GSDP, and remittances are the variables which shows highest positive association (r> 0.9). This reveals that all these variables reinforce each other byinfluencing the growth of the other positively. Among these variables, several studies on migration have found that remittances play a key role in economic and social development of Kerala. Hence remittances are taken as key driver of ALC.

The second important driver has been identified as share of agricultural income in GSDP There is a negative correlation between the share of agricultural income and all other variables. But the highest negative correlation

was found between share of agricultural income and the density of population (r= -0.97). As it is well known fact that as density of population increases, the fragmentation of holdings increases and the Percapita availability of agricultural land falls. The fragmented land becomes unviable for cultivation and as a result, agricultural income falls. Moreover, fall in agricultural income motivates people to sell their land or use it for other purposes other than agriculture. A high correlation is also seen between construction and density of population (r=0.76). A major contribution of states income in the industrial sector comes from construction. This analysis of the association between independent and dependent variable is useful for the purpose of regression analysis.

From the above analysis of the correlation matrix, we have dropped those variables which have very high correlation among themselves, such as urbanization & service sector GSDP. Since some variables have very high correlation with dependent variable, we have hypothesized that four major factors causes a diversion of land from agriculture to non-agriculture. They are remittances, share of agricultural income, density of population and construction. Due to a very high correlation between density of population and share of agricultural income, we have analysed their causation (of agricultural income and density of population taking density of population as an independent variable) separately. The Regression model is given in section 4.4 and the results are given in Table 5.

4.4 Multiple Regression Analysis

(l) $Y = a + b_1X_1 + b_2 X_2 + b_3 X_3 + + b_4 X_4 + U$ where

Y = Share of non-agricultural land in Total Geographical Area Reported

X_1 = Remittances

X_2 = Share of Agricultural Income

X_3 = Construction GSDP

X_4 = Density of Population

TABLE 5 DRIVERS OF NON-AGRICULTURAL USES OF LAND KERALA 1979-2010: REGRESSION COEFFICIENTS

Models	Dependent variable	Intercept	Remitt-ances	Share of Agricultural income	Construc-tion	AR(1)	AR(2)	R-squared	D-W Stat	F-Stat
	LNA		X1	X2	X3					
1	Y	9.28	0.0001***	-0.06***	-0.0000004	0.97***	-0.4	0.98	1.9	323.4
	t-stat	(-15.99)	(-8.95)	(-3.44)	(-1.44)	-4.94	(-1.75)			
		Intercept	Population Density (X4)							
2	Y=X2	-24.2	0.04			0.8***	0.06	0.98	2.0	487.4
	t- stat	-12	-3.08			-4.2	-0.36			

Note: LNA means the Land under Non-Agricultural uses, *** signifies the regression coefficients are significant at 1% level and figures in parentheses are t-stat

The important endogenous driver which causes the land use shift from agriculture to non-agriculture is the due to unprofitable nature of cultivation and the resultant fall in agricultural income which is captured through X2. As income falls by 1 percent there is on an average increase in the share of LNA by 0.06 percent. Agricultural income share is affected by density of population on an average by 0.04 percent. The fragmentation of holdings caused by density of population could have been compensated through an increase in productivity of crops. Nevertheless, despite of a very high productivity of rice in Kerala which is second next to Punjab (Kannan, 2011) the people prefer to keep it fallow as the income from paddy cannot overcome the cost of production.

The other variable which has become highly significant in influencing non-agricultural uses of land is the remittances. The increase in remittances causes agricultural land conversion to the extent of 0.0001 percent on an average. This seems to be a very small amount of conversion. This may be due to the data which is taken as a proxy for agricultural land conversion. The LNA does not capture the entire dynamism of change as the share of LNA in total geographical area increases very mildly. However, since it has become highly significant, one can confidently say that the most important exogenous driving force in the non-agricultural land use is the remittances. Though there is construction boom in Kerala, the variable construction GSDP has not found significant in our analysis. This could be attributed to the strong remittances effect on construction sector.

5. Conclusions and Policy Implications

The study mainly analysed the agricultural land conversion in Kerala and its major drivers. The agricultural land conversion is justified by analysing the growth rate of AL and LNA. The positive growth rate of LNA and negative growth rate of AL prove the occurrence agricultural land

conversion in Kerala. The correlation matrix shows a positive and significant correlation between variables such as, remittance, urbanisation, service sector GSDP, construction GSDP, and density of population and a negative relation of all these variables with share of agricultural income. The Regression analysis result shows that the major drivers of ALC are fall in agricultural income and remittances along with the interplay of other factors that affect the competition for land. These variables are classified as endogenous and exogenous variables, respectively. The factors that affect the fall in agricultural income are mainly the agrarian reform measures coupled with density of population which led to an increased fragmentation of holding and made the cultivation unviable. A separate regression analysis is done to show the causation of fall in agricultural income as a result of density of population. It is found to be highly significant. The major exogenous driver which played a dynamic role in the development of Kerala economy is remittances. The effect of remittances in the agricultural land conversion is positive and significant.

Since the most important resource of the economy is lost in pursuit of lopsided developmental policies that rely on service sector development and this is triggered by remittances, this study suggests the following measures for the preservation of agricultural land and prevention of land conversion to non-agricultural purposes. Kerala still has high potential for agricultural growth and development provided food crops also given immense attention through incentives just like non-food crops. An agricultural preservation policy will be more favourable than a prevention policy as we see that laws against paddy land conversion do not stop people from it rather it promotes illegal dealings. Like in developed countries that were successful in managing their urbanisation process, proper management and planning may restrict the agricultural land conversion, otherwise the remaining agricultural land also will be soon made unviable for cultivation. Since construction of residential housing has become a status symbol for any family, large area is consumed for it. So revised housing policy only can control the conversion of agricultural land to residential purposes. The remittances could be channelled for productive investment and employment creation within the state especially in agro-based industries. This will create market for agricultural commodities, and may reduce the construction boom and asset creation in buying land for unproductive purposes. A blend of policies to make agriculture a status job by encouraging the emigrants and returned emigrants to invest in agriculture which could increase the competition for land for agricultural and other productive purposes.

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Economics of production and marketing of maize in western Maharashtra

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Abstract

The present investigation is attempted to study the resource use structure, estimate the cost of cultivation and the marketing of maize in western Maharashtra. For this purpose, 90 farmers were selected from western Maharashtra. The data related to the Agricultural year 2014-15 was taken for the present study. The sample farmers were classified into three size groups of holdings i. e., small, medium and large. The findings of the study showed that Cost 'C' was the highest in large size group (Rs. 48795.57) followed by medium (Rs. 45311.31) and small (Rs. 44869.23) size groups, respectively. It can be revealed from the above discussion that the pattern of cost on various items of cost of cultivation was comparatively less in medium size group but more or less similar among the other size groups of holdings.

The benefit cost ratio at overall level was 1.11. However it was maximum in small size (1.16) and minimum in large size group (1.04). In all two important marketing channels were observed in the study area for maize marketing. Majority (63.71 %) of maize producer sold their produce through Ist marketing channel i. e. Producer Local trader Commission agent Wholesaler Retailer Consumer. It is followed by channel II (28.81 %). Per quintal price realized by the maize growers ranged from Rs. 931.25 and 911.11 in different two marketing channels.

Introduction

In India, maize is the third most important food crops after rice and wheat. According to advance estimate it is cultivated in 8.7m ha (2010-11) mainly during kharif season which covers 80% area. The predominant maize growing states that contributes more than 80 % of the total maize production are Andhra Pradesh (20.9 %), Karnataka (16.5%), Rajasthan (9.9 %), Maharashtra (9.1%), Bihar (8.9%), Uttar Pradesh (6.1 %), Madhya Pradesh (5.7 %), Himachal Pradesh (4.4 %).

Maize is a short duration crop which is adaptable to a wide range of agroclimatic situations, having high yield potential, suitable for cultivation in all seasons, due to its day neutral nature and can fit well in various inter and sequence cropping systems.

The demand for maize crop is increasing very tremendously therefore it is felt necessary to study the various reasons behind it; looking to the above the present study is undertaken with the following objectives to study the input utilization for cultivation of maize, to study the costs, returns and profitability of maize, to study the marketing channels and marketing cost of maize and to study the problems in production and marketing of maize and suggest the remedial measures.

Methodology

The study was based on secondary data collected in the CPMCC scheme, Department of Agricultural Economics, MPKV, Rahuri. On the basis of size of operational holding, the maize cultivators categorized into three size groups as small (below 2.00 ha.), medium (2.00 to 4.00 ha.) and large (4.01 ha. and above). In all 90 cultivators, were selected randomly, comprising 30 each from small, medium and large size group of holdings. The secondary data thus, collected was compiled and analyzed to fulfill the objectives of the present study. The data were analyzed by using simple tabular method.

Results

Input utilization on maize farms

Input utilized for production of maize and its prices on three different size groups of holdings for the years 2014-15 were worked out and the average is presented in Table 1.

Resource use structure of maize revealed that, the seed utilized at the overall level was 16.10 kg/ha for the study period. The human labour utilized per hectare was 76.23 man-days. The bullock labour use was 5.44 pair days/ha and utilization of machine power was 9.91 hrs/ha. The maize farms have applied 9.50 quintals of organic manure per hectare. The average nitrogen utilized by the farms was 91.10 kg/ha, whereas phosphorus used was 55.91 kg/ha and potassic fertilizer applied by the farms was 12.56 kg/ha. The average output of maize was 37.44 q/ha.

The study on maize pointed out that, increase in the use of family human labour was observed with increase in the size group of holdings, indicating economies of scale, while decrease in use of resources like machine labour was noticed with increase in size group of holdings. Higher level of input utilization was observed in case of family human labour, organic manure and nitrogenous fertilizers on medium size group of holdings.

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TABLE 1 INPUT UTILIZATION ON MAIZE FARMS.

(PER HA)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
A	Inputs				
1	Area (ha)	4.87	5.06	5.13	15.06
2	Total Hired Labour (man-days)	28.86	36.19	33.20	32.80
	a) Male	12.25	12.67	16.87	13.97
	b) Female	16.61	23.52	16.33	18.83
3	Total Family Labour (man-days)	41.09	43.73	45.36	43.43
	a) Male	24.36	23.15	26.38	24.64
	b) Female	16.74	20.58	18.98	18.79
4	Total human labour	69.95	79.92	78.56	76.23
5	Bullock Power (pair-day)	4.95	4.55	6.80	5.44
6	Machine Power (hr)	10.55	10.04	9.16	9.91
7	Seed (kg/ha)	17.45	15.42	15.50	16.10
8	Organic manure (q)	5.95	7.11	15.20	9.50
9	Nitrogen (kg)	85.69	93.48	93.89	91.10
10	Phosphorus (kg)	54.00	60.47	53.22	55.91
11	Potassium (kg)	16.22	8.30	13.29	12.56
12	Output- yield (q/ha)	36.14	38.32	37.81	37.44

Per hectare cost of cultivation of maize

The per hectare cost of cultivation of maize was worked out by using standard cost concepts normally used in the farm management studies. The information on item wise cost of cultivation of maize for different size group of holdings is presented in the Table 2.

It is revealed from the table that at overall level, per hectare cost of cultivation of maize i.e. cost 'C' was worked out to be Rs. 46355.22. Among the different items of cost, the maximum were contributed by total human labour i.e. Rs. 13938.51 (30.08%) followed by rental value of land Rs. 8541.80 (18.43%). The other important items of cost were bullock labour (9.79 %), fertilizers (9.64 %) and seed (4.94 per cent). The expenditure on amount of machine labour, manures, irrigation cost, repairs, incidental charges, land revenue and interest on fixed capital was together worked out to be 13.84 per cent of the total cost of cultivation. The per quintal cost of production was Rs. 1238.07 and 37.44 qtls productivity level.

TABLE 2 PER HECTARE COST OF CULTIVATION OF MAIZE

(Figures in Rs.)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
1	2	3	4	5	6
1.	Hired labour				
a.	Male	2723.61 (6.07)	2875.89 (6.35)	3242.69 (6.65)	2951.59 (6.37)
b.	Female	2227.93 (4.79)	3083.40 (6.80)	2654.97 (5.48)	2660.82 (5.69)
2.	Bullock labour	5222.93 (11.64)	3450.16 (7.61)	4962.96 (10.17)	4538.64 (9.79)

1	2		3	4	5	6
3.	Machine labour		3266.94 (7.28)	3555.34 (7.85)	3749.51 (7.68)	3528.22 (7.61)
4.	Seed		2234.09 (4.98)	2328.06 (5.14)	2311.89 (4.74)	2292.16 (4.94)
5.	Manure		677.62 (1.51)	798.42 (1.76)	1241.72 (2.54)	910.36 (1.96)
6.	Fertilizer		3973.36 (8.86)	4519.44 (9.97)	4891.14 (10.02)	4469.47 (9.64)
7.	Irrigation charges		1143.19 (2.55)	1036.48 (2.29)	1361.05 (2.79)	1181.55 (2.55)
8.	Plant protection		98.56 (0.22)	142.29 (0.31)	107.21 (0.22)	116.20 (0.25)
9.	Repairs and incidental charges		1456.80 (3.25)	1473.56 (3.25)	927.85 (1.90)	1282.25 (2.77)
10.	Working capital		23024.70 (51.32)	23263.05 (51.34)	25451.00 (52.16)	23931.27 (51.63)
11.	Interest on working capital		1381.48 (3.08)	1395.78 (3.08)	1527.06 (3.13)	1435.88 (3.10)
12.	Depreciation on implements and machinery		1480.05 (3.30)	1464.32 (3.23)	1948.97 (3.99)	1634.50 (3.53)
13.	Land revenue and taxes		54.30 (0.12)	52.81 (0.12)	33.17 (0.07)	46.60 (0.10)
14.	Cost 'A'		25940.53 (57.81)	26175.97 (57.77)	28960.19 (59.35)	27048.24 (58.35)
15.	Interest on fixed capital @ 10 %		2391.97 (5.33)	2258.18 (4.98)	2662.25 (5.46)	2439.09 (5.26)
16.	Rental value of land		8602.44 (19.17)	8639.22 (19.07)	8388.14 (17.19)	8541.80 (18.43)
17.	Cost 'B'		36934.94 (82.32)	37073.36 (81.82)	40010.59 (82.00)	38029.13 (82.04)
18.	Family labour	Male	5232.62 (11.66)	5221.34 (11.52)	5882.41 (12.06)	5449.85 (11.76)
		Female	2702.67 (6.02)	3016.60 (6.66)	2902.58 (5.95)	2876.25 (6.20)
19.	Cost 'C'		44869.23 (100)	45311.31 (100)	48795.57 (100)	46355.22 (100)
20.	Yield value		51940.45	52152.17	50527.88	51530.41
21.	Per quintal cost		1241.55	1182.44	1290.52	1238.07

(Figures in the parentheses are the percentage to the total cost of cultivation)

The share of cost 'A' and Cost 'B' in the total cost of cultivation of maize at overall level was found to be Rs. 27048.24 (58.35 %) and Rs. 38029.13 (82.04 %), respectively. Among the different size groups, the cost 'A' was found to be highest in large size group (59.35 %) followed by small (57.81 %) and medium size group (57.77 %), respectively. The cost 'B' found to be highest in small size group (82.32 %) followed by large (82.00 %) and medium (81.82 %) size groups, respectively.

It is also observed from the table that the per hectare total output received at overall level was Rs. 51530.41. It was highest in medium size group (Rs. 52152.17) followed by small (Rs. 51940.45) and large (Rs. 50527.88) size group of holdings.

The per quintal cost of production of maize was worked out to be Rs. 1238.07 at overall level. Among the different size groups per quintal cost of production was minimum in medium size group and it was due to higher productivity.

Resource use gap on maize farms

Inputs play a significant role for boosting production of maize. The production of maize depends on judicious and balanced use of inputs. In the light of these specific relationships between inputs and output of maize, the data have been analyzed further to work out the gaps in the actual use of levels and recommended levels of inputs and resultant output of maize on per hectare basis on small, medium and large farms. The results obtained from the analysis are presented in Table 3.

It has been clearly indicated that less use in the seed quantity was observed than the recommended levels of inputs. Only in case of phosphorus fertilizer the excess use was observed on small and medium farms and all other inputs the less use was observed on all size groups of holdings. Notable gap was observed in use of manures, which was 82.20 per cent. In case of use of nitrogen, at the overall level the gap was 24.06 per cent, and in potash the gap was 66.77 per cent. In case of yield, there were near about 25 per cent less returns received due to the less use of inputs.

TABLE 3 RESOURCE USE GAP ON MAIZE FARMS.

(Per ha)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
I	Seed (kg)				
A	Recommended	18	18	18	18
B	Actual use	17.45	15.42	15.50	16.10
C	Gap	0.55	2.58	2.50	1.90
D	Per cent gap	3.03	14.36	13.91	10.54
II	Manure (qtls)				
A	Recommended	50	50	50	50
B	Actual use	5.95	7.11	15.20	9.50
C	Gap	44.05	42.89	34.80	40.50
D	Per cent gap	88.09	85.77	69.59	81.01
III	Nitrogen (kg)				
A	Recommended	120	120	120	120
B	Actual use	85.69	93.48	93.89	91.10
C	Gap	34.31	26.52	26.11	28.90
D	Per cent gap	28.59	22.10	21.76	24.06
IV	Phosphorus (kg)				
A	Recommended	60	60	60	60
B	Actual use	54.00	60.47	53.22	55.91
C	Gap	6.00	-0.47	6.78	4.09
D	Per cent gap	9.99	-0.79	11.30	6.81
V	Potash (kg)				
A	Recommended	40	40	40	40
B	Actual use	16.22	8.30	13.29	12.56
C	Gap	23.78	31.70	26.71	27.44
D	Per cent gap	59.45	79.25	66.77	68.59
VI	Yield (qtls)				
A	Recommended	50	50	50	50
B	Actual yield	36.14	38.32	37.81	37.44
C	Gap	13.86	11.68	12.19	12.56
D	Per cent gap	27.72	23.36	24.38	25.12

Costs and returns structure on maize farms.

Maize crop is considered as a heavy feeder among the other kharif food grain crops. The cost of cultivation of maize was worked out and the detailed costs and returns structure on different categories of maize farms and at the overall level for the years 2014-15 were examined and presented in Table 4.

TABLE 4 Costs and returns structure on maize farms

(Per ha)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
1	Total cost				
	i) Cost 'A'	25940.53	26175.97	28960.19	27048.24
	ii) Cost 'B'	36934.94	37073.36	40010.59	38029.13
	iii) Cost 'C'	44869.23	45311.31	48795.57	46355.22
2	Profit at				
	i) Cost 'A'	25999.92	25976.21	21567.68	24482.17
	ii) Cost 'B'	15005.51	15078.81	10517.29	13501.28
	iii) Cost 'C'	7071.22	6840.86	1732.30	5175.19
3	Gross income	51940.45	52152.17	50527.88	51530.41
4	B:C ratio				
	i) Cost 'A'	2.00	1.99	1.74	1.91
	ii) Cost 'B'	1.41	1.41	1.26	1.36
	iii) Cost 'C'	1.16	1.15	1.04	1.11

Costs and returns structure revealed that per hectare cost of cultivation of maize was Rs.44869.23, Rs.45311.31 and Rs.48795.57 on small, medium and large size group of holdings, respectively and it has decreased in medium size of holdings and increased in large size group of holdings and at the overall level it was Rs.46355.22. Gross income was Rs.51940.45, Rs.52152.17 and Rs.50527.88 on small, medium and large size group of holdings, respectively and at the overall level it was Rs.51530.41. The net profit at Cost 'C' was Rs.7071.22, Rs.6840.86 and Rs.1732.30 on small, medium and large size group of holdings, respectively and at the overall level it was Rs.5175.19. The benefit: cost ratio was in the range of 1.04 to 1.16 during the study period.

Marketing channels

Method of sale affects the efficiency of marketing and price spread in different channels. In local market, the produce was sold directly to consumer or through retailers to the consumer. In case of sale in the Agricultural Produce Market Committee markets the maize sold produce through commission agents, then commission agent on receipt of produce, arranges for sale in these markets through open auction method of sale. The marketing system for assembling and distribution of maize consisted of producer and other intermediaries are as below.

1. Producer-Wholesaler/Commission agent-Retailer-Consumer

2. Producer-Village trader - Retailer- Consumer.

In all two important marketing channels were observed in the study area for maize marketing. Majority (63.71 per cent) of maize producer sold their produce through Ist marketing channel i. e. Producer Local trader Commission agent Wholesaler Retailer Consumer. It is followed by channel II (28.81 per cent).

Marketing cost

The per quintal cost of marketing of maize incurred through different agencies is given in Table 5.

It is revealed from the table that the average marketing cost in channel-I was Rs. 90.63 and in channel-II Rs. 6.45. The major items of cost in the case of channel-I were commission charges (40.95 %), transport (43.41 %), packaging charges (6.90 %) and hamali (5.10 %).

TABLE 5 CHANNELWISE PER QUINTAL COST OF MARKETING OF MAIZE (RS.)

Sr. No.	Particulars	Channel-I	Channel-II
1.	Packaging charges	6.25 (6.90)	6.37 (98.76)
2.	Transportation	39.34 (43.41)	-
3.	Commission	37.11 (40.95)	-
4.	Weighing charges	2.72 (3.00)	-
5.	Hamali	4.62 (5.10)	-
6.	Market fee	0.54 (0.60)	-
7.	Losses during transit	0.05 (0.06)	0.08 (1.24)
	Total market cost	90.63 (100)	6.45 (100)

(Figures in the parentheses indicate the percentage to the respective total)

In the case of channel-II the total marketing cost formed grading and packaging charges to an extent of 98.76 per cent, losses during transit with 1.24 per cent.

Marketing costs, marketing margins and price spread in different marketing channels.

Maize crop is considered as a heavy feeder among the other kharif food grain crops. The marketing costs, marketing margins and price spread in different marketing channels of maize was worked out and the detailed were presented in Table 6.

TABLE 6 MARKETING COSTS, MARKETING MARGINS AND PRICE SPREAD IN DIFFERENT MARKETING CHANNELS. (FIG. IN RS./QTLS)

Sr. No.	Particulars	Channels	
		I	II
1	2	3	4
1.	Producer		
a.	Gross price received	931.25 (74.59)	911.11 (89.71)
b.	Cost incurred	42.60 (3.41)	33.11 (3.25)
c.	Net price received	888.65 (71.18)	878.00 (86.45)
2.	Local trader		
a.	Price received	888.65 (71.18)	
b.	Cost incurred	31.50 (2.52)	
c.	Margin	41.92 (3.36)	
3.	Commission agent		
a.	Price received	962.07 (77.06)	
b.	Cost incurred	36.37 (2.91)	
c.	Margin	52.23 (4.18)	
4.	Wholesaler		
a.	Price received	1050.68 (84.16)	
b.	Cost incurred	40.90 (3.28)	
c.	Margin	56.99 (4.57)	
5.	Retailer		
a.	Price received	1133.08 (90.76)	878.00 (86.45)
b.	Cost incurred	46.91 (3.76)	36.25 (3.58)
c.	Margin	68.44 (5.48)	101.32 (9.98)
6.	Consumers' price	1248.42 (100)	1015.67 (100)
7.	Total marketing cost+ commission of intermediaries	386.38 (30.95)	170.68 (16.80)
8.	Producers share in consumers' rupee (%)	68.24	86.45

(Figures in parentheses indicates percentage to the consumers' price)

It is revealed from the table that, per quintal price realized by the maize growers ranged from Rs. 931.25 and 911.11 in different two marketing channels. The highest net price was received in channel-I. The producers share in consumers rupee was the highest (86.45 per cent) in channel II and the lowest (68.24 per cent) in channel I, it was due to higher marketing cost and commission of intermediaries. Up to 32 per cent share of consumer's rupee was galloped by the intermediaries in marketing of maize and the producers share in consumer's rupee was up to 68 per cent only.

Conclusions

1. Cost 'C' was the highest in large size group (Rs. 48795.57) followed by medium (Rs. 45311.31) and small (Rs. 44869.23) size groups, respectively. It can be revealed from the above discussion that the pattern of cost on various items of cost of cultivation was comparatively less in medium size group but more or less similar among the other size groups of holdings.
2. The benefit cost ratio at overall level was 1.11. However it was maximum in small size (1.16) and minimum in large size group (1.04)
3. In all two important marketing channels were observed in the study area for maize marketing. Majority (63.71 per cent) of maize producer sold their produce through Ist marketing channel *i. e.* Producer Local trader Commission agent Wholesaler Retailer

Consumer. It is followed by channel II (28.81 per cent).

4. Per quintal price realized by the maize growers ranged from Rs. 931.25 and 911.11 in different two marketing channels. The highest net price was received in channel-I. The producers share in consumers rupee was the highest (86.45 per cent) in channel II and the lowest (68.24 per cent) in channel I, it was due to higher marketing cost and commission of intermediaries.

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White Stem Borer(WSB) in Western Ghats and shifts towards Robusta coffee: Evidences from a recent household survey of Arabica coffee growers in Kodagu district of Karnataka state

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Abstract

The coffee growing regions in the Western Ghats are witnessing a major shift from Arabica to Robusta cultivation over the past few years. This paper analyses the major causes for the shift by using a newly collected sample survey data of 60 Arabica coffee growers in Kodagu district. Among the interviewed growers, about 68.33 per cent of growerswere shifting towards Robusta, while about 21.67 per cent of growers were willing to shift, but unable to shift towards Robusta. However about 10 per cent of growers were not willing to shift towards Robusta, despite several constraints. Among the growers shifting towards Robusta, about 90 per cent of them opinioned that White Stem Borer (WSB) was the major cause for the shift. Henceforth, this paper focuses on White Stem Borer (WSB), currently a major pest in Indian Arabica.Though the occurrences of WSB are universal in all Arabica growing regions, the incidence varied across the estates,while the severity of incidence was found to be increasing over the years.The Mean average annual reduction in yield due to WSB was about 20 per cent, while the average uprooting of plants being 60 plants per acre in individual estates.Further on,the major factors responsible for WSB attack were analyzed. Among the environmental factors, about 47 per cent of growers opinioned the rise in temperature as a major cause for WSB attack, while about 35 per cent growers' opinionederratic rainfall followed by lower elevation (18 per cent)as the major factors responsible for WSB attack. It was interesting to note that the incidence of White Stem Borer(WSB) was severe in estates located at Lower Elevation (LE) and Low Rainfall (LR) regions.About 20 per cent of the estates lyingin these regions experienced very high incidence of borer attack, wherein the uprooting of plants varied between 50-100 plants per acre. However, the incidence of borer attack was found to be low in estates located High Elevation (HE) and Medium Rainfall (MR) regions. Among the management conditions, about 30 per cent of growers opinioned the maximum spreads of WSB were through the neglected neighboring estates and improper management of shades (24 per cent) and Ineffective Control Measures (24 per cent). The control of WSB included both cultural and chemical controls.The cultural costs increased with the incidence of attack, ranging between Rs.268 to Rs.3000 per acre. The average chemical costs for WSB control were estimated to be Rs.6930 per hectare.The study has suggested that inter-countries combined and co-ordinated research for WSB control, combination of antixenosis and antibiosis characters in coffee, biological insecticides could also prove effective. Besides, proper training for cultural control would turn effective.The overall results show that currentlyWSB had a very strong impact on Arabica productivity, resulting in net reduction in growers' income whoare thereby shifting towards lower cost Robusta cultivation. At a macro level, this shift could handicap the country's overall Arabica production.

Keywords: Coffee White Stem Borer, shifts, environment, management, institutions.

1.1. Introduction

The Western Ghats of India is one of the 25 biodiversity hotspots of the world (Myers et al., 2000) which traditionally supports cultivation of coffee under the tropical shade (Bali et al., 2007), while also contributes to 97 per cent of country's production. But over the recent years there has been a gradual shift from Arabica to Robusta coffee in the region to an extent that the much demanded Arabica variety coffee is under 'high risk of extinction' (Davis et et al., 2012).The Arabica coffee isconsidered to have a higher cup quality than Robusta. Factually, the lesser caffeine content (0.9 to 1.7%) of Arabica, high bean qualities, milder taste and fine cup qualities reflect superior qualities than Robusta (Belachew, 2003), making Arabica varietyexclusive for nearly all 'specialty coffee' (Davis etet al., 2012). Nonetheless, prices of Arabica remain relatively higher than Robusta (Blackman., 2010 & Fig.1).

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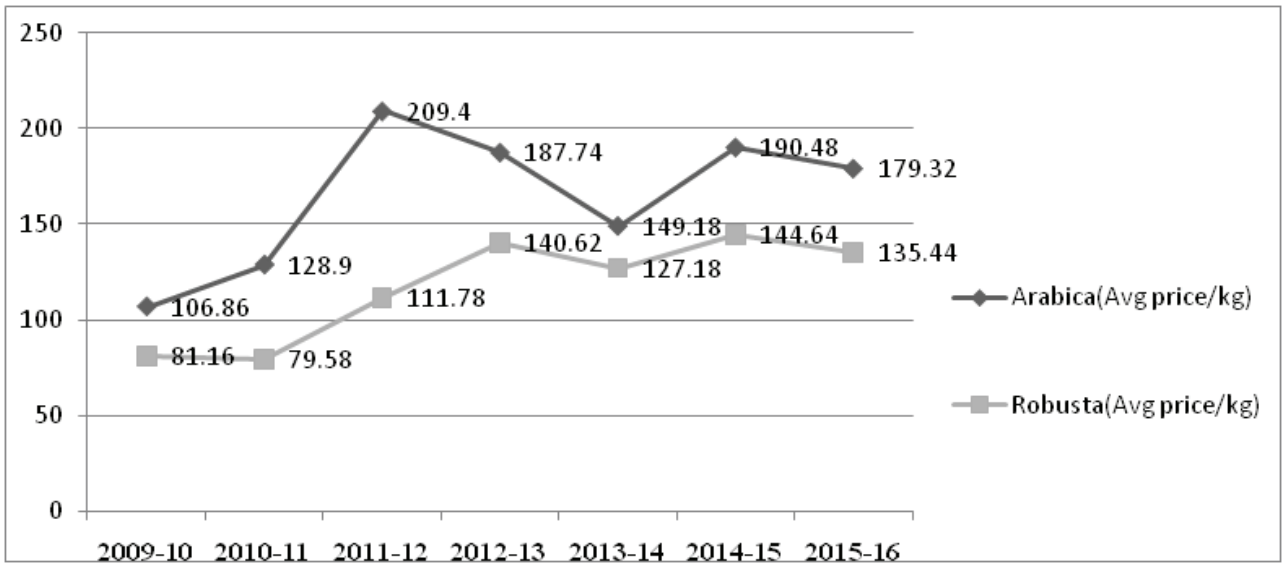
Fig1: Average price of Arabica and Robusta over the years (Rs/kg)



(Source: Coffee Board of India, 2015)

1.2 Structural shift from Arabica to Robusta in Kodagu district

Historically, Kodagu district was an Arabica growing region (Leroy et al., 2011). But over a period of time the district had witnessed a gradual shift from Arabica to Robusta (Table 1). The Arabica coffee which contributed to about 21 per cent of total district's production in 2008-09, drastically reduced to merely 14 per cent in 2014-15. The Compound Average Growth Rate (CAGR) of Arabica production in the district during this period being negative (-6%).While, the area under Arabica reduced from 27.90 per cent to 26.65 per cent from 2008-09 to 2014-15. Likewise, at a macro-level, the Arabica production constituted for about 82 per cent of total country's production in 1950-51, reduced to merely 30 per cent in 2014-15 (Coffee Board, 2015). This gradual decline in Arabica production has alarmed the coffee scientists and growers, who fear extinction of Indian Arabica (Business standard, 2014). Taking the above factors into account, what are the reasons for such shifts? To what extent White Stem Borer is responsible for the shift? What are the factors responsible for borer attack in Arabica? What are the extra costs incurred for borer control? This paper finds plausible answers to these questions, which have important policy implications on strengthening our Arabica production.

Table1: Arabica to Robusta trend in Kodagu district over the years

Years	Arabica		Robusta	
	Area(ha)	%	Area(ha)	%
2008-09	28828	27.90	74497	72.10
2009-10	28803	27.81	74777	72.19
2010-11	28303	27.32	75277	72.68
2011-12	28053	26.77	76727	73.23
2012-13	27963	26.66	76927	73.34
2013-14	27963	26.66	76927	73.34
2014-15	27960	26.65	76953	73.35
	Production (tons)	%	Production (tons)	%
2008-09	24370	21.31	90000	78.69
2009-10	22,850	19.37	95,125	80.63
2010-11	20,900	19.09	88,600	80.91
2011-12	21,800	18.95	93,225	81.05
2012-13	22,025	17.75	102,075	82.25
2013-14	21,040	18.81	90,820	81.19
2014-15	18,030	14.76	104090	85.24

(Source: Coffee Board of India, 2015)

The performance of Indian Arabica is declining due to factors owing to higher costs of management, pests and diseases attack. Among the pests, White Stem Borer (Xylotrechusquadripes), a serious pest in India, as well as China, Vietnam and Thailand (Le Pelly, 1968), is currently haunting the Arabica coffee industry.The Coffee White Stem Borer (Xylotrechusquadripes), deadliest pest in Arabica was first reported in Mysore in 1838. As of today, the major source for decline in Arabica productivity is due to white stem borer (Business Standard, 2014); ranked to be number one and the major production constraint in Coffeaarabica(Murphy et al., 2008). The wide spread attack of this pest through years, subsequent uprooting of plants, thereby reduction in plant population and productivity, has resulted in huge cumulative revenue loss to the growers (Venkatesh, 2012). The reduction in yield of Arabica due to Stem Borer coupled with higher risks and cost of Arabica cultivation, due to which the growers are shifting towards Robusta, which has higher yield and lower cost Robusta cultivation (Deepika, 2013).

In India, the average estimated loss yield in individual estate is above 25 per cent, causing substantial annual economic losses of Rs.450million to the nation (Murphy et al., 2008).Subramaniam, 1943 estimated an average yield loss in heavily infested plantations could varying between 17.80 per cent to 20 per cent. However he notes that when integrated management practices are followed, losses could vary between 2.3 per cent to 12.50 per cent. (Radhakrishnan, 1987) report that removal of stem borer infested plants in India, even at the rate of one plant per ha, could cost a total loss to India at about US $642,585 per annum, while Venkatesha (2012) report annual economic losses to India as high as $17.5-26 million. As per the report of Hall (2006), *Xylotrechus quadripes* could cost an annual loss of $40 million for uprooting, replacement and production loss, destroying over nine million trees annually. Likewise, recent reports estimate that White Stem Borer (WSB) could cause a loss of about half a million Arabica plants per year for which the estimated loss is 1500 tonnes per annum in the country (Business line, 2015)

In Karnataka, during 2014, nearly about 3200 ha of coffee plantations were affected by White Stem Borer (Business Standard, 2014).About 50 per cent of Arabica estates in Karnataka are infested by WSB, while in Kodagu district significant yield loss of 35 per cent each year due to stem borer. Not able to bear the economic burden of White stem borer, several estates are being left neglected, without application of fertilizers, insecticides or any plant protection chemicals. Given the perennial nature of coffee, the crop losses could even reach to the extent of 93.60 per cent in plantations under poor management (Basavaraj et al., 2005), while the adverse impact of this pest could stay upto 5 years (Murphy et al., 2008). This has in turn majorly impacted the marginal and small growers, whose livelihoods depend on the production and income from coffee farming. Meanwhile, the Coffee Board also opinions that White Stem Borer has also remained a major threat in formulation of policies for promotion of Arabica.

1.3 Main objectives

With this background, the study attempts to understand the following:

- Factors responsible for the shift from Arabica to Robusta cultivation in Kodagu district.
- Taking into account the White Stem Borer (WSB) as a major cause for productivity decline in Arabica, the paper attempts to explore the underlying factors responsible for WSB attack.
- To analyze the extra costs incurred forWhite Stem Borer (WSB) control in Kodagu district.
- To understand the role of institutionsfor borer control and to draw some valid conclusions and policy implications.

1.4 Materials and methods

The study was undertaken in Kodagu district of the Western Ghats region of Karnataka state, popularly known as the 'coffee bowl' of India. The district alone contributes to about 38 per cent of country's coffee production. Besides, this sector provides direct employment to about 5 lakh people in India , out of which 2.54 lakh are in Kodagu alone (Bhagwat et al., 2008). This study is based on the field survey conducted in Kodagu during February-April, 2016, covering about 60 Arabica growers in the district. The growers were identified based on recommendations of Coffee Board and Kodagu Planters' Association (KPA), Madikeri. The secondary data pertaining to the study were collected from publications of Indian Coffee Board. The Compound Annual Growth Rate (CAGR) was calculated to understand the changes in coffee production over time. The paper is organized in the following order:

- Section 1 details the major shifts from Arabica to Robusta cultivation among the growers, opinion of growers to shift from Arabica to Robusta, willingness to shift and Non-shift towards Robusta
- Section 2 details the factors responsible for WSB attack in Kodagu district.
- Section 3 estimates the cultural and chemical costs incurred for bore control
- Section 4 describes institutional support for control of WSB
- Section 5 concludes and provides policy implications.

1.5 Major findings

1.5.1 Opinion of growers on shift, willingness to shift and non-shift towards Robusta

Table 2 summarizes the shift towards Robusta, in accordance to the size of land holdings. About 41 growers (68.33 per cent) of the interviewed growers were replanting Robusta plants in place of Arabica. Among them, about38.33 per cent (23 growers) belonged to the category of small growers, while about 30 per cent (18 growers) were large holders. However, about 21.67 per cent (13 growers) were willing to shift, but unable to shift towards Robusta, majority of them (18.33 per cent) were small growers, while only 3.34 per cent were large growers. Nonetheless about 10 per cent of the interviewed growers continued with Arabica cultivation alone, despite several constraints, however were not willing to shift towards Robusta.

TABLE 2: GROWERS SHIFT FROM ARABICA TO ROBUSTA (N=60)[1]

Variable	Shifting towards Robusta	Willing to shift, but unable to shift	No shift towards Robusta
Small(<10ha)	38.33	18.33	5.00
Large(>10ha)	30.00	3.34	5.00
Total	68.33	21.67	10.00

Source: Survey results.

An important part of this survey was also to understand the various factors responsible for this shift. A Five-point Liekert scale (strongly agreed received a ranking of 5, while strongly disagreed received a ranking of 1) was used to understand the factors responsible for the shift, non-shift and willingness to, but unable to shift among the Arabica growers.

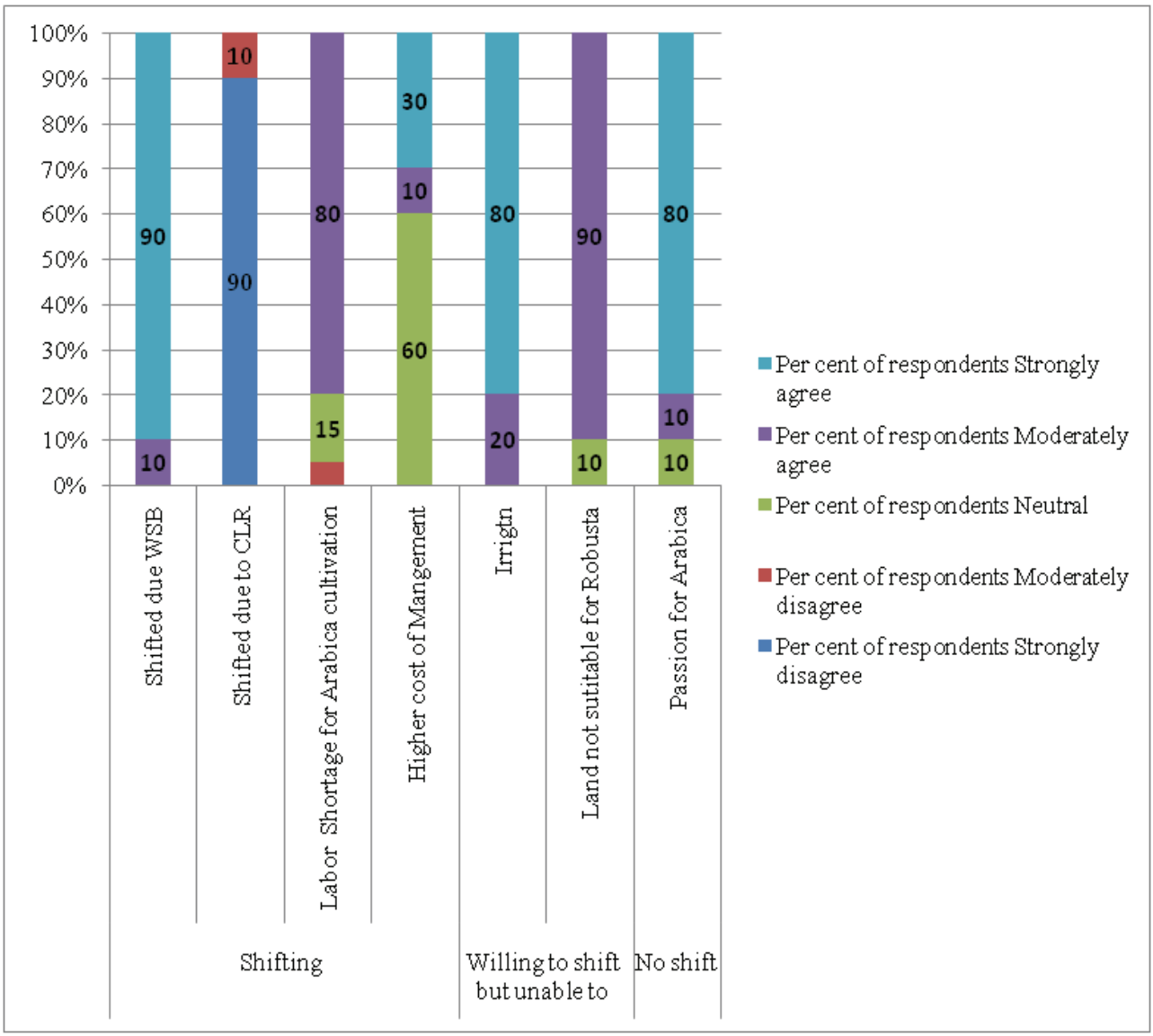
1.5.1.1 Opinion of Arabica growers towards shift towards Robusta

From the above discussion, it is evident that about 68.33 per cent of growers were shifting towards Robusta. As expected, White Stem Borer (Xylotrechusquadripes) was highly rated by the growers as number one, the major cause for the shift, ranked to be the major production constraint in Coffeaarabica. Among the growers shifting towards Robusta, about ninety per cent of them,strongly agreed that the heavy infestation of White Stem Borer in their estates with resultant heavy crop loss prompted them to shift towards Robusta (Fig.2). In our survey, the Arabica growers responded that an average annual yield loss due to WSB in individual estates were about 20 per cent, while the average uprooting being 60 plants per acre. The field visits in Kodagu, revealed that the higher incidences were observed in S.795 and Sln. 6 varieties of Arabica. Nonetheless, studies have shown that lower incidence of borer attack in Sln.5A variety of Arabica due to their inbuilt genetic tolerance for stem-borer (ICO, 2006). However, none of the respondents in our survey reported Sln.5A variety of Arabica cultivated in their estates. Thereby, growers in Kodagu should be encouraged to cultivate Sln.5A variety of Arabica.

Though Arabica variety is also more susceptible to a fungal disease Coffee Leaf Rust (CLR), caused by Hemileia vastatrix, the surveyed growers opinioned that currently CLR was under control due to regular application of Bordeaux mixture. Likewise, Narayana (2013a) findings imply that occurrence of CLR was decreasing in Kodagu. Overall most of the growers (about 90 per cent), who are shifting towards Robusta,strongly opinioned that CLR was not the reason for the shift. Further on, about 80 per cent of interviewed growers moderately asserted that the shortage of 'skilled' labor force had also paralyzed the Arabica plantation in Kodagu, while about 15 per cent of growers took a neutral stand in this regard. The severe shortage of labor force, despite hike in wage rates have also prompted the Arabica growers to search for alternative solutions by substituting with Robusta in place of Arabica , as the Robusta cultivation require lesser requirement of labor (Fig.2). About 30 per cent of growers strongly agreed that higher cost incurred in Arabica cultivation in comparison to Robusta induced them to shift towards Robusta which has fairly lower production costs. However, about 60 per cent of interviewed growers took a neutral stand in this regard (Fig.2). Nonetheless, whatever may be the factors responsible for the shift, it is certainly the concern for the entire coffee industry, as they fear it's extinction in near future. Not only in Kodagu, even at inter-continental level, scientists' estimate global extinction of Arabica by the next 70 yrs(Plat, 2012).

[1]Note: All figures refer to share (%) of farmers to total sample size. For instance 38.33 means that 38.33 per cent of 60 Arabica growers in Kodagu district. N refers to total sample size[1]

Fig.2: Opinion of Arabica growers on shifting towards Robusta, willingness to shift but unable to shift and non-shift towards Robusta

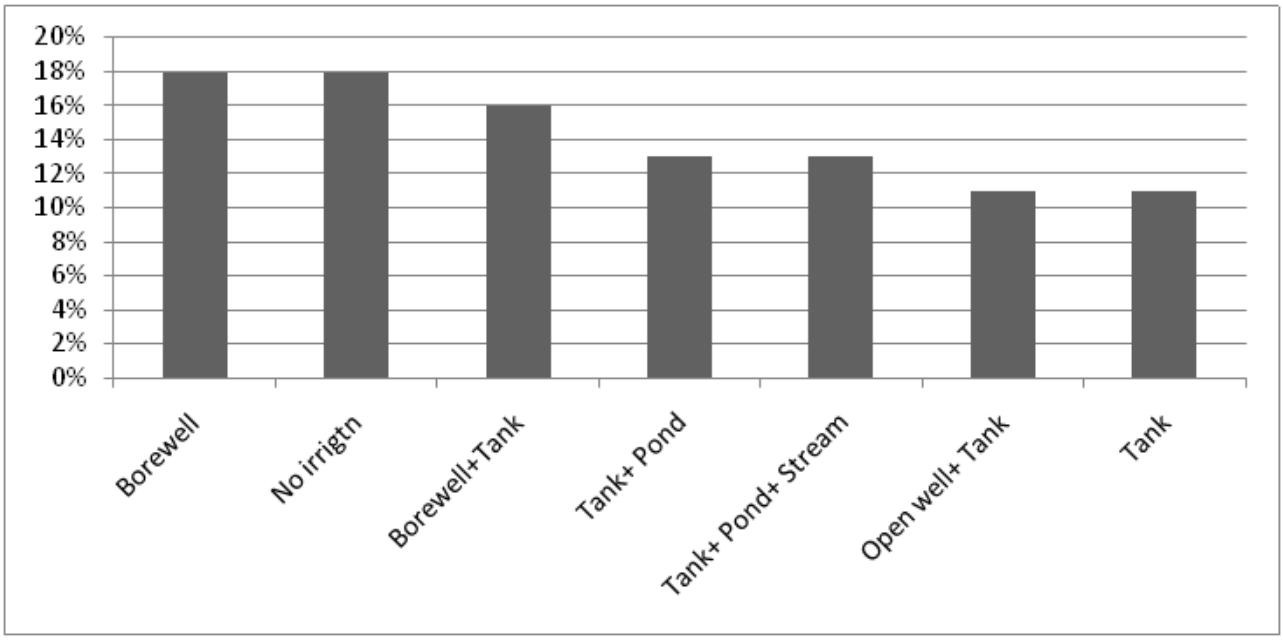


(Source: Survey results)

1.5.1.2 Opinions of growers regarding willing to shift, but unable to shift towards Robusta

As discussed earlier, about 21.67 per cent of the interviewed growers were willing to shift to Robusta, but unable to shift. Among them about 80 per cent of growers strongly agreed that lack of irrigation facilities in their estates constrained them to shift for Robusta, as water requirements for Robusta was very high. In contrast, Arabica being drought tolerant crop required less irrigation requirement than Robusta(Titus, 2011). Even so, our house hold survey indicated that bore wells and tanks were the major sources of irrigation in the study region. However about 18 per cent of growers largely relied on rainfall (Fig 3), with no alternative sources of irrigation. This was specifically pre-dominant in Northeastern belt of Somwarpet, wherein the mean annual rainfall was found to be scanty viz., about 65 inches per year. Though the Arabica growers in this region have constructed tanks for the purpose of irrigating coffee, however were unsuccessful in irrigating as they were not able to gather sufficient water in their tanks. Furthermore, the Arabica growers who had no tanks sank bore-wells, in turn exploiting the ground water table. Apart from this, about 90 per cent of themmoderately agreed their land unsuitable for Robusta cultivation.

Fig 3: Sources of irrigation among sample farmer households



(Source: Survey results)

1.5.1.3 Opinions of growers over non-shift towards Robusta

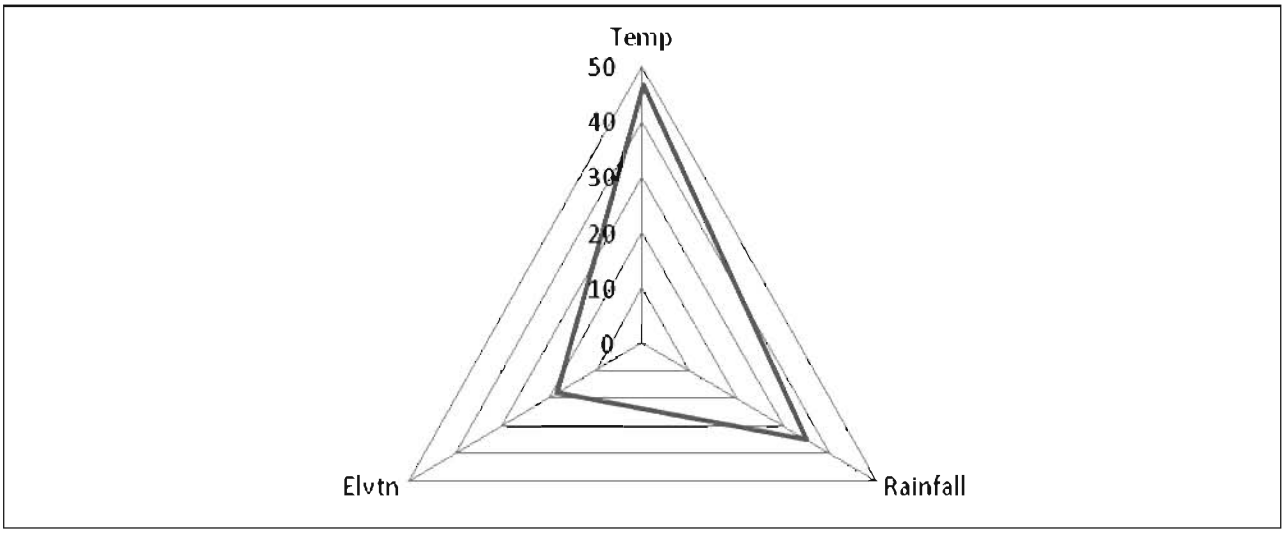
About 10 per cent of the interviewed growers were not willing to shift towards Robusta, however continued with Arabica cultivation itself despite several constraints. Among them, about 80 per cent strongly believed that Arabica coffee had better future prospects, besides wanted to save Arabica for future generations, thereby protecting them from the risk of becoming extinct. While one large grower indicated that he directly exported his Arabica coffee to United Kingdom, for which he received extra-premium, thereby more assertive for Arabica cultivation.Furthermore, the growers opinioned that cultivation of Arabica helped them to preserve the natural shade trees and biodiversity. For instance, Arabica plants require higher shade requisites, thus cultivated under the dense cover of indigenous shade trees (Garcia et al., 2009), besides the Arabica estates maintain a higher number of shade trees than Robusta estates (Chengappa et al., 2014). In contrast, the gradual shifts from Arabica to Robusta have also reduced the shade density in the coffee estates of the Western Ghats (Leroy, 2011). This reduction in shade trees might also adversely impact the rainfall patterns in Kodagu in the following years.

The growers who were not willing to shift towards Robusta have replanted Chandragiri variety of Arabica in place of the uprooted varieties. The respondents opinioned that Chandragiri was resistant to WSB, while it's whole stem covered with its thick branches of leaves, provides with a higher shade cover and thus does not provide 'optimum open space and sunlight' required by WSB, thereby acts as a physical barrier to the borer attack. Moreover, the Chandragiri variety is resistant to both CLR and WSB. Henceforth, they opinioned that Chandragiri was relatively a better variety of in Kodagu. This section of the growers were highly passionate towards Arabica cultivation, showed no signs of shifting towards Robusta.

1.5.2 Factors responsible for White Stem Borer attack in Arabica coffee

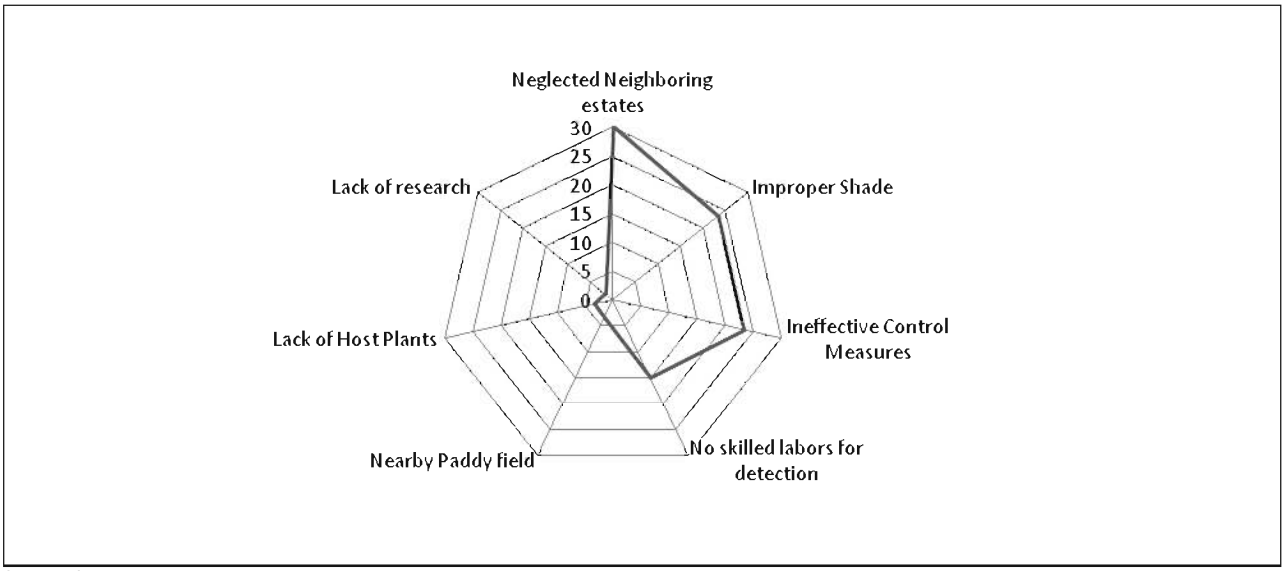
The surveyed growers note that though WSB was observed right from inception of their estates and that the incidence was found to be increasing over the years, while currently face severe incidence of borer attack. There are several factors responsible for the borer attack which can be classified based on environment and management practices adopted in individual estates. Among the environmental factors, about 47 per cent grower's ranked rise in temperature as number one cause for borer attack, 35 per cent growers' opinioned erratic rainfall and while 18 per cent growers ranked elevation to be the major environmental factors responsible for borer out-break (Fig.3). While the management practices included flight of WSB from the neighboring neglected estates (30 per cent), improper shade management (24 per cent) and Ineffective Control measures (24 per cent) were ranked top three by the growers. The other factors included lack of skilled labors for detection of WSB (15 per cent), nearby paddy fields (3 per cent), lack of host plants (3 per cent) and lack of research for WSB control (Fig.4).

Fig 3. Environment factors responsible for WSB attack



Source: Survey results

Fig 4. Management factors responsible for WSB attack



Source: Survey results

Taking into account the field observations, incidences of borer were classified on the basis of elevation and rainfall. For instance, the surveyed estates <1000 meters were classified as Low Elevation (LE) and >1000 meters as High Elevation (HE) estates. Accordingly, the mean annual rainfall 40-70 inches, 70-110 inches and 110-200 inches were classified as Low Rainfall (LR), Medium Rainfall (MR) and High Rainfall (HR) region. In accordance, estates were further classified into 6 categories viz., Lower Elevation and Lower Rainfall(LE+LR), Lower Elevation and Medium Rainfall(LE+MR); Lower Elevation and High Rainfall(LE+HR); High Elevation and Low Rainfall(HE+LR); High Elevation and Medium Rainfall(HE+MR) and High Elevation and High Rainfall(HE+HR). The incidence of White Stem Borer was classified according to number of plants uprooted per acre. If the uprooting of plants were less than 10 per acre, classified as Low incidence, similarly uprooting 10-25 plants/acre, 25-50 plants/acre, 50-100 plants/acre, 100-150 plants/acre and >150 plants/acre were classified as medium , high, very high incidence, critical and alarming rate respectively (Table 3).

It is evident from Table 3, that the incidence of White Stem Borer was very high in estates located at Low elevation and Low Rainfall (LE+LR). Among the 60 estates surveyed, about 60 per cent (36 estates) fall come under LE+ LR category, out of which 20 per cent (12 estates) suffered very high incidence of borer attack, wherein the uprooting varied between 50 to 100 plants per acre in a year. Few estates (4 estates) experienced low incidence of WSB, in which less than 10 plants per acre were being uprooted. Meanwhile about 13 per cent of

estates experience medium incidence of pest attack, where the uprooting varied between 10-25 plants per acre. However one estate visited viewed incidence at an alarming rate, wherein the uprooting was more than 150 plants per acre. About 22 per cent of surveyed estates fall under Lower elevation and Medium rainfall category, among which two estates suffer very high incidence and one estate experienced borer attack at an alarming rate. Under the third category of Lower Elevation and High Rainfall region, about 3 per cent of estates had medium borer incidence and 2 per cent had high incidence. About 10 per cent of estates fall under category of High elevation and Low Rainfall, whereby 3 per cent estates experienced medium and very high incidence. Under the fifth category of High Elevation and Medium rainfall, about 2 per cent estates experienced each of high and very high incidences. It was interesting to note that White Stem Bore incidence was absent in High elevation and High rainfall zones.

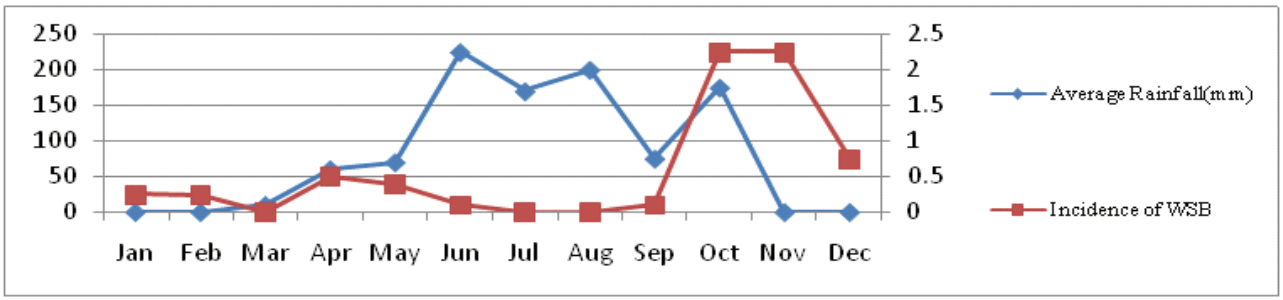
TABLE 3: Estate Elevation and Rainfall Vs WSB Incidence

	Number of estates					
WSB incidence	LE+LR[1]	LE+MR[2]	LE+HR[3]	HE+LR[4]	HE+MR[5]	HE+HR[6]
Low (<10 uproot plants/ac)	4 (7.00)	-	-	1(2.00)	-	-
Medium (10-25 uproot plants/ac)	8(13.00)	3(5.00)	2(3.00)	2(3.00)	-	-
High (25-50 uproot plants/ac)	11(18.00)	7(12.00)	1(2.00)	1(2.00)	1(2.00)	-
Very High (50-100 uproot plants/ac)	12(20.00)	2(3.00)	-	2(3.00)	1(2.00)	-
Critical (100-150 uproot plants/ac)	-	-	-	-	-	-
Alarming (>150 uproot plants/acre)	1(2.00)	1(2.00)	-	-	-	-
Total estates	36(60.00)	13(22.00)	3(5.00)	6(10.00)	2(3.00)	-

Source: Survey results (Figures in parentheses indicate percentage to total)

The variations in climatic conditions, increased temperature, erratic rainfall and lower elevations provide favorable conditions for breeding of White Stem Borer. In contrast, heavy rains, low temperature and higher elevations control the spread of borer. As per the field trials conducted at Chetalli, Kodagu by Coffee Board on Flight patterns of White Stem Borer in Chetalli (Kodagu) from 2002-2006 for a period of five years indicated inverse relationship between rainfall and incidence of White Stem Borer (Fig.5). On the other hand, the dry spells during April, coupled with higher summer temperature and delayed blossom showers aggravate the breeding and spread of WSB. Likewise, our survey also indicated that WSB has contrasting effects with elevation and rainfall.

Fig5. Rainfall and incidence of Coffee White Stem-Borer at CRS, Chetalli



(Source: Kumar P.K.V.(2009)

[1]LE(Low Elevation) + LR (Low Rainfall) under < 1000 meters elevation & Mean Annual Rainfall of 40-70 inches
[2]LE(Low Elevation) + MR (Medium Rainfall) under < 1000 meters elevation & Mean Annual Rainfall of 70-110 inches
[3]LE(Low Elevation) + HR (High Rainfall) under < 1000 meters elevation & Mean Annual Rainfall of 110-200 inches
[4]HE(High Elevation) + LR (Low Rainfall) under > 1000 meters elevation & Mean Annual Rainfall of 40-70 inches
[5]HE(High Elevation) + MR (Low Rainfall) under > 1000 meters elevation & Mean Annual Rainfall of 70-110 inches
[6]HE(High Elevation) + HR (High Rainfall) under > 1000 meters elevation & Mean Annual Rainfall of 110-200 inches

1.5.3 Costs incurred for WSB control

The most common control measure adopted by growers was chemical control. About 24 per cent surveyed growers' opinioned that chemicals like Chloropyriphos and Lindane were ineffective in control of borers, while stated Gammexane was highly effective in borer control and that WSB infestation increased after the BHC was banned. However, the coffee importing countries have also imposed stringent control over minimal residual Lindane application on coffee (Business Standard, 2014), thereby limiting growers on Lindane application.

The cultural methods of control of WSB includes borer tracing, detection, handpicking of beetles, uprooting and burning of the infested plants (Duffy, 1968). It is evident from Table 4 that, the cultural costs increased with the incidence of attack, ranging between Rs.268 per acre to Rs.3000 per acre. About 56 per cent of the growers practiced Chloropyrifos spraying, which costed about Rs.7425 per hectare, out of which 72.63 per cent were material cost while 27.36 per cent were labor costs. About 23 per cent of growers applied Lindane, which amounted to about Rs.8372 per hectare. Along with this, combination of Lindane andContof, Lindane and Neem costed about Rs.9000 and Rs.8750 per hectare respectively. About 9 per cent of the growers applied a mixture of Chloropyrifos and Lime,which costed about Rs.8038 per hectare.On the other hand, scientists observe that the Chlorpyriphos and Lindane used for WSB, were highly toxic and that the blanket application of insecticides followed by growers, reaches the soil and ground water including wells and river, making the water unfit for drinking purposes. However, about 5.10 per cent of the growers belonged to non-adoption category, just relying on cultural methods only for control of WSB.

TABLE 4: Cultural Costs for White Stem Borer Control in Arabica

Rate of incidence	Uprooted (plants/acre)	Cultural Costs (Rs/acre) WSB detection, uprooting and burning of stems
Low	<10	268
Medium	10-25	350
High	25-50	700
Very High	50-100	1450
Critical	100-150	1800
Alarming	>150	3000

Source: Survey results

TABLE 5: Chemical Costs for White Stem Borer Control

Chemicals	Per cent of growers adopting	Avg material cost Costs (Rs/ha)	Labor costs (Rs/ha)	Total Costs (Rs/ha)
Chloropyrifos	56%	5393	2032	7425.5
Chloropyrifos + Lime	9%	5538	2500	8038
Lindane	23%	6045	2327	8372
Lindane+ Contof	2.50%	6500	2500	9000
Lindane+ Neem	2.50%	6250	2500	8750
Non-adoption	5.10%	0	0	0

Source: Survey results

1.5.4 Institutional support for WSB control in Kodagu

The use of pheromone traps for WSB control was first demonstrated by Venkatesha in 1986. However the growers find it expensive to use since one hectare required about 25 traps (Jayaram, 2009). To tackle this issue, the Coffee Board provided pheromone traps at subsidized rates of 50 per cent. From our survey, it was found that about 26 per cent of the growers had installed pheromone traps at the height of 2.4 meters, set up at a distance of 20 meters apart.These were provided by the Coffee Board at subsidized rate of Rs.50 per trap (actual cost being Rs.200). However cent per cent of the growers opinioned that the use of pheromone traps were not very effective in controlling the borer.They also opinioned that along with WSB, it also trapped the other insects too, in-turn disturbing the food web. In general, the response of growers to pheromone trap technology was not encouraging and growers were no more interested in continuing this practice.

The Pest and disease Act, 1968, implemented strict rules to control the stem borer in wherein Kodagu, Chickmagalur and Hassan districts were declared as 'White Stem Borer affected areas' for a period of five years from notification dated 13/07/ 2001, and Coffee White-stem borer was declared as a serious pest under section 3 of Karnataka Pests and Disease Act. Under section 19 of

this Act, the extension officers of Coffee Board were given the responsibility of inspection of stem borer affected Arabica estates. Meanwhile, the Board had also directed the growers to uproot and burn the infested plants, so as to prevent the further spread of disease. However, the borers made entry through the neighboring, neglected estates. In such cases, the Act had provided powers to Coffee Board inspecting officers to issue notice against those growers of the neglected estates. The growers, if failed to take up preventive measures, the officer had every right to take up any remedial action to prevent borer in such estates. The costs incurred by the officer were in turn recovered from growers as arrears of land revenue. Besides, the act had also restricted movement of infested plant, soil or manure from one place to another (Murphy, 2008). Earlier, the Board had also encouraged the growers to collect the borer and paid the growers Rs.1-Rs.1.5, while the uprooted plants were purchased by the tobacco growers of the neighboring district at the rate of Rs.4 per plant (Ambinakudige, 2006).

Furtheron, to improve the productivity of Arabica coffee as well as to control the white stem borer, the 12th Five Year Plan approved the Integrated Coffee Development Project (ICDP) subsidy scheme of the Coffee Board. Under the component of 'Development of support for traditional areas', provides subsidy to the growers for gap filling in the estates subjected to removal of white stem borer infested Arabica plants. The support is provides to all small, medium and large growers, including corporate estates as well as co-operatives, subject to the condition that estates have minimum of 25 per cent of vacancies. Subsidy is calculated taking into consideration existing space in that area.The program aims to raise 50 lakh seedlings during 2015-16 for filling gaps in White stem borer affected Arabica estates.

Besides Mission Mode tackling of WSB, Demonstrations for popularizing Integrated pest Management, collaborative research with Indian Council of Agricultural Research (ICAR), Bio Control Research Laboratories (BCRL).Further more, the Central Coffee Research Institute has conducted field trials in 2014 inorder to come out with solution to prevent borer spread viz., chemical injections to stem and coating with the sealer cum healer, wrapping of the stem, and feeding the roots with systemic pesticides.

1.5.5.1 Recommendations and policy implications

The Coffee white stem borer, no doubt heavily risk the Arabica growers leading them towards Robusta.Though there are several control measures, they but less effective. Though several research works have been carried out in isolation in different countries, no country has ever come up with an effective solution. A combined and co-ordinated research activity is required for sustainable management strategies (Venkatesha, 2012).

Development of pest/disease resistant varieties, through proper plant genetic materials in Arabica is a better option (Ram, 2008),which is economically efficient and ecologically correct. A combination of antixenosis and antibiosis characters in coffee could prove effective control. Though pathogen resistant genes such as Mex-1 gene and SH3 gene are developed (Lashermers et al.2010), no effective insect resistance genes were identified in coffee. Some options could be biological insecticides like B.thuringiensis could prove effective (Perthuis et al., 2005).

The cultural management requires skilled work force for identification of borer infested plants, installation of pheromone traps, optimum shade management, and implementation of Integrated Pest Management practices. Proper training and skills for effective management of pests and diseases are required. In this regard, Coffee Board could play a major role.

1.5.5.2 Conclusions

Currently, White Stem Borer is the serious problem affecting the coffee industry not only in India, but across the globe, leading to the decline in Arabica production.The available management recommendations are highly ineffective, while the situation is still worsened in India. At the institutional end, there is still lack of proper research outputs that could provide effective solution to the problem, while at the growers end, lack proper skill for effective management, general lack of information and poor management practices. Efforts should be directed towards creating awareness among the farming community, while also promote lab-field technology transfer. A renewed effort for understanding biological conditions as well macro agro-climatic conditions is necessary. The varietal and bio-control measures are yet to be fully exploited. Lastly, inter-country partnership of countries conducting research on coffee to fight pest and disease menace in coffee.

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Agro Economic Research

Assessment of Marketable and Marketed Surplus of Major Foodgrains in Uttar Pradesh*

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Background of the Study

Generally the predominant agricultural countries like India depend much on the marketable surplus of agricultural produces. As a matter of fact, it is not the total production of agricultural sector but the surplus generated by the agricultural sector for the market plays the crucial role in the development of such countries. Thus, in cases of agricultural economics like India and the state of Uttar Pradesh, it is not sufficient to boost only its agricultural production but it must boost the marketable surplus of agricultural produces regularly. Marketable surplus represents the theoretical surplus available for disposal with the producer left after his genuine requirements of family consumption, payment of wages in kind, feed, seed and wastages have been met. Marketed surplus on the other hand represents only that portion of the marketable surplus which is actually marketed and is placed at the disposal of the non-farm rural and urban population (Sadhu and Singh, 1983, page 245). In case of commercial agriculture, the farmer as he is motivated by profit considerations takes his whole produce to the market and purchases his requirements from the market. But in case of subsistence agriculture, farmer generally produces for his own subsistence and it is only the remainder left after meeting his own requirements, which is taken to the market for sale. To the extent that the farmer's retention is a matter of subjective guess, the concept of marketable surplus on the other hand, refers to the actual quantity of produce which enters into the market and as such, it is subjective. In most of the cases, marketed surplus may be less than the marketable surplus because farmer may not be ready to sell whole of his marketable surplus. He may hoard a part of it in anticipation of rising price of the produce or for some other reasons. There may be a subsistence farmer who has produced just to meet his family consumption requirements. But he may take some portion of his produce to the market to meet his immediate cash obligations. In such cases, the marketed surplus released by the farmer will not be the real marketed surplus.

The need of estimation of the actual marketable and marketed surplus has been perceived in the country since the time immemorial. After gaining independence these estimations became more important particularly in the context of planned agricultural development, distribution system, effective implementation of the development programmes, formulation of various economic policies and pricing policies for agricultural commodities. Thus, the instant study is relevant and well justified to be conducted in all the states of India.

Keeping the above cited facts in view this study was entrusted to the various AERCs of the country entitled as "Assessment of Marketable and Marketed Surplus of Major Food-grains in India", Individual state report to be conducted with the following main objectives:-

Objectives of the Study

The main objectives of the study were

1. To estimate marketable and marketed surplus of selected cereals, coarse cereals and pulses in Uttar Pradesh.
2. To estimate farm retention for consumption, seed, feed, wages and other payments in kind etc. and
3. To examine role of various factors such as institutional,, infrastructural, socioeconomic, etc. in influencing household marketed surplus decision.

Research Methodology-

(a) Coverage of the study

This study was confined to the whole state of U.P. on the basis of significant share in total acreage and production of major food-grains i.e. (1) Rice, (2) Bajara, (3) Wheat and (4) Tur. The number of ultimate sample farmers was restricted to 300 from the districts growing more than one selected crop from the prevalent crop rotations in selected districts of U.P.

(b) Sampling Design

The sampling technique used in this study was a multistage stratified random sampling technique. From the 3 prevalent crop-rotations i.e. (1) Rice — Wheat, (2) Bajara — Wheat and (3) Tur — annual with mixtures, two districts from each crop-rotations were selected randomly. From the selected districts two developments blocks from each district making total 12 blocks were selected randomly on the same criteria. From each of such block one suitable

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village making total 12 villages were undertaken randomly. List of farmers from each of such villages were taken and categorized in 4 size-groups i.e. (1) Marginal, (2) Small, (3) Medium and (4) Large. Thereafter ultimate samples were chosen according to probability proportion to total numbers in each size-groups restricting 25 samples from each village making 300 samples in all.

(c) Methodology

This study was based on both primary as well as secondary data. The primary data on all aspects of the present study were collected through the specially prepared schedules and questionnaires by survey method contacting the sample farmers directly on their farms. The required secondary data were collected from the records available at various levels with the help of concerned officials. Personal observations were also done. As regards the analysis of data apart from simple mathematical and statistical analysis, the inverse and positive relationships between prices and marketed surplus by Krishanan and Rajkrishna were tried to assess the marketed surplus of selected crops. The reference year was agricultural year 2010-11 as well as marketing year 2011-12 and for secondary data was 2000-01 to 2009-10.

Main Findings

This study reveals that in the state of Uttar Pradesh the maximum i.e. 47 percent of the gross state income was shared by tertiary sector against the minimum i.e. 22.2 percent by secondary sector. The share of primary sector was 30.8 percent wherein the maximum i.e. 26.9 percent was shared by agriculture and animal husbandry.

In primary sector, agriculture and animal husbandry, in secondary sector manufacturing and in tertiary sector trade, hotel and restaurants were the main occupational sectors which contributed maximum in the gross state income of Uttar Pradesh.

The percentage growth in the gross state income of Uttar Pradesh was continuous during the span of 2005-06 to 2010-11 with a slight variation in the year 2007-08 and 2010-11.

It is very well clarified that the area under total cereals has declined over the decades from (1999-2000 to 2009-10). This decrease has been caused much due to decrease in kharif cereals.

It is evidently clear that in kharif area has been shifted from rice to Bajra and maize and in Rabi it has been shifted from Gram, Pea, Barley and Arhar to Wheat in Uttar Pradesh.

It is evidently clear that the slight increase in total cereals is due to the slight increase in the area of wheat during Rabi season.

The area under rice has firstly increasing trend till 2001-02 but thereafter it has a declining trend continuously with fluctuations till 2010-11. Accordingly the production has also increased till the year 2001-02 but thereafter suddenly decreased.

The area, production as well as productivity of rice has firstly increased till 2001-02 showing increasing trend but thereafter the trend in area production and productivity has shown a declining trend with fluctuations.

The area of Bajara has a declining trend on an overall. But the trends in production of Bajara have been all along increasing during the span of 1960-61 to 2010-11. Thus, despite decling trend in area of bajara, the trends in production and productivity of bajara have been increasing during the span of 1960-61 to 2010-11.

The trend in area of wheat has been increasing in the state of U.P. Accordingly the trend of production and productivity has also been increasing. The area, production and productivity of wheat has an increasing trend during 1950-51 to 2010-11.

The trends in area of Arhar have been declining with fluctuations in the Uttar Pradesh. Accordingly the trends in production of Arhar have also been declining with varying fluctuations and hence the trends of productivity of Arhar have also been declining with fluctuations in Uttar Pradesh.

In Shahjahanpur district the area and production of rice have increased but productivity has decreased during the span of 1990-91 to 2010-11. But the production and productivity of wheat have increased despite the decrease in the area of wheat in Shahjahanpur.

The area, production and productivity of rice in Barabanki district has an increasing trend during the span of 1990-91 to 2010-11. In case of wheat also . the area, production and productivity in this district have increased continuously during the same span of period.

The trends in area, production and productivity of Bajara in Agra district have been increasing during the span of 1990-91 to 2010-11. In case of wheat also the trends in area, production and productivity have also been increasing all along the span of 1990-91 to 2010-11.

The trends of area, production and productivity of wheat in Budaun district have been increasing during the span of 1990-91 to 2010-11.

The productivity of Arhar has decreased during 1990-91 to 2010-11despite the mixed trends in area and production of Arhar in Hamirpur district. In Fatehpur district the production and productivity of Arhar decreased continuously despite the increase in area of Arhar.

The ratios of marketable surplus to production were higher in case of lentil, barley, maize and jowar during 1994-95. The major food-grains whose marketed surplus

ratios were higher in Uttar Pradesh were lentil, arhar, rice and bajara.

In Shahjahanpur district the ratio of marketed surplus to marketable surplus was highest which shows that more than marketable surplus was marketed in case of rice. In Barabanki the ratios of marketed surplus to marketable surplus were considerably higher in case of wheat and arhar.

In agra district the ratio of marketed surplus to marketable surplus of arhar was considerably higher. In Budaun the ratios of marketed surplus to marketable surplus of rice and wheat were much higher.

In Hamirpur only the ratio of marketed surplus to marketable surplus of arhar was considerable. In Fatehpur it was higher in case of rice during 1994-95.

Regarding land utilization, Budaun in Bajara-Wheat belt, Shahjahanpur in rice-wheat belt and Fatehpur in Arhar belt had covered higher reporting area than rest of districts in these belts.

The pastures and culturable wastes area was higher in Barabanki and Fatehpur districts. The gross cropped area was highest in Budaun district and hence it has been better in land-use pattern and Hamirpur poorest in land-use pattern.

The cropping intensity was highest i.e. 188.79 percent in Barabanki against the lowest i.e. 106.50 percent in Hamirpur district. While the average cropping intensity in Uttar Pradesh was 153.79 percent. Barabanki, Shahjahanpur and Budaun hare better land-use pattern.

The productivity of rice in Shahjahanpur was comparatively higher than the state average productivity. but in Barabanki was slightly lower than the state average productivity. The productivity of wheat in sample districts was higher than the state average productivity of wheat.

The productivity of Bajara in Agra and Budaun was slightly lesser than the state average productivity. The productivity of Arhar in Hamirpur and Fatehpur was much lower than the state average productivity of Arhar.

The total land owned by all the sample farmers was under cultivation and not a single case of leasing-in or leasing-out was reported in the area under study.

In the whole area of study only surface canals and tube-wells were the main sources of irrigation. Tube-wells were utilized more commonly by marginal farmers (64.73 percent). While canals by small farmers (31.58 percent).

Coverage during kharif was 45.87 percent and was covered by paddy. In Rabi 45.20 percent was covered by wheat. A negligible area i.e. 1.53 percent was covered by Rabi vegetables.

Bajara in kharif, wheat in Rabi, were the main crops in Agra and Budaun districts. The coverage in Rabi was higher i.e. 52.47 percent during summer (Zaid) the total coverage was 6.30 percent.

In Hamirpur and Fatehpur during kharif the coverage was 49.29 percent and in Rabi it was 50.70 percent. The maximum was covered by paddy, oilseed and Arhar in kharif and Rabi by paddy and Arhar.

The yields of paddy and wheat were higher on large farms in Shahjahanpur and Barabanki. The yield of sugarcane was higher on marginal farms.

In Arhar rotation districts paddy and wheat were the main food-grain crops. Arhar was found to be cultivated on rainfed and marginal lands only.

The pattern of investments on the farms of all the sample districts was one and the same in the state of Uttar Pradesh.

As regards the pattern of live-stocks on the sample farms of selected districts, the buffaloes were raised more commonly in both of these districts under paddy-wheat rotation. In Bajara-Wheat belt too the buffaloes were raised more commonly. In Arhar rotation districts small and large farmers had raised buffaloes more commonly. There was a total 3.80 percent loss in paddy under rice-wheat belt. The higher loss i.e. 4.18 percent was on marginal farms against the lower i.e. 3.35 percent on large farms. In wheat also loss was highest i.e. 4.16 percent on the marginal farms against lowest i.e. 3.54 percent on large farms.

The maximum loss was incurred in threshing incase of Bajara. In wheat also maximum loss was reported in threshing. The losses were maximum on large farms and minimum on medium farms. In Arhar also maximum losses were in threshing of Arhar on medium farms.

The losses from field to threshing floor were comparatively higher in case of wheat under rice-wheat rotation districts than in case of farm to market. In Bajara-Wheat belt the losses were higher in transport from field to threshing floor.

In Bajara-Wheat rotation districts the losses in wheat was higher during transport from field to threshing floor. In Arhar also the losses were slightly higher in case from field to threshing floor and on large farms it was higher.

The storage in bags was not beneficial as the losses were higher in comparison of storage in steel drum. The storage of wheat in bags was beneficial. In Bajara under Bajara-Wheat districts. The losses were maximum i.e. 4.62 percent on large farms. In Arhar rotation belt the losses in Arhar was higher (6.62 percent) on medium and large farms. The average losses were 4.94 percent in case of Arhar.

Self consumption was the main item of retention on the farms under rice-wheat rotation districts. The retention was higher on marginal and medium farms of this belt.

In case of wheat under rice-wheat rotation districts the maximum of wheat was retained for self-consumption. While in Bajara-Wheat belt the maximum of bajara was retained for self consumption. In case of wheat in this, belt wheat was retained maximum for self consumption.

In case of Arhar in Arhar rotation districts almost entire quantity of Arhar was retained for self consumption only.

As regards sale in market the paddy under rice-wheat belt 61.75 percent of paddy was marketed in regulated market at the distance of 3.15 kms. In wheat 63.73 percent was sold in regulated market.

The sale of bajara in bajara-wheat districts was done 100 percent in regulated market. But Arhar was sold in unregulated market at a distance of 5.90 kms. The availability of paddy on the aggregate level was 7377.24 qtls. It was higher on marginal and large farms. While that of wheat availability was accounted to 4383.63 gds. at the aggregate level.

In case of Bajara under bajara-wheat rotation districts the availability at aggregate level was 1790.05 qtls. The availability on marginal farms was comparatively much higher than the farms of all other size-groups. The availability of wheat was 3395.75 qtls. at aggregate level.

The availability of Arhar at aggregate level was 258.63 qtls. and was higher on large farms in comparison of the farms of all other size-groups in these districts. The sale pattern of paddy under rice-wheat rotation indicates that 61.75 percent of paddy was sold to Govt. agencies and 38.25 percent to private traders. The prices paid by private traders was lesser than that paid by Govt. agencies.

The sale pattern of wheat shows that 68.73 percent of wheat was sold to Govt. agencies and 36.27 percent to private traders. The prices paid by private traders were much lower.

The sale pattern of bajara shows that only 5.82 percent of total bajara was sold to Govt. agencies and 94.18 percent was sold to private traders. The quantity sold by marginal farmers was higher.

The sale pattern of Arhar shows that entire quantity was sold to the private traders in the months of April — May.

The percentages of marketed surplus to production of rice was 75.95 percent and that of wheat was 67.75 percent. Thus, percentage of marketed surplus to production of rice was comparatively higher than that of wheat in the selected districts.

The percentage of marketed surplus to production of Bajara was 61.69 percent and that of wheat was 61.19 percent. Thus, marketed surplus to production of bajara was slightly higher than wheat in the bajara-wheat belt.

The percentage of marketed surplus to production of Arhar in Arhar rotation districts was 76.71 percent and was lower than the percentage of marketed surplu's to marketable surplus of Arhar.

Due to poor infrastructure 73.77 percent of paddy and wheat were sold in local market under rice-wheat rotation districts. There was not any storage or warehouse in the area available any where.

In Bajara-Wheat rotation districts too there was not any facilities of storage and warehouses available in the area.

In Arhar rotation districts 42 percent of farmers sold their produce in regulated market and 33 percent in unregulated markets. No storages was available in the area. Regarding technological factors 51 percent of sample farmers were aware of MSP and 62 percent of farmers reported less retention for seed and feed and 38 percent about less retention for self consumption.

No contract farming was reported in any of the six selected districts in any village.

In rice 99 percent of farmers had covered under improved seeds. But in case of wheat only 53 percent of area was reported to be covered under improved seeds.

In Bajara-Wheat rotation districts only 21 percent of sample farmers were aware of MSP hence policy awareness was deplorably poor in this area. No contract farming was reported in this belt.

In bajara-wheat rotation districts only 17 percent of area under wheat was covered under improved seed. While that of bajara 39 percent was covered under improved seed.

In Arhar rotation districts 72 percent of sample farmers were aware of MSP. About 40 percent told yes for sale possibilities. 22 Percent reported less retention for seed and feed and 18 percent for self consumption. No contract farming was reported in the area.

Regarding institutional factor in rice-wheat rotation districts only 30 percent of farmers had access to credit by commercial banks. 29 percent had Kisan Credit Cards for the limit of 3 years.

Regarding sources of price information majority of farmers reported to receive information by buyers in the villages.

Credit facilities in other selected districts were under pitiable conditions and farmers were quit helpless in this respects.

Conclusions:-

In the state of Uttar Pradesh the share of primary sector was 30.8 percent of the gross state income wherein the maximum i.e. 26.9 percent was shared by agriculture and animal husbandry. Thus, importance of agriculture and animal husbandry is of paramount importance in the state which lags behind the other states of the country. The area under total cereals has declined over the decades from 1999-2000 to 2009- 10. Kharif area has been shifted from rice to bajara and -maize and in Rabi from Gram, Pea, Arhar and Barley to wheat in Uttar Pradesh.

The area, production and productivity of rice has firstly increased till 2001-2002 showing increasing trend but thereafter has shown a declining trend With fluctuations. The treud in area, production and productivity of wheat has been increasing during 1950-51 to 2010-11. The trends in area, production and productivity of Arhar have also been declining with fluctuations in Uttar Pradesh. The trends in area, production and productivity of bajara have also been increasing during 1990-91 to 2010-11.

The ratios of marketable surplus to production were higher in case of Lentil, Barley, Maize and Jowar during 1994-95. The major food-grains whose marketed surplus ratios were higher in Uttar Pradesh were lentil, arhar, rice and bajara during 1994-95.

The cropping intensity was highest i.e. 188.79 percent in Barabanki district against the lowest i.e. 106.50 percent in Hamirpur district. Barabanki, Shahjahanpur ,and Budaun have better land utilization pattern. The total land owned by all the sample farmers was under cultivation and not a single case of leasing-in or leasing-out was reported in the area of study. The investment pattern was one and the same in the state of Uttar Pradesh.

The maximum loss was incurred in threshing of bajara. In wheat also maximum loss was reported in threshing. The losses were maximum on large farms and minimum on medium farms. In Arhar also maximum losses were in threshing on medium farms.

The storage in bags was not beneficial as the losses were higher in comparison of storage in steel drums. Self consumption was the main item of retention on the farms under rice-wheat rotation districts. The retention was higher on marginal and medium farms of these districts. Maximum of bajara was also retained for self consumption. In arhar too the entire quantity inmost of the cases was retained for self consumption only.

Regarding sale in market the paddy under rice-wheat rotation districts 61.75 percent of paddy was marketed in regulated market at the distance of 3.15 kms. In wheat 63.73 percent was sold in regulated market. The sale of bajara was done 100 percent in regulated market. But arhar was sold in unregulated market at a distance of 5.90 kms.

The percentage of marketed surplus to production of bajara was 61.69 percent and that of wheat was 61.19 percent. The percentage of marketed surplus to production of arhar was 76.71 percent and was lower than the percentage of marketed surplus to marketable surplus of arhar.

Regarding factors affecting the marketed surplus it was found that due to poor infrastructure 73.77 percent of paddy and wheat were sold in local markets. There was not any storage or warehouse.

No contract farming was reported in any village of the six selected districts. In bajara-wheat belt only 21 percent of farmers were aware of MSP. Hence, policy awareness was deplorably poor in the area under the study.

In bajara-wheat rotation districts only 17 percent of the area under wheat was covered under improved seed. While in case of bajara 39 percent was covered under improved seeds.

Regarding intuitional factors affecting the marketed surplus in rice-wheat rotation districts only 30 percent of farmers had access to credit by commercial banks. 29 percent of farmers had Kisan Credit Cards for the limit of 3 years.

Regarding sources of price information the majority of farmers reported to receive information by buyers in the villages of selected districts.

Policy Implications

1. In the whole state of Uttar Pradesh the marketing of rice, wheat, bajara and arhar is still not assured on the MSP declared by the C.A.C.P. Hence, there is urgent need to implement regulated marketing of these food-grains in Uttar Pradesh strictly.
2. Infrastructural developments are deplorably poor which hampers the market arrivals of marketable surplus. Therefore, it is the first need to provide all weather roads to each and every village at least of the potential pockets in the whole state of Uttar Pradesh.
3. To regulate the market is most essential for saving the farmers from the clutches of the cruel traders. Strict regulated marketing will automatically eradicate the middlemen and rush of private traders who captures the market arrivals of major food-grains.
4. As majority of farmers still depend much for receiving price information by the traders/buyers who use to rush in villages usually and cheat them. Thus, information on prevailing prices in each and every market must be made available to farmers for making proper marketing decisions.

5. In most of the areas in Uttar Pradesh storage/ warehouses are almost nil. Thus, farm level storage structures must either be facilitated by the Govt. or the farmers must be provided assistance to develop their own farm level storage structures.

6. To minimize operational losses at farm or farm to threshing floor the farmers must be provided harvesters or combines at cheaper rates so that they may afford the costs.

7. Credit facilities to needy farmers were also reported deplorably poor in Uttar Pradesh. Hence access to credit must be developed by increasing numbers of branches of commercials banks in the villages.

8. Adequate quantity of improved seeds must be made available timely to increase marketable surplus by increasing productivity.

9. Contract farming must be encouraged by the Govt. agencies to increase the production with the minimum costs.

10 Farmers must be educated or must be aware that boosting marketed surplus is more essential than boosting agricultural production on their farms.

Commodity Reviews

Foodgrains

During the month of August, 2016 the Wholesale Price Index (Base 2004-05=100) of pulses increased by 1.41 percent, cereals increased by 0.44 percent & foodgrains increased by 0.68 percent respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base: 2004-2005=100)

Commodity	Weight (Percent)	WPI for the Month of August, 2016	WPI for the Month of July, 2016	WPI A Year ago	Percentage change during	
					A month	A year
1	2	3	4	5	6	7
Rice	1.793	248.5	247.4	237.2	0.44	4.76
Wheat	1.116	230.2	227.6	214.6	1.14	7.27
Jowar	0.096	292.2	294.1	274.3	-0.65	6.53
Bajra	0.115	305.6	306.9	248.7	-0.42	22.88
Maize	0.217	291.6	296.7	249.2	-1.72	17.01
Barley	0.017	280.0	278.2	220.6	0.65	26.93
Ragi	0.019	336.7	337.3	324.1	-0.18	3.89
Cereals	3.373	249.1	248.0	232.3	0.44	7.23
Pulses	0.717	438.9	432.8	326.2	1.41	34.55
Foodgrains	4.09	282.3	280.4	248.8	0.68	13.46

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 August, 2016.

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

Procurement of Rice

0.014 million tonnes of rice(including paddy converted into rice) was procured during August 2016 as against 0.270 million tonnes of rice (including paddy converted into rice) procured during August 2015. The total procurement of rice in the current marketing season i.e 2015-2016, up to 31.08.2016 stood at 34.16 million tonnes, as against 31.89 million tonnes of rice procured, during the corresponding period of last year. The details are given in the following table:

PROCUREMENT OF RICE

(In Thousand Tonnes)

State	Marketing Season 2015-16 (upto 31.08.2016)		Corresponding Period of last Year 2014-15		Marketing Year (October-September)			
					2014-15		2013-14	
	Procurement	%age to Total	Procurement	%age to Total	Procurement	%age to Total	Procurement	%age to Total
Andhra Pradesh	4326	12.66	3555	11.15	3591	11.17	3722	11.76
Chhatisgarh	3442	10.08	3355	10.52	3423	10.64	4290	13.56
Haryana	2861	8.38	2015	6.32	2015	6.27	2406	7.60
Maharashtra	230	0.67	199	0.62	199	0.62	161	0.51
Punjab	9350	27.37	7786	24.42	7786	24.21	8106	25.62
Tamil Nadu	1139	3.33	979	3.07	1049	3.26	684	2.16
Uttar Pradesh	2910	8.52	1698	5.32	1698	5.28	1127	3.56
Uttarakhand	598	1.75	465	1.46	465	1.45	463	1.46
Others	9300	27.23	11836	37.12	11936	37.11	10678	33.75
Total	34156	100.00	31888	100.00	32162	100.00	31637	100.00

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2016-2017 up to June, 2016 is 22.93 million tonnes against a total of 27.89 million tonnes of wheat procured during last year. The details are given in the following table ::

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

State	Marketing Season 2016-17 (upto 30.06.2016)		Corresponding Period of last Year 2015-16		Marketing Year (April-March)			
					2015-16		2014-15	
	Procurement	%age to Total	Procurement	%age to Total	Procurement	%age to Total	Procurement	%age to Total
Haryana	6722	29.32	6692	24.00	6778	24.13	6495	23.20
Madhya Pradesh	3990	17.40	7195	25.80	7309	26.02	7094	25.34
Punjab	10645	46.42	10346	37.10	10344	36.83	11641	41.58
Rajasthan	762	3.32	1300	4.66	1300	4.63	2159	7.71
Uttar Pradesh	802	3.50	2267	8.13	2267	8.07	599	2.14
Others	9	0.04	85	0.30	90	0.32	6	0.02
Total	22930	100.00	27885	100.00	28088	100.00	27994	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oil Seeds and Edible Oils

The wholesale Price Index (WPI) of nine major oilseeds as a group stood at 227.9 in August, 2016 showing an increase of 1.4% and 6.7% over the previous month and year respectively. The WPI of gingelly seed increased by 12.0%, copra (coconut) by 7.2%, rape & mustard seed by 2.5%, safflower (kardi seed) 1.2%, groundnut seed by 0.8%, over the previous month. The WPI of niger seed decreased by 2.8%, soyabean by 1.7%, cotton seed by 1.3% and sunflower by 1.0% over the previous month. The WPI of edible oils as a group stood at 155.7 in August, 2016 showing an increase of 0.8% and 5.6% over the previous month and year respectively. The WPI of gingelly oil increased by 3.3%, groundnut oil by 1.5%, mustard & rapeseed oil by 1.4%, cotton seed oil by 1.3%, and copra oil by 1.0% over the previous month. The WPI of soybean oil decreased by 0.5%, over the previous month.wpi of sunflower oil remained unchanged over the previous month.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 286.4 in August, 2016 showing a decrease of 3.5% over the previous month and increase of 7.0% over the previous year.

Potato

The WPI of potato stood at 298.6 in August, 2016 showing an increase of 6.9% and 66.7% over the previous month and year respectively.

Onion

The WPI of onion stood at 250.5 in August, 2016 showing a decrease of 3.3% and 64.2% over the previous month and year respectively.

Condiments & Spices

The WPI of condiments & spices (group) stood at 360.1 in August, 2016 which shows an increase of 2.5% and 7.2% over the previous month and year respectively. The WPI of chillies (dry) increased by 0.6% over the previous month. However, WPI of turmeric and black pepper decreased by 1.1% and 0.5% over the previous month.

Raw Cotton

The WPI of raw cotton stood at 246.4 in August, 2016 showing an increase of 1.1% and 28.1% over the previous month and year respectively.

Raw Jute

The WPI of raw jute stood at 418.2 in August, 2016 showing a decrease of 20.4% over the previous month. However, it shows an increase of 15.5% over the last year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

COMMODITY	LATEST August, 2016	MONTH July, 2016	YEAR August, 2015	% VARIATION OVER MONTH	% VARIATION OVER YEAR
OIL SEEDS	224.8	224.1	213.5	0.3	5.3
Groundnut Seed	285.6	283.8	250.2	0.6	14.1
Rape & Mustard Seed	236.9	230.4	219.1	2.8	8.1
Cotton Seed	229.1	219.3	184.4	4.5	24.2
Copra (Coconut)	109.8	109.3	148.0	0.5	-25.8
Gingelly Seed (Sesamum)	293.7	316.3	347.5	-7.1	-15.5
Niger Seed	332.6	330.0	331.3	0.8	0.4
Safflower (Kardi Seed)	154.2	153.2	148.4	0.7	3.9
Sunflower	187.3	187.3	188.7	0.0	-0.7
Soyabean	216.3	224.1	203.9	-3.5	6.1
EDIBLE OILS	154.5	154.3	148.3	0.1	4.2
Groundnut Oil	216.4	212.1	193.7	2.0	11.7
Cotton Seed Oil	190.9	191.8	179.9	-0.5	6.1

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS —CONTD.

COMMODITY	LATEST August, 2016	MONTH July, 2016	YEAR August, 2015	% VARIATION OVER MONTH	% VARIATION OVER YEAR
Mustard & Rapeseed Oil	181.7	180.7	180.4	0.6	0.7
Soyabean Oil	154.3	154.3	146.8	0.0	5.1
Copra Oil	137.0	138.8	154.2	-1.3	-11.2
Sunflower Oil	133.7	134.6	126.9	-0.7	5.4
Gingelly Oil	182.8	183.5	167.5	-0.4	9.1
FRUITS & VEGETABLES	296.9	277.4	242.7	7.0	22.3
Potato	279.3	248.7	175.9	12.3	58.8
Onion	259.0	255.4	406.5	1.4	-36.3
CONDIMENTS & SPICES	351.4	352.3	333.8	-0.3	5.3
Black Pepper	754.5	764.3	730.1	-1.3	3.3
Chillies(Dry)	396.5	407.3	321.1	-2.7	23.5
Turmeric	252.6	250.4	248.9	0.9	1.5
Raw Cotton	243.8	214.9	195.7	13.4	24.6
Raw Jute	525.7	538.3	362.1	-2.3	45.2

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		
											Carpen-er	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	Dec,15	8	200	200	300	NA	250	NA	300	NA	NA
	Guntur	Tadikonda	Dec,15	8	270	218	275	NA	225	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	Feb, 16	8	350	269	NA	NA	NA	NA	350	300	NA
Karnataka	Bangalore	Harisandra	May, 16	8	375	360	400	305	400	305	600	400	NA
	Tumkur	Gidlahali	Nov, 15	8	180	170	180	NA	NA	NA	200	190	NA
Maharashtra	Nagpur	Mauda	Sep, 14	8	100	80	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Sep, 14	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	March,14	8	120	120	100	100	75	75	200	200	NA

1.1 : DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE)

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily working Hours	Ploughing	Sowing	Weeding	Harvest-ing	Other Agri Labour	Herds-man	Skilled Labour		
												Carpen-ter	Black Smith	Cobbler
Assam	Barpeta	Laharapara	May, 16	M	8	300	250	250	250	250	200	350	300	250
				W	8	NA	200	200	200	200	NA	NA	NA	NA
Bihar	Muzaffarpur	BhaluiRasul	June,16	M	8	300	300	300	300	300	300	400	400	NA
				W	8	NA	300	NA	NA	300	NA	NA	NA	NA
	Shekhpura	Kutaut	June,16	M	8	250	NA	225	100	NA	NA	500	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ChhattisgarhDhamtari		Sihava	Feb,16	M	8	179	180	170	NA	150	200	300	200	120
				W	8	NA	120	125	NA	100	80	NA	80	100
Gujarat*	Rajkot	Rajkot	Sep, 15	M	8	215	205	163	180	150	188	450	450	360
				W	8	NA	175	150	175	135	117	NA	NA	NA
	Dahod	Dahod	Sep,15	M	8	180	160	160	160	130	NA	260	210	210
				W	8	NA	160	160	160	130	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Mach, 16	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	Jun,15	M	8	NA	200	200	200	200	200	350	350	NA
				W	8	NA	200	200	200	200	200	NA	NA	NA
Kerala	Kozhikode	Koduvally	March,16	M	4-8	1290	675	NA	675	1008	NA	825	NA	NA
				W	4-8	NA	NA	475	575	550	NA	NA	NA	NA
	Palakkad	Elappally	March,16	M	4-8	NA	500	NA	500	467	NA	600	NA	NA
				W	4-8	NA	NA	300	300	300	NA	NA	NA	NA
Madhya Pradesh	Hoshangabad	Sangarkhera	July, 16	M	8	250	250	250	NA	250	150	400	400	NA
				W	8	NA	200	250	NA	200	150	NA	NA	NA
	Satna	Kotar	July,16	M	8	200	200	200	200	200	200	300	300	300
				W	8	NA	200	200	200	200	200	NA	NA	NA
	Shyopurkala	Vijaypur	July,16	M	8	NA	300	300	300	NA	250	300	300	NA
				W	8	NA	300	NA	300	NA	NA	NA	NA	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily working Hours	Ploughing	Sowing	Weeding	Harvest-ing	Other Agri Labour	Herds-man	Skilled Labour		
												Carpen-ter	Black Smith	Cobbler
Odisha	Bhadrak	Chandbali	April, 16	M	8	300	NA	NA	300	300	300	350	300	250
				W	8	NA	NA	NA	200	200	200	NA	NA	NA
	Ganjam	Aska	March, 16	M	8	300	200	200	250	300	NA	400	400	200
				W	8	NA	100	100	200	200	200	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	Nov, 15	M	8	395	NA	395	395	380	100	400	400	200
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	Aug,15	M	8	NA	NA	300	NA	NA	300	700	500	NA
				W	8	NA	NA	200	NA	NA	200	NA	NA	NA
	Jalore	Sarnau	Aug,15	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu*	Thanjavur	Pulvarnatham	June, 16	M	8	NA	343	NA	355	344	NA	NA	NA	NA
				W	8	NA	NA	110	133	128	NA	NA	NA	NA
	Tirunelveli	Malayakulam	June, 16	M	8	NA	350	375	400	491	NA	NA	NA	NA
				W	8	NA	NA	171	180	329	NA	NA	NA	NA
Tripura	State Average		June, 15	M	8	299	280	280	281	279	295	328	291	297
				W	8	NA	216	218	216	215	225	NA	NA	NA
Uttar Pradesh*	Meerut	Ganeshpur	March,16	M	8	275	258	256	262	256	NA	377	NA	NA
				W	8	NA	200	207	200	207	NA	NA	NA	NA
	Aurraiya	Aurraiya	March,16	M	8	150	150	150	150	160	NA	314	NA	.NA
				W	8	NA	NA	NA	NA	160	NA	NA	NA	NA
	Chandauli	Chandauli	March,16	M	8	200	NA	200	NA	200	NA	350	NA	NA
				W	8	NA	NA	200	NA	200	NA	NA	NA	NA

M-Man
W-Woman
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

Commodity	Variety	Unit	State	Centre	Aug-16	Jul-16	Aug-15
Wheat	PBW 343	Quintal	Punjab	Amritsar	1600	1595	1600
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1625	1610	1470
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1740	1722	1452
Jowar	-	Quintal	Maharashtra	Mumbai	2350	2300	2200
Gram	No III	Quintal	Madhya Pradesh	Sehore	7181	7601	4530
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1360	1380	1365
Gram Split	-	Quintal	Bihar	Patna	8550	9000	5500
Gram Split	-	Quintal	Maharashtra	Mumbai	9500	10600	5600
Arhar Split	-	Quintal	Bihar	Patna	11000	13200	9140
Arhar Split	-	Quintal	Maharashtra	Mumbai	8600	10600	10000
Arhar Split	-	Quintal	NCT of Delhi	Delhi	12150	13450	9550
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	11500	12500	12500
Gur	-	Quintal	Maharashtra	Mumbai	4400	4000	3100
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	3800	3800	4000
Gur	Balti	Quintal	Uttar Pradesh	Hapur	NA	3280	NA
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	4400	4370	3950
Mustard Seed	Black	Quintal	West Bengal	Raniganj	4850	4700	4450
Mustard Seed	-	Quintal	West Bengal	Kolkata	5100	5200	4700
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	6500	6200	4240
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	4435	4490	3935
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2500	2500	1900
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2500	2500	2000
Castor Seed	-	Quintal	Telangana	Hyderabad	3450	3700	4050
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	10500	11250	13415
Copra	FAQ	Quintal	Kerala	Alleppey	6400	5200	8300
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	5500	5500	4500
Groundnut	-	Quintal	Maharashtra	Mumbai	8300	7600	6500
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1474	1490	1368
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1650	1610	1500
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2100	2050	1500
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2070	2100	1845
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1553	1575	1395
Castor Oil	-	15 Kg.	Telangana	Hyderabad	1170	1178	1260
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1490	1480	1880
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2205	2145	1800
Coconut Oil	-	15 Kg.	Kerala	Cochin	1395	1155	1755
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2240	2140	2000
Groundnut Cake	-	Quintal	Telangana	Hyderabad	4143	3886	4071
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	5800	5900	4000
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	NT	NT	3400
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	3730	5350	4040
Jute Raw	W 5	Quintal	West Bengal	Kolkata	3680	5300	3990
Oranges	Big	100 No	Tamil Nadu	Chennai	750	780	500
Banana	-	100 No.	NCT of Delhi	Delhi	400	333	375

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

Commodity	Variety	Unit	State	Centre	Aug-16	Jul-16	Aug-15
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	497	499	495
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	80000	86000	65000
Almonds	-	Quintal	Maharashtra	Mumbai	69000	54000	72000
Walnuts	-	Quintal	Maharashtra	Mumbai	55000	55000	70000
Kishmish	-	Quintal	Maharashtra	Mumbai	11000	11000	19000
Peas Green	-	Quintal	Maharashtra	Mumbai	4200	6000	4100
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	1385	2650	1370
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	1500	2000	1200
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1200	1300	1500
Potato	Red	Quintal	Bihar	Patna	1550	1600	780
Potato	Desi	Quintal	West Bengal	Kolkata	1710	1800	640
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	2293	2833	N. A.
Onion	Pole	Quintal	Maharashtra	Nashik	550	600	4500
Turmeric	Nadan	Quintal	Kerala	Cochin	15500	15500	12500
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	9100	8900	8100
Chillies	-	Quintal	Bihar	Patna	9800	9900	9100
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	67000	66500	63000
Ginger	Dry	Quintal	Kerala	Cochin	16000	16500	22000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	129500	128500	131500
Cardamom	Small	Quintal	West Bengal	Kolkata	100000	105000	110000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3800	3800	3600
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	34351	35685	30015
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	46000	46000	47000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	36350	36650	34500
Fish	Rohu	Quintal	NCT of Delhi	Delhi	8000	10000	7100
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	35000	35000	35000
Eggs	Madras	1000 No.	West Bengal	Kolkata	4100	4500	3950
Tea	-	Quintal	Bihar	Patna	21200	21200	21100
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	34000	34000	33000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26500	28500	31000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	15700	14700	13000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	4800	4610	4500
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3600	3500	3500
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	13000	13000	N. A.
Rubber	-	Quintal	Kerala	Kottayam	10500	12000	9800
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	32600	32600	31500

3. Month end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year, 2016

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug
1	2	3	4	5	6	7	8	9	10	11	12	13
CARDAMOM	Guatmala Bold Green	U.K.	-	Dollar/MT	9000.00	9000.00	9000.00	9000.00	9000.00	9000.00	9000.00	9000.00
				Rs./Qtl	61281.00	61542.00	60210.00	59796.00	60255.00	60516.00	60309.00	60309.00
CASHEW KERNELS	Spot U.K. 320s	U.K.	-	Dollar/MT	8350.09	8143.20	8333.00	9184.69	9568.85	9560.20	9620.02	8629.11
				Rs./Qtl	56855.76	55683.20	55747.77	61023.08	64063.45	64282.78	64463.75	57823.67
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands	-	Dollar/MT	1374.00	1244.70	1244.70	1244.70	1274.70	1249.90	1249.90	1335.00
				Rs./Qtl	9355.57	8511.26	8327.04	8269.79	8534.12	8404.33	8375.58	8945.84
CHILLIES	Birds eye 2005 crop	Africa	-	Dollar/MT	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00	4100.00
				Rs./Qtl	27916.90	28035.80	27429.00	27240.40	27449.50	27568.40	27474.10	27474.10
CLOVES	Singapore	Madagascar	-	Dollar/MT	8650.00	8650.00	8650.00	8700.00	8750.00	8750.00	8900.00	8250.00
				Rs./Qtl	58897.85	59148.70	57868.50	57802.80	58581.25	58835.00	59638.90	55283.25
COCONUT OIL	Crude Phillipine/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	1155.00	1255.00	1545.00	1535.00	1430.00	1600.00	1500.00	1610.00
				Rs./Qtl	7864.40	8581.69	10336.05	10198.54	9573.85	10758.40	10051.50	10788.61
COPRA	Phillipines cif Rotterdam	Phillipine	-	Dollar/MT	687.50	714.50	811.00	813.00	767.00	798.50	797.00	818.00
				Rs./Qtl	4681.19	4885.75	5425.59	5401.57	5135.07	5369.11	5340.70	5481.42
CORRIANDER		India	-	Dollar/MT	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	1650.00
				Rs./Qtl	13618.00	13676.00	13380.00	13288.00	13390.00	13448.00	13402.00	11056.65
CUMMIN SEED		India	-	Dollar/MT	2200.00	2200.00	2500.00	2500.00	2500.00	2500.00	2500.00	2500.00
				Rs./Qtl	14979.80	15043.60	16725.00	16610.00	16737.50	16810.00	16752.50	16752.50
GROUNDNUT OIL	Crude Any Origin cif Rotterdam	U.K.	-	Dollar/MT	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
				Rs./Qtl	8170.80	8205.60	8028.00	7972.80	8034.00	8068.80	8041.20	8041.20
MAIZE		U.S.A.	Chicago	C/56 lbs	369.25	359.75	368.50	380.75	404.75	393.00	335.75	327.50
				Rs./Qtl	988.09	966.77	968.85	994.17	1064.95	1038.52	884.20	862.47
OATS		CANADA	Winnipeg	Dollar/MT	283.14	250.42	250.99	247.92	244.91	263.38	314.33	221.77
				Rs./Qtl	1927.90	1712.37	1679.12	1647.18	1639.67	1770.97	2106.33	1486.08
PALM KERNAL OIL	Crude Malaysia/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	890.00	1030.00	1320.00	1285.00	1200.00	1410.00	1350.00	1505.00
				Rs./Qtl	6060.01	7043.14	8830.80	8537.54	8034.00	9480.84	9046.35	10085.01
PALM OIL	Crude Malaysian/ Sumatra, cif Rotterdam	Netherlands	-	Dollar/MT	575.00	637.50	705.00	710.00	717.50	710.00	655.00	775.00
				Rs./Qtl	3915.18	4359.23	4716.45	4717.24	4803.66	4774.04	4389.16	5193.28
PEPPER (Black)	Sarawak Black lable	Malaysia	-	Dollar/MT	10000.00	10000.00	10000.00	10000.00	10200.00	10200.00	10200.00	10200.00
				Rs./Qtl	68090.00	68380.00	66900.00	66440.00	68289.00	68584.80	68350.20	68350.20
RAPESEED	Canola	CANADA	Winnipeg	Can Dollar/MT	481.20	460.70	469.50	499.50	524.80	480.00	453.90	468.80
				Rs./Qtl	2334.78	2298.89	2378.02	2643.85	2707.97	2515.20	2312.62	2432.60
	UK delivered rapeseed, delivered Erith(buyer)	U.K.	-	Pound/MT	247.00	247.00	245.00	245.00	245.00	232.00	252.00	252.00
				Rs./Qtl	2415.66	2352.43	2314.03	2378.22	2405.66	2271.05	2222.39	2227.93
RAPESEED OIL	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	660.00	614.00	615.00	658.00	602.00	602.00	594.00	594.00
				Rs./Qtl	6454.80	5847.74	5808.68	6387.21	5911.04	5892.98	5238.49	5251.55
SOYABEAN MEAL	UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk	U.K.	-	Pound/MT	248.00	255.00	249.00	291.00	342.00	325.00	331.00	314.00
				Rs./Qtl	2425.44	2428.62	2351.81	2824.74	3358.10	3181.43	2919.09	2776.07
SOYABEAN OIL		U.S.A.	-	C/lbs	30.87	30.92	33.36	33.62	31.34	31.55	29.53	33.57
				Rs./Qtl	4632.67	4659.94	4918.85	4923.10	4624.46	4675.61	4361.29	4957.95
	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	618.00	639.00	650.00	616.00	590.00	596.00	653.00	714.00
				Rs./Qtl	6044.04	6085.84	6139.25	5979.51	5793.21	5834.24	5758.81	6312.47

3. Month end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year, 2016-Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
SOYABEANS		U.S.A.	-	C/60 lbs	883.00	867.50	905.25	1019.00	1085.50	1137.50	1010.50	1030.75
				Rs./Qtl	2206.53	2177.03	2222.60	2484.68	2667.14	2807.02	2485.09	2534.89
	US NO.2 yellow	Netherlands	Chicago	Dollar/MT	377.20	372.90	385.60	409.20	426.00	456.40	412.00	420.90
				Rs./Qtl	2568.35	2549.89	2579.66	2718.72	2852.07	3068.83	2760.81	2820.45
SUNFLOWER SEED OIL	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	674.00	720.00	720.00	720.00	720.00	720.00	746.00	748.00
				Rs./Qtl	6591.72	6857.28	6800.40	6989.04	7069.68	7048.08	6578.97	6613.07
Wheat		U.S.A.	Chicago	C/60 lbs	476.50	442.75	463.00	474.25	466.00	458.75	414.75	404.00
				Rs./Qtl	1190.73	1111.10	1136.77	1156.39	1144.99	1132.06	1019.98	993.54

Source: Public Ledger

Foreign Exchange Rates

Currency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
CanDollar	48.52	49.90	50.65	52.93	51.60	52.40	50.95	51.89
UKPound	97.80	95.24	94.45	97.07	98.19	97.89	88.19	88.41
USDollar	68.09	68.38	66.90	66.44	66.95	67.24	67.01	67.01

Crop Production

3 Sowing and Harvesting Operations Normally in Progress during the Month of November, 2016

State	Sowing	Harvesting
1	2	3
Andhra Pradesh	Paddy, Jowar (In some areas), Bengal Gram, horsegram, condiment, spices and potato	Kharif paddy, ragi, other Kharif cereals ginger and groundnut
Assam	Rabi paddy, gram, mustard, winter vegetables and potato	Kharif paddy, jute, tea and winter potato
Bihar	Wheat, Barley, Gram, rapeseed & mustard & sweet potato	Kharif paddy and Potato
Gujarat	Paddy, wheat, gram pulses and potato	Paddy, Kharif, jowar, groundnut, bajra and cotton
Himachal Pradesh	Wheat, barley and gram	Winter paddy, rabi kharif, sugarcane, ginger (dry), chillies (dry), tobacco, cotton, tumeric and sannhemp
Jammu & Kashmir	Wheat (in Kashmir), barley, Linseed, rapeseed and mustard	Maize (in Jammu)
Karnataka	Bengal gram, potato and rabi paddy	Kharif paddy, jowar, bajra, ragi, groundnut and sweet potato
Kerala	Paddy, pulses & Sweet Potato	Kharif paddy, sugarcane, ginger and tapioca
Madhya Pradesh	Wheat, barley, gram, rabi pulses, potato, rapeseed, mustard and castored	Kharif paddy, jowar, bajra, ragi, kharif, pulses, potato, chillies, tobacco, cotton sweet potato and turmeric
Maharashtra	Wheat, gram, barley, jowar and pulses	Kharif paddy, jowar, groundnut, bajra, cotton and sugarcane
Manipur		Winter paddy, tur, groundnut, sesamum, sweet potato and tumeric
Orissa	Wheat, sugarcane, tobacco, mustard gram and linseed	Kharif paddy, groundnut, sugarcane, cotton and sannhemp
Punjab	Wheat, Barley, gram & linseed	Jowar, bajra, maize, cotton and sugarcane
Rajasthan	Wheat, Barley, gram, potato, tobacco, rapeseed, mustard and lineseed.	Paddy, jowar, bajra, sugarcane and cotton
Tamil Nadu	Rabi paddy, jowar, cotton tobacco, horsegram, chillies, rapeseed and mustard	Kharif paddy, kharif jowar, cumbu ragi, maize, groundnut (unirrigated), cotton varagu, samai, tapioca & ginger
Tripura	Pulses, potato, rapeseed and mustard	Winter rice
Uttar Pradesh	Wheat, barley, gram, lineseed and cotton	Kharif paddy, jowar, bajra, sugarcane, Groundnut, cotton, tobacco and sannhemp
West Bengal	Wheat paddy, wheat, barley, linseed, rapeseed, mustard and potato	Winterpaddy, sugarcane, sesamum and cotton
Delhi	Wheat, barley, gram, pulses, tobacco, lineseed, rapeseed and mustard	Jowar, Kharif pulses, sugarcane, Sesamum and sweet potato

(K)-Kharif (R)-Rabi

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