AGRICULTURAL SITUATION IN INDIA

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Agricultural Situation in India

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PART I

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

NOTE TO CONTRIBUTORS

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

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

PART II

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.

A. General Survey

1. Trends in Foodgrain Prices :

During the month of October, 2012, the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains decreased by 0.33 per cent from 211.9 in September, 2012 to 211.2 in October. 2012.

Similarly, the Wholesale Price Index Number of Cereals showed an increase of 0.15 per cent from 201.3 to 201.6 and Pulses showed an increase of 1.68 per cent from 261.4 to 265.8.

There is no change in Wholesale Price Index Number of Wheat and remained at 198.0 where as that of Rice increased by 0.82 per cent during the same period.

The Government of India has fixed the Minimum Support Prices for the Rabi Crops of 2012-13 season of Fair Average Quality as under :—

Rs. per quintal

Commodity	MSP
Wheat	Not Announced
Barley	980
Gram	3000
Masur (Lenti1)	2900
Rapeseed / Mustard	3000
Safflower	2800

2. Weather, Rainfall and Reservoir situation during October, 2012

- Cumulative Post-Monsoon Rainfall for the country as a whole during the period 1st October to 28th November, 2012 is 19% less than LP A. Rainfall in the four broad geographical divisions of the country during the above period was (-) 87% in North West India, (-) 25% in Central India, 1% in South Peninsula and (-) 17% in East and North East India.
- Out of a total of 36 meteorological subdivisions, 15 subdivisions constituting 38% of the tota area of the country received excess/normal rainfall and the remaining 21 subdivision constituting 62% of the total area of the country received deficient/ scanty rainfall.
- Central Water Commission monitors 84 major reservoirs in the country which have a total live capacity of 154.42 BCM at Full Reservoir Level (FRL). Current live storage in these reservoirs as on 29th November,. 2012 was 103.12 BCM as against 112.22 BCM on 29-11.2011(last year) and 96.74 BCM of normal storage (average storage of the last 10 years). Current year's storage in 92% of the last year's and 107% of the normal storage. Major States reporting lower than normal storage are Jharkhand, West Bengal, Tripura, Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.
- As per latest information available on sowing of crops, around 61 % of the normal area under Rabi crops have been sown upto 30-11-2012. Area sown under all rabi crops taken together has been reported to be 374.22 lakh hectares at All India level as compared to 384.70 lakh hectares in the corresponding period of 2011-12. Area coverage was higher by 1.2 lakh ha. under Jowar and lower by 4.6 lakh ha. under Wheat and 3.2 lakh ha under Gram.
- A statement indicating comparative position of area coverage under major Rabi crops during 2012-13 (upto 30-11-2012) and the corresponding period of last year is given in the following table.

ALL INDIA CROP SITUATION - RABI (2011-12) AS ON 30-11-2012

Crop Name	Normal Area	Average Area as on date	Area sown reported (in lakh hectares)			Absolute Change over (+/–1)	
			30-11-2012	% of Normal	30-11-2011	Average as on date	Last Year
Wheat	282.62	144.05	157.89	55.9	162.50	13.8	–4.6
Rice	44.99	1.57	0.85	1.9	1.05	–07	–02
Jowar	44.99	40.44	35.65	79.2	34.48	–4.8	1.2

ALL INDIA CROP SITUATION - RABI (2011-12) AS ON 30-11-2012

Crop Name	Normal Area	Average Area as on date	Area sown reported (in lakh hectares)			Absolute Change over (+/–1)	
			30-11-2012	% of Normal	30-11-2011	Average as on date	Last Year
Maize	11.36	4.91	5.10	44.9	4.50	0.2	0.6
Barley	6.57	5.15	4.79	72.8	5.54	–04	–08
Total Coarse Cereals	62.92	50.80	46.15	73.3	44.83	–4.7	1.3
Total Cereals	390.53	196.42	204.89	52.5	208.38	8.5	–3.5
Gram	80.57	73.14	72.40	89.9	75.58	–0.7	–3.2
Lentil	14.46	13.25	10.81	74.7	11.93	–2.4	–1.1
Peas	7.15	6.60	6.33	88.6	6.95	–0.3	–0.6
Kulthi(Horse Gram)	2.36	3.92	3.57	151.5	3.71	–0.3	–0.1
Urad	7.46	2.98	2.36	31.7	3.26	–0.6	–0.9
Moong	6.40	1.33	0.89	13.9	0.97	.04	–0.1
Lathyrus	5.46	3.58	2.86	52.4	3.76	–0.7	–0.9
Others	3.61	3.91	3.27	90.6	3.42	–0.6	–0.1
Total Pulses	127.46	108.70	102.49	80.4	109.56	–6.2	–7.1
Total Foodgrains	518.00	305.12	307.38	59.3	317.94	2.3	–10.6
Rapeseed & Mustard	62.80	56.65	57.10	90.9	56.43	0.5	0.7
Groundnut	8.87	2.40	2.51	28.3	2.05	0.1	0.5
Safflower	3.05	2.22	1.16	38.0	1.56	–1.1	–0.4
Sunflower	10.26	5.69	3.39	33.1	3.37	–2.3	0.0
Sesamum	2.56	0.40	0.24	9.3	0.38	–0.2	–0.1
Linseed	4.03	2.93	2.17	53.8	2.62	–0.8	–0.5
Others	0.00	0.58	0.28	#DIV/01	0.36	–0.3	–0.1
Total Oilseed (Nine)	91.56	70.87	66.84	73.0	66.76	–4.0	0.1
All-Crops	**609.55**	**375.99**	**374.22**	**61.4**	**384.70**	**–1.8**	**–10.5**

Source Crops and TMOP Divisions DAC

Agriculture :

All India production of foodgrains: As per the 1st advance estimates (Kharif only) released by Ministry of Agriculture on 24-09-2012, production of foodgrains during 2012-13 is estimated at 117.18 million tonnes compared to 123.88 million.tonnes (1st advance estimates) in 2011-12.

Procurement: Procurement of rice as on 1st October, 2012 (Kharif Marketing Season 2011-12) at 34.92 million tonnes represents an increase of 3.65 per cent compared to the corresponding date last year. Wheat procurement during Rabi Marketing Season 2012-13 is 38.15 million tonnes as compared to 28.15 million tonnes during the corresponding period last year.

TABLE 1— PROCUREMENT IN MILLION TONNES

	2009-10	2010-11	2011-12	2012-13
Rice (Oct.-Sept.)	32.03	34.20	35.04*	9.41*
Wheat (Apr.-Mar.)	25.38	22.51	28.34	38.15**
Total	**57.41**	**56.71**	**63.38**	**47.56**

* Position as on 5-11-2012.** Position as on 02-08-2012

Off-take: Off-take of rice during the month of September, 2012 was 28.20 lakh tonnes. This comprises 19.80 lakh tonnes under TPDS and 8.40 lakh tonnes under other schemes during September 2012. In respect of wheat, the total off take was 30.34 lakh tonnes comprising of 13.78 lakh tonnes under TPDS and 16.96 lakh tonnes under other schemes.

Stocks: Stocks of foodgrains (rice and wheat) held by FCl as on November 1, 2012 were 69.53 million tonnes, which is higher by 24.72 per cent over the level of 55.75 million tonnes as on November 1, 2011.

TABLE 2—OFF-TAKE AND STOCKS OF FOODGRAINS (MILLION TONNES)

	Off-take			Stocks	
	2010-11	2011-12(P)	2012-13(P) up to Sept. 2012)	Nov. 1, 2011	Nov. 1, 2012
Rice	29.93	32.12	15.65	26.08	28.95
Wheat	23.07	24.26	14.27	29.67	40.58
Total	**53.00**	**56.38**	**29.92**	**55.75**	**69.53**

P=Provisional

Growth of Economy —

As per the latest estimates of the Central Statistics Office (CSO), the growth in real Gross Domestic Product (GDP) is placed at 5.3 per cent in the second quarter of 2012-13 with agriculture, industry and services registering growth rates of 1.2 per eent, 2.8 per cent and 7.2 per cent respectively. As per the Revised Estimates (RE), the, growth in GDP at factor cost at constant (2004-05) prices was estimated at 6.5 per cent in 2011-12 as compared to 8.4 per cent in 2010-11 (Quick Estimate). At disaggregated level, this (RE 2011-12) comprises growth of 2.8 per cent in agriculture and allied activities, 3.4 per cent in industry and 8.9 per cent in services as compared to a growth of 7.0 per cent, 7.2 per cent and 9.3 per cent respectively during 2010-11.

TABLE 3— GROWTH OF GDP AT FACTOR COST BY ECONOMIC ACTIVITY

(at 2004-05 Prices)

Industry	Growth			Percentage Share in GDP		
	2009-10	2010-11 QE	2011-12 RE	2009-10	2010-11 QE	2011-12 RE
1. Agriculture, forestry and fishing	1.0	7.0	2.8	14.7	14.5	14.0
2. Industry	**8.4**	**7.2**	**3.4**	**28.1**	**27.8**	**27.0**
a. Mining and quarrying	6.3	5.0	–0.9	2.3	2.2	2.1
b. Manufacturing	9.7	7.6	2.5	16.0	15.8	15.3
c. Electricity, gas and water supply	6.3	3.0	7.9	2.0	1.9	1.9
d. Construction	7.0	8.0	5.3	7.9	7.9	7.8
3. Services	**10.5**	**9.3**	**8.9**	**57.2**	**57.7**	**59.0**
a. Trade, hotels, transport and communication	10.3	11.1	9.9	26.6	27.2	28.1
b. Financing, insurance, real estate and business services	9.4	10.4	9.6	17.1	17.4	17.9
c. Community, social and personal services	12.0	4.5	5.8	13.5	13.1	13.0
4. GDP at factor cost	**8.4**	**8.4**	**6.5**	**100.0**	**100.0**	**100.0**

(QE): Quick Estimates; (RE): Revised Estimates

TABLE 4—QUARTERLY ESTIMATE OF GDP

(Year-on-year in per cent)

	2010-11				2011-12				2012-13	
Industry	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1. Agriculture, forestry & fishing	3.1	4.9	11.0	7.5	3.7	3.1	2.8	1.7	2.9	1.2
Industry	8.3	5.7	7.6	7.0	5.6	3.7	2.5	1.9	3.6	2.8
2. Mining & quarrying	6.9	7.3	6.1	0.6	–0.2	–5.4	–2.8	4.3	0.1	1.9
3. Manufacturing	9.1	6.1	7.8	7.3	7.3	2.9	0.6	-0.3	0.2	0.8
4. Electricity, gas & water supply	2.9	0.3	3.8	5.1	8.0	9.8	9.0	4.9	6.3	3.4
5. Construction	8.4	6.0	8.7	8.9	3.5	6.3	6.6	4.8	10.9	6.7
Services	**10.0**	**9.1**	**7.7**	**10.6**	**10.2**	**8.8**	**8.9**	**7.9**	**6.9**	**7.2**
6. Trade, hotels, transport & communication	12.6	10.6	9.7	11.6	13.8	9.5	10.0	7.0	4.0	5.5
7. Financing, insurance, real estate & buss. Services	10.0	10.4	11.2	10.0	9.4	9.9	9.1	10.0	10.8	9.4
8. Community, social & personal services	4.4	4.5	–0.8	9.5	3.2	6.1	6.4	7.1	7.9	7.5
9. CDP at factor cost (total I to 8)	**8.5**	**7.6**	**8.2**	**9.2**	**8.0**	**6.7**	**6.1**	**5.3**	**5.5**	**5.3**

Source: CSO

Agroforestry in Climate Change Adaptation and Mitigation

A. Abdul Haris[1], Vandna Chhabra[2] and B. P. Bhatt[3]

It is the popular phrase "climate is what you expect, while weather is what you get" weather refers -day to day atmospheric condition resulting from changes in temperature, rain, sunshine and wind etc. Climate refers to the average weather condition for a certain period—months to thousands or millions of years. A classical period of 30 years average changes in surface variables can be taken as stable climatic condition. Climate change is a matter of global concern which means any significant change in climatic parameters lasting for an extended period of time. Climate variability refers to short-term changes in climate such as longer dry or rainy season, intense heat during summer, more rains during rainy months, and many more. Evidences of climate change are; increasing mean surface temperature and associated changes like variability in rainfall, increased frequency of extreme events, unpredictable weather, uncertain water availability, food scarcity, increasing the incidence of pests and diseases, altering cropping seasons etc.

Studies have shown that climate change is due to the increasing emission and accumulation of greenhouse gasses, such as carbon dioxide and other gases with high global warming potential, in the atmosphere. Greenhouse gases are released from human activities such as deforestation, burning of fossil fuels, chemical use, and many others. These gases trap heat in the atmosphere and prevent it from being released into space. This increases global temperature which changes both weather and climate conditions. Global warming increases ocean temperature and rate of evaporation. Climate change, through global warming, increased the number, frequency, and intensity of extreme weather events in the country over the years. Increasing global temperature causes glaciers and polar ice caps to melt hence making sea levels rise. Climate change can extend El Nino or bring more rains than usual during La Nina. Farmers become confused as to when they should plant crops, thereby affecting length of cropping season, time of harvest, and food supply. Water shortage during dry months can also affect crop growth and overall food production.

Climate change can vary the life cycle of pests-increasing their population. Diseases can also become prevalent based on the environmental conditions resulting from climate change. Climate change can make summer months warmer or cold months cooler than usual. These changes in temperature can cause animals to migrate to more suitable places, or force them to adapt with adverse effects on their physical conditions. Biodiversity is thus at more risk now than ever because of climate change.

Forest destruction for agriculture and industry purpose is a major threat to the biodiversity in India. Forests are the sinks of carbon dioxide which is the major green house gas apart from maintaining a favourable bioclimate. As public forests become all the time more depleted, the pressure towards forests will increase. Agroforestry is a perfect choice to reduce pressure on forests by increasing tree cover and productivity of wastelands and to prevent and mitigate climate-change effects (Dhyani et.al, 2009).

Currently worldwide area under agroforestry is 1,023 million ha (Nair, 2009), and areas that could be brought under agroforestry is estimated to be 630 M ha (IPCC, 2000) with the potential to sequester 586 Gg C yr-1 by 2040. Pandey, 1998 reported that agroforestry systems in India have trees in farms and a variety of forest management and ethnoforestry practices. In India, area under natural forests has reduced to 19.39%, lower than recommended threshold of 33% (SFR, 1993). It needs minimum of 100 million ha under forest or other tree plantations to maintain the ecological balance. The National Agriculture Policy-2000 sets a goal to bring one third of the total area of the country under the tree cover. Indeed, numerous regions of India can be designated as agricultural biodiversity,heritage sites based on the crop diversity and numerous tree species in traditional agroforestry' systems to enhance food security and adaptation to climate change (Singh, 2011). Agroforestry can improve the lives of farmers, help reduce poverty, and maintain ecological stability.

Agroforestry is an art and science that has been practiced traditionally. It combines the production of trees, food crops, and forage crops for animals on the same land. It can even integrate mini-forests, orchards, and aquaculture systems. Some of the agroforestry species that can be grown for various purposes include *Sesbania sesban, Calliandra species, Leucaena species, Jatropha curcus, Tephrosia vogeli, Cajanus cajan, Eucalyptus*

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species, Acacia species and some fruit trees. Based on the nature of composition, agroforestry can be classified as agrosilvicultural, silvipastoral, agrosilvipastoral and multipurpose tree plantation system.

Agrosilvi -cultural system

In this system, agricultural crops are intercropped with trees in the interspace between the trees. The trees are grown in agricultural fields, on farm boundaries or separately. The species generally grown *include Prosopis cineraria, Zizyphus nummularia; Eucalyptus* globulus, Jatropha curcus, etc. Wheat, mustard, sugarcane, potato, maize and paddy are crops that can be grown along with trees.

Silvipastoral system

The production of woody plants combined with pasture is referred to Silvipasture system. The trees and shrubs may be used primarily to produce fodder for livestock or they may be grown for timber, fuelwood, and fruit or to improve the soil. Tree species under this system are *Tectona grandis*, *Gmelina arborea*, *Terminalia myriocarpa Acacia nilotica, Albizia lebbeck, Azadirachta indica, Leucaena leucocephala, Gliricidia sepium, Sesbania grandiflora* and grasses like red clover, white clover and Setaria etc are cultivated.

Agrosilvipastoral and Agrihortisilvipastoral system

The production of woody perennials combined with annuals and pastures is called as Agrisilvipastoral system. Many species of trees, bushes, vegetables and other herbaceous plants are grown in dense and in random or spatial and temporal arrangements. Fodder grass and legumes are also grown to meet the fodder requirement of cattle. Woody species like *Dalbergia sissoo, Ficus spp, Anacardium occidentale,Artocarpus heterophyllus, Citrus spp, Psiduim guajava, Mangifera indica, Azadirachta indica, Cocus nucifera,*and herbaceous species like Bhindi, Onion, cabbage, Pumpkin, Sweet potato, Banana, Beans, etc.are grown in this system.

Plantation based Agroforestry systems

Modern commercial plantation crops like rubber, coffee, poplar, eucalypts and oil palm represent a well-managed and profitable stable land-use activity in tropics. Some of the plantation crops like coconut, palms have been cultivated since very early times but their economic yield remained low. However, the research attention and commercial yields of these crops have increased substantially.

Other systems

Apiculture with trees: In this system various honey producing trees frequently visited by honeybees are planted on the boundary of the agricultural fields.

Aquaforestry: Various trees and shrubs preferred by fish are planted on the boundary and around fish ponds. Tree leaves are used as feed for fish.

Mixed wood lots: In this system, special location specific Multi purpose trees are grown mixed or separately planted for various purposes such as wood, fodder, soil conservation, soil reclamation etc.

Adaptation to climate change through Agroforestry

Adaptation is the adjustment of natural and man-made systems to environmental stimuli. Main corridor through which agroforestry may qualify as an adaptation to climate change is through diversifying production systems. The role of agroforestry in reducing the vulnerability of agroecosystems-and the people that depend on them-to climate change and climate variability needs to be understood more clearly. Because of its potentials, agroforestry is not only unique from agriculture and forestry; it may also be a key strategy in mitigating and adapting to climate change.

Food security: Agroforestry ensures food security by generating direct benefits to farmers such as food, fodder, feed for fish and livestock, fuel wood, live fences, and other products. The diversity of crops provides multiple harvests at different times of the year, thereby reducing the risk of crop loss and food shortage. In northeast Indian state of Meghalaya the guava and Assam lemon based agri horticultural agroforestry systems (farming systems that combine domesticated fruit trees and forest trees) gave 2.96 and 1.98-fold higher net return respectively in comparison to farmlands without trees (Bhatt and Mishra, 2003).

Ecological balance: Agroforestry helps in maintaining ecological balance by water conservation, improved soil fertility, and improved microclimate conditions. Agroforestry systems such as intercropping and mixed livestock systems, involving legume-based rotations, reduce runoff and improve soil fertility.

Improvement of quality of life: Agroforestry improves quality of life of farmers by increasing income due to multiple harvests and sale of products from the systems different components, thereby providing regular income throughout the year. About 76% of the human population was dependent on 21% of land suitable for agriculture in the Garhwal hills for livelihood almost 20 years ago (Dadhwal et al. 1989).

Mitigation of climate change through Agroforestry

Mitigation is the process of reducing the impact of climate change through interventions which remove the carbon dioxide and other green house gases from the atmosphere. It can be through reducing the source of emission or creating improved sink capacity. An agro-forestry system not only supports the livelihood but also mitigates the impact of climate change through carbon

sequestration (Pandey 2002, 2007). Carbon sequestration occur through forestation, reforestation and restoration of degraded lands, agroforestry, cropland and grazing management and silviculture, promoting increase carbon stocks in biomass or soil carbon. Biological carbon sequestration is the process of fixing atmospheric carbon in plants through photosynthesis and its assimilation in tissues and storage organs as structural and metabolic components which ultimately enrich soil carbon. Carbon conservation through conservation of biomass and soil carbon, improved forest management practices, carbon substitution through increased transfer of forest biomass into durable wood, sustainable use of biofuels, and enhanced harvesting and utilization of waste as bio fuel are some of the activities helpful to mitigate climate change. The interactions of the different components of agroforestry systems can help absorb and sequester carbon dioxide and other greenhouse gasses from the atmosphere. In India, average sequestration potential in agroforestry has been estimated to be 25tC per ha over 96 million ha, but there is substantial variation in different regions depending upon the biomass production (Sathaye and Ravindranath, 1998). The net annual carbon sequestration rates for fast growing short rotation agroforestry crops such as poplar and Eucalyptus have been reported to be 8 Mg C ha-1 yr-1 and 6 Mg C ha-1yr-1 respectively (Kaul et al., 2010). However, a poorly designed agroforestry system can enhance global warming and further contribute to climate change. Undertaking agroforestry systems involves proper implementation of soil and water conservation measures, particularly along steep slopes. Putting these measures in place enable agroforestry systems to efficiently minimize erosion, floods, and landslides. The canopy of trees, tree litter, and humus also filter sunlight thereby maintaining soil moisture. An efficient agroforestry system not only maximizes the benefits it provides but also ensures the link to climate change mitigation.

Limitations of Agroforestry

An integrated food-tree farming system, while advantageous, does have certain negative aspects like competition of trees with food crops for space, sunlight, moisture and nutrients may reduce food crop yield; damage to food crop during tree harvest operation; potential of trees to serve as hosts to insect pests that are harmful to food crops, which may displace food crops and take over entire fields. Requirement for more labour inputs, which may causes scarcity at times in other farm activities and resistance by farmers to displace food crops with trees, especially where land is scarce are also some of the limitations to agroforestry.

Researchable issues

To use agroforestry systems as an important option for climate change mitigation and adaptation, livelihoods improvement and sustainable development, research and policy will have to progress towards

(i) Effective communication to enhance agroforestry practices with multifunctional values

(ii) Maintenance of the traditional agroforestry systems and creation of new systems

(iii) Selection of more useful trees for livelihoods improvement

(iv) Designing silvicultural and farming systems to optimize food production, carbon sequestration and biodiversity conservation

(v) Maintaining a continuous cycle of regeneration-harvest and regeneration

(vi) Domestication of useful fruit tree species currently growing in the wilderness to provide more options for livelihoods improvement

(vii) Strengthening the markets for non timber forest products

(viii) Addressing the research needs and policy for linking knowledge to action.

Policy Issues

Appropriate policy issues can strengthen adaptation and resilience of communities to local and global change. On the recommendations of the National Commission on Agriculture (GOI, 1976) the farm forestry programmes in India, along with other social forestry programme, started in late 1970s to meet rural people's subsistence needs. The National Forest Policy (GOI, 1988) stipulated that forest based industries should meet their raw material requirements by establishing a direct relationship with the farmers. The Amendment to the Forest (Conservation) Act in 1988 restricted leasing of forestlands to private sector for industrial plantations. The National Agriculture Policy (2000) emphasized the role of agroforestry for, nitrogen fixation, efficient nutrient cycling and organic matter addition and for improving drainage. The Task Force on Greening India for Livelihood Security and Sustainable Development of Planning Commission (2001) has also recommended that agroforestry may be introduced over an area of 14 million ha out of 46 m ha irrigated areas that are degrading due to water-logging, salinization and soil erosion for sustaining agriculture.

A Committee on 'Development of Bio-fuels' was constituted in July 2002 under which Jatropha plantation is promoted for production of Biodiesel. With a view to substituting diesel for biodiesel, the Government of India has launched the National Mission on Biodiesel. The National Environmental Policy 2006 also emphasised the promotion of private and farm forestry in environmental conservation and management.

Government of India stresses on biofuels, like biodiesel to meet the energy requirements of the country. Bio-diesel production can be integrated with the agroforestry with suitable incentives and policy initiatives. The country's bio-diesel programme is based on non-edible oil seeds, like Jatropha curcas and Pongamia pinnata. A National Mission on Biodiesel (NMB) has been constituted with Ministry of Rural Development as the nodal agency.

Conclusion

Agroforestry is an art and science that has been practiced traditionally that combines the production of trees, food crops, and forage crops for animals from the limited land available to small and marginal farmers in diverse agro ecosystems. Diversifying the production system by including agroforestry may reduce the risks associated with climatic variability in synergy with climate change mitigation. The interactions of the different components of agroforestry systems can help absorb and sequester carbon dioxide and other greenhouse gasses from the atmosphere. However while planning such systems, complimentarity of different enterprises in the farm and competing requirements of land, labour, capital and management aspects needs to be looked into. If agroforestry systems are properly planned and implemented, more carbon dioxide and other greenhouse gases can be sequestered every year. Appropriate research and policy interventions can strengthen adaptation and resilience of communities to local and global change.

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Growth in Foodgrain Production in India is Technology led or Policy led : Special Reference to Andhra Pradesh with District wise Economic Analysis

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Abstract

This study is to assess the impact of Technology and policy on production of foodgrains in India in general along with district wise analysis of Andhra Pradesh in particular. Time senes data for the period 1990-91 to 2009-10 were collected from Bureau of Economics and Statistics, Government of India and Andhra Pradesh. Analytical tools like Hierarchical and K-Means Clustering, Compound growth rate (CGR), Coppock's Instability Index (C.I.l), Decomposition of change in average production were employed.

Growth in production was higher during period-1 than period-II, along with low degree of instability. Effect of technology was higher than the policy effect on the production differential in both Andhra Pradesh and in India. So, growth in production should mainly come from yield attributing factors like development of farming system specific high yielding varieties, input use efficiency and technology etc.

Growth in production was higher during period-I than period-II, along with low degree of instability. Effect of technolopgy was higher than the policy effect on the production differential in both Andhra Pradesh and in India. So, growth in production should mainly come from yield attributing factors like development of farming system specific high yelding varieties, input use efficiency and technology etc.

India is the one of the largest producer, consumer and importer of food grains in the world. During 2010-11, food grains were grown in 125.73 Million hectares with a production of 24l.77 Million tonnes and productivity of 1,921 kg/ha . The major food grains grown in India are Rice, Wheat, Red gram, Bengal gram etc. During 2009-10, Andhra Pradesh ranks sixth in Food grains production, with 6.67 (5.3%) Million hectares of area, 15.30 (6.33%) Million tonnes of production and 2,294 kg/ha productivity (Agricultural Statistics at a glance 2011). Growth in crop production during the post-green revolution period has been accompanied with increased instability and yield fluctuation turned out to be the major source of production instability (Hazell 1984; Jayadevan 1991). In Andhra Pradesh inter period comparison between period I (1980-81 to 1990-91)and period II (1991- 92 to 2001-02) revealed that growth in area and production in period II has performed well over period I, contrastingly, there was decline in productivity growth during period II over period I (Ramarao and Raju 2005). With this background to find out whether growth in food grain production is technology led or policy led, an attempt has been made in the present study with the following specific objectives:

1. To calculate growth rates in area, production and productivity
2. To estimate the extent of instability in production
3. To assess the technology effect and policy effect on change in average production
4. To Identify the productivity clusters
5. To examine the growth and instability clusters based on production

Materials and Methods

The study pertains to India (country as a whole), Andhra Pradesh (state as a whole), three geographical regions of Andhra Pradesh viz; Coastal Andhra, Rayalaseema and Telangana and all districts ie., 22 districts (Because data for Hyderabad district is negligible). Here, the food grains means summing up total cereals and millets with total pulses. The time series data for period (1990-91 to 2009-10) on area, production and productivity were collected from various publications of the Bureau of Economics and Statistics, Government of India and Andhra Pradesh. In order to analyse the technology and policy effect, productivity was taken as proxy for technology and area was taken as policy variables. Because, technology will affect the yields of the crops, where as policy parameter price will lead to area expansion. For the purpose of analysis data period was divided into two sub periods viz. Period -I (1990-91 to 1999-2000) and Period -II (2000-01 to 2009-10). Analysis was conducted separately for each period.

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Analytical Tools: Following analytical techniques were employed to achieve the objectives.

Estimation of growth rates: Compound growth rates were estimated by fitting an exponential function of the following form.

$$Y=A.b^t$$

$$\text{Log } Y = \text{Log } A + t.\ \text{log } b$$

Where,

Y = Area/Production/Productivity A= Constant b= (1 +r)

r = Compound Growth Rate t = Time variable in years (1, 2, 3 ... n)

The value of antilog of 'b' was estimated by using LOGEST function in MS-Excel. Then, the percent Compound Growth Rate is calculated as below;

$$CGR\ (\%) = [LOGEST\ (Y_t : Y_{10}) - 1] \times 100$$

Estimation of extent of instability : For the calculation of extent of instability, Coppock's. Instability Index (Cll) was employed. Cll is a close approximation of the average year-to-year percentage variation adjusted for trend. In algebraic form:

$$C.I.I = [\text{Antilog } v\sqrt{\log V} - 1] \times 100$$

$$\text{Log } V = \frac{[\text{Log } (X_{t+1}/X_t) - m]^2}{N-1}$$

Where,

X_t = Areal productionl Productivity in the year 't' N= Number of years

log V = Logarithm ic variance m = Arithmetic mean of difference between the logs of X_{t+1} etc.,

Decomposition of Change in Average Production: Change in average production between the periods arises from changes in mean area and mean yield (productivity), interaction . between changes in mean yield and mean area and change in yield-area covariance (Hazell, 1984).

The change in average production , ΔE (P) between the periods can be obtained as follows:

$$\Delta E\ (P) = \bar{A}_1.\ \Delta\bar{Y} + \bar{Y}_1\ .\ \Delta\bar{A} + \Delta A.\ .\ \Delta\bar{Y} + \Delta Cov\ (A,Y)$$

Where,

$\bar{A}_1$, ΔY, $\bar{Y}_1$. ΔA, ΔA. ΔY and Δ Cov (A,Y) are change in mean area, change in mean yield, changes in mean area and mean yield and changes in area & yield covariance respectively

Clustering: Cluster analysis is a multivariate procedure ideally suited to segmentation application. Clustering is the technique, which groups the objects of interest based on the proximities of the concerned character. Two-stage clustering technique was employed by using the Hierarchical and K-Means Clustering techniques. Hierarchical Clustering gives the number of groups to be formed. Where as, K-Means Clustering will decide the membership in each cluster.

(1) Based on productivity:

Hierarchical Cluster analysis given three clusters of districts based on yield (kg/ha). These clusters were named as low (1,500), medium (1,500-2,000) and high (> 2,000).

Based on growth *vis-a-vis* instability

Based on the production growth (CGR) Hierarchical Cluster analysis classified the districts into three clusters viz., Low (< 0 %), Medium (0.1-2.0%) and High (> 2.1%). Similarly, based on production instability (CII) districts were categorised into three clusters *viz*; Low (< 1 0%), Medium (l 0-20%) and High (> 20%). Then, these three clusters each in growth and instability were cross tabulated and resulted in nine clusters Viz., L-L (Low-Low), L-M,L-H,M-L,M-M,M-H,H-L,H-M, and H-H (High-High) clusters, and presented in the form of 3× 3 tables (tables 6 and 7). Further, analysis was carried for the both periods.

Results and Discussion

Magnitude of Growth:

During the period -I, country as a whole, growth rate was negative in area (-0.32%), growth rate in production (3.18%) and productivity (3.51 %) were high (Table 1). So, growth in productivity contributed more towards growth in production than by growth in area. Similar trend was noticed in state as a whole also. Among the regions, ranges of growth rates in area varied between -5.34 per cent (Rayalaseema) and 0.41 per cent (Coastal Andhra), in production they were from - 0.52 per cent (Rayalaseema) to 2.94 per cent (Telangana) and in productivity varied between 1.90 per cent (Coastal Andhra) and 5.64 per cent (Telangana). Growth in productivity contributed more towards growth in production in all regions. Among the districts, range of growth rates in area was between -7.78 per cent (Kadapa) and 4.16 per cent (Srikakulam), in production the lowest was -2.43 per cent (Ananthapur) and the highest was 6.11 per cent (Srikakulam), in productivity growth rates varied from -0.1 per cent (Krishna) to 8.06 per cent (Warangal). All districts in Rayalaseema and Telangana regions shows negative trend in area. Out of 22 districts, in 19 districts growth in productivity was higher than growth in area and likewise contributed towards production growth.

During the period -II, among the districts, highest growth rates in area (3.31 %), production (4.72%) and productivity (5.92%) were recorded in Kurnool, Mahaboobnagar and Ranga reddy respectively. Lowest

growth rates in area (-4.79 %) and production (-4.88%) were noticed in Chittoor, in productivity (-2.82) was observed in Kadapa. Lowest growth rates in all variables were recorded among the districts of Rayalaseema region, while highest in production and productivity were noticed in districts of Telangana. Further, 13, three, four districts registered with negative growth rates in area, production and productivity respectively. Among the regions, growth rates in area varied between -0.72 per cent (Coastal Andhra) and 1.62 per cent (Rayalaseema), in production varied from 1.40 per cent (Coastal Andhra) to 3.20 per cent (Telangana), in productivity varied between 0.67 per cent (Rayalaseema) and 3.31 per cent (Telangana). Growth in area contributed more towards growth in production than growth in productivity in Rayalaseema, vice versa was noticed in Coastal Andhra and Telangana.

State as a whole, growth in productivity (2.42%) contributed more towards growth in production (3.3%) than by growth in area (- 0.20%). Similarly, Country as a whole, growth in productivity (0.84%) had higher influence on production (0.63%) than by growth in area (- 0.22%).

Shah and Shah (1997) reported that foodgrain production during 1977-76 to 1990- 91 has increased substantially but has brought in uneven development across the region and crops in India. In present study among the regions of Andhra Pradesh, during the period -1 growth in production varied between -0.52 (Rayalaseema) to 2.94 (Telangana) shows high difference (3.46 %) among the regions, where as, this difference (1.80 %) was lowered during period -II. Further, uneven growth was noticed across districts also. During period -I all the districts in Rayalaseema and Telangana has showed negative growth rate in area, whereas, during period -II seven districts (out of 9) in Coastal region recorded negative growth rate in area. It conveys that improved technology and improved varieties are locally biased.

Extent of Instability:

Country as a whole, during the period -I, productivity variability (4.40%) had more influence on production fluctuations (4.44%) than by instability in area (0.97%) (Table 2). During the period -II also instability in productivity (1.78%) has more influence on production variability (2.74%) than by instability in area (1.14%). Inter period comparison revealed that instability in production and productivity during the period-II was less than period-I.

State as a whole, during both periods, productivity variability had more influence on production fluctuations than by instability in area. Inter period comparison revealed that instability in production and productivity during the period-II was less than period-I.

Among the regions, during the period -I, the lowest instability in area (2.18%), production (5.02%) and productivity (4.11%) were recorded in Coastal Andhra. Highest instability in area (6.61 %) and productivity (8.88%) were recorded in Rayalaseema, while, in production (6.54%) was observed in Telangana. In all regions contribution towards production fluctuations was more by variability in productivity. During the period -II, the lowest instability in area (2.67 %), production (4.72%) and productivity (3.21%) were recorded in Coastal Andhra. Highest in area (3.85%) and production (8.98%) was noticed in Telangana and in productivity (7.64%) was recorded in Rayalaseema. Contribution towards production variability was more by productivity variability in all regions.

Among the districts, during the period -I, the lowest in area (1.53%), production (4.04%) and productivity (3.82%) were recorded in Khammam, Krishna and Guntur respectively. Highest instability in area (12.51%) and production (23.93%) were noticed in Srikakulam and in productivity (13.35%) was recorded in Vizianagaram. Highest in all variables were noticed in among the districts of Coastal Andhra. In 18 districts, out of 22, contribution of instability in productivity in relation to variability in area was more towards production fluctuations. During the period -II, the lowest instability in area (2.83%) was noticed in Medak, in production (4.66%) and productivity (3.61%) were observed in West Godavari. Highest instability in area (9.04%), production (15.68%) and productivity (12.73%) were registered respectively in and Karimnagar, Nalgonda and Kadapa. In 19 districts, out of 22, production fluctuation was more influenced by instability in productivity than variability in area.

Technology effect and Policy effect on change in average production:

Between period -I and II, country as a whole, effect of technology (213.97%) was higher than policy (-11.29). Similar trend was noticed in State as a whole, where technology (154.12%) had very high effect on average production differential between the periods, than other factors (Table-3).

Among the regions, technology effect has higher effect on production differential than other components of change in all regions. When compared about magnitude, it was highest in Rayalaseema (848.04%) followed by Telangana (141.13%) and Coastal Andhra (138.04%).

Among the districts, in 19 districts (7 in Coastal Andhra, 3 in Rayalaseema and All in Telangana) technology had more effect on average production differential than by other components of change. The highest technology effect was recorded in Krishna (449.49%). While, highest policy effect (1465.68%) was noticed in Nalgonda.

Clustering based on productivity:

During period -I, 36.44%, 29.31 % and 34.24% of state average production was in low, medium and high cluster groups respectively (Table 4). During, period -II, a good

amount (59.72%) was in high cluster group (Table 5). That shows the definite effct of technology in some districts over the time. In the districts where productivity was decreased magnitude was low, whereas, in the districts where productivity increased the magnitude was high. This was reflected in average productivity level in period-II (2.02 tonnes/ha) which is higher than period -I (1.53 tonnes/ha). During period-I, 12, six and four districts were in low, medium and high clusters respectively. During period-II, eight, six and eight districts were in low, medium and high clusters respectively. This shows technology led the movements of the some districts from low to medium and to high clusters from period 1 to II. That is to say that three districts Viz., Srikakulam, Prakasam and Khammam moved from low cluster to medium cluster, one district Viz., Warangal moved from low to high clusters, three districts Viz., East Godavari, Nizamabad and Karimnagar moved from medium to high clusters. But, point of concern is that productivity levels of 15 districts were stagnant.

Clustering based on Growth vis-a-vis Instability:

Production growth was 2.25% and 2.21 % in periods-I and II respectively for state as a whole (Table 1). The average foodgrains production increased from period-I (11.48 Million tonnes) to period -II (14.13 Million tonnes) by 25% in the state.

During period -I, looking in isolated manner (Table 6), first from growth rates angle there was 62.17% of production base was in high clusters followed by 34 % in medium and 4% in low clusters. Looking from instability angle 80% of production base was in low cluster followed by 13.8% in medium and 6.28% in high clusters.

Looking from both Viz., growth and instability, the most desirable combination is the district with high growth and low instability (Top-Right corner group), where as, opposite (Bottom-Left corner group) is most undesirable group.

Tables 6 show that in period -I, there was 47.69% of states' production base was in H-L (High growth and Low Instability) cluster followed by 28.42% in M-L cluster and 8.2% in H-M clusters.

During period -II, 45.97% of state production was in high growth cluster, followed by 39.3% in medium cluster and 6% in low cluster (Table 7). In instability clusters 69.81 % of the state production was in low clusters followed by 30.19% in medium cluster. In joint situation of growth and instability, 30.03% of production was in M-L (Medium growth and Low instability) clusters followed by 29.89% in H-L (High growth and Low instability) cluster. It reveals that growth and instability are going in opposite direction. Further, nearly 60% of state production is in Medium and High growth clusters with low instability.

Looking through tables 6 and 7 reveals that except three districts Viz., Ananthapur (L-L cluster) and Guntur (M-L Cluster) and East Godavari (H-L group) all the districts moved from one cluster to another cluster from periods -I to II. Majority of the districts moved from low growth clusters to medium and towards high clusters, in instability reverse trend was observed. The fact established here is that growth and instability are going in opposite direction.

Positive movements were observed in Visakhapatnam, Adilabad (from H-M to H-L) and Srikakulam (from H-M to H-L). Among these districts growth was high and production was moving from instabilised to stabilised condition.

Most undesirable movement is in the direction from Top-Right corner (H-L Cluster) to Down-Left corner (L-H cluster) like Nalgonda moved from L-H cluster to M-M cluster. Other undesirable movements are from right to left Horizontally like Krishna (from M-L to L-L), West Godavari, Nellore and Medak (from H-L to M-L) etc., and movement from top to bottom vertically like Kadapa (from L-L to L-M), Nizamabad (from M-L to M-M) etc.

Concern about movement from top-left corner to bottom-right corner and opposite direction depends upon production base. That is, if production base is high generally then low instability at the cost of growth is desirable, whereas, at low production base high growth is desirable at the cost of fluctuations.

Policy Implications

1. Production was more contributed by productivity in Foodgrains this indicates the growth in production should come from yield attributing factors like development of High Yielding farming system specific varieties and improvement in input use efficiency.
2. Yield stabilisation efforts should be given prime importance, like assured supply of farm inputs and providing the remunerative prices.
3. Identified high and low growth rate districts and regions for foodgrains will be better utilised in the local specific and crop specific research schemes and growth oriented development programmes.
4. Though area has less effect on Foodgrain production, but for overall improvement in Foodgrain production for supplying staple food to people, the area attributing factors like adequate supply of farm inputs for area expansion should also be given importance.

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TABLE 1—COMPOUND GROWTH RATES OF AREA, PRODUCTION AND PRODUCTIVITY OF FOODGRAINS IN INDIA AND ANDHRA PRADESH DURING PERIOD —I AND II

(values in percentages)

Districts, Regions and State	Period —I			Period —II		
	Area	Production	Productivity	Area	Production	Productivity
Srikakulam	4.16	6.11	1.87	–0.04	2.82	2.86
Vizianagaram	2.73	4.99	2.20	–2.70	0.08	2.86
Visakhapatnam	1.25	3.94	2.66	–2.90	1.73	4.77
East Godavari	2.15	2.48	0.33	–0.56	3.46	4.03
West Godavari	–0.82	2.81	3.67	–0.03	1.97	2.00
Krishna	–0.64	1.14	1.79	–1.79	–3.21	–1.45
Guntur	1.27	1.18	–0.10	–1.43	1.27	2.74
Prakasam	–3.31	2.93	6.46	2.25	2.74	0.48
Nellore	–1.08	2.37	3.48	0.11	2.00	1.89
Coastal Andhra	0.41	2.32	1.90	–0.72	1.40	2.14
Kurnool	–4.94	0.48	5.70	3.31	7.33	3.89
Ananthapur	–6.46	–2.43	4.31	1.05	–1.07	–2.09
Kadapa	–7.78	–1.19	7.14	2.98	0.07	–2.82
Chittoor	–2.61	0.36	3.05	–4.79	–4.88	–0.10
Rayalaseema	–5.34	–0.53	5.08	1.62	2.30	0.67
Ranga Reddy	–1.08	1.82	2.93	–3.40	2.33	5.92
Nizamabad	–2.16	1.72	3.96	–0.27	1.97	2.25
Medak	–0.62	4.79	5.45	0.10	2.05	1.95
Mahaboob Nagar	–4.18	0.51	4.89	0.07	4.72	4.65
Nalgonda	–3.05	3.29	6.54	–0.75	0.96	1.72
Warangal	–4.25	3.47	8.06	2.09	7.03	4.84
Khammam	–1.95	4.45	6.52	–0.23	2.99	3.22
Karim Nagar	–2.53	2.11	4.77	1.85	2.81	0.95
Adilabad	–2.17	4.82	7.14	–2.52	2.77	5.43
Telangana	–2.55	2.94	5.64	–0.10	3.20	3.31
Andhra Pradesh	–1.57	2.25	3.88	–0.20	2.21	2.42
INDIA	–0.32	3.18	3.51	—0.22	0.63	0.84

TABLE 2—COPPOCK'S INSTABILITY INDICES (CII) OF AREA, PRODUCTION AND PRODUCTIVITY OF FOODGRAINS IN INDIA AND ANDHRA PRADESH DURING PERIOD —I AND II

(values in percentages)

Districts, Regions and State	Period —I			Period —II		
	Area	Production	Productivity	Area	Production	Productivity
Srikakulam	12.51	23.93	10.66	3.60	8.61	5.58
V izianagaram	7.93	21.97	13.35	5.18	12.35	8.10
Visakhapatnam	3.78	11.06	7.62	5.41	9.30	6.43
East Godavari	2.74	7.73	6.31	3.57	6.37	5.98
West Godavari	2.52	8.37	8.66	3.30	4.66	3.61
Krishna	1.72	4.04	4.37	4.17	10.78	6.79
Guntur	2.43	5.85	3.82	4.02	8.12	6.92
Prakasam	4.87	7.15	8.79	5.53	14.16	11.68
Nellore	2.16	5.35	5.60	5.85	9.27	5.27
Coastal Andhra	**2.18**	**5.02**	**4.11**	**2.67**	**4.72**	**3.21**
Kurnool	6.50	6.08	10.45	3.93	10.51	8.15
Ananthapur	9.81	8.53	8.28	4.08	9.98	10.02
Kadapa	10.55	7.10	9.32	3.94	12.01	12.73
Chittoor	5.72	12.78	8.29	8.66	14.17	6.75
Rayalaseema	**6.61**	**6.35**	**8.88**	**2.87**	**8.61**	**7.64**
Ranga Reddy	2.13	5.51	4.79	6.11	6.32	8.45
Nizamabad	4.00	6.00	5.73	6.50	11.70	5.98
Medak	2.67	10.44	9.31	2.83	6.25	5.41
Mahaboob Nagar	9.52	13.24	7.11	4.02	9.09	8.41
Nalgonda	5.12	7.42	8.76	7.26	15.68	8.19
Warangal	7.31	11.33	11.68	4.73	9.43	6.52
Khammam	1.53	7.81	7.94	5.65	13.51	8.47
Karim Nagar	5.94	7.84	5.96	9.04	15.09	5.73
Adilabad	2.95	11.75	12.92	4.21	8.36	6.93
Telangana	**4.28**	**6.54**	**6.94**	**3.85**	**8.98**	**5.91**
Andhra Pradesh	**2.59**	**4.88**	**5.49**	**2.86**	**5.86**	**3.93**
INDIA	**0.97**	**4.44**	**4.40**	**1.14**	**2.74**	**1.78**

TABLE 3—EFFECT OF TECHNOLOGY AND POLICY ON AVERAGE PRODUCTION IN FOODGRAINS BETWEEN PERIOD—I AND II IN INDIA AND ANDHRA PRADESH

(values in percentage)

Districts, Regions and State	Sources of Effect			
	Technology Effect	Policy Effect	Combined Effect	Technology and policy covariance
Srikakulam	–7.17	88.75	0.35	18.07
Vizianagaram	79.07	74.33	–0.43	–52.97
Visakhapatnam	–91. 70	194.11	16.00	–18.41
East Godavari	83.90	10.09	2.49	3.53
West Godavari	112.27	–9.30	–3.52	0.56
Krishna	449.49	–323.88	–59.16	33.54
Guntur	128.82	–20.35	–2.29	–6.18
Prakasam	137.50	–26.22	–6.50	–4.78
Nellore	149.57	–23.39	–6.36	–19.81
Coastal Andhra	**138.04**	**–32.57**	**–6.85**	**1.38**
Kurnool	139.23	–26.53	–9.61	–3.09
Ananthapur	–622.05	553.28	115.22	53.55
Kadapa	47.06	17.57	–0.94	36.31
Chittoor	–66.52	150.88	20.85	–5.21
Rayalaseema	**848.04**	**–570.81**	**–110.84**	**–66.39**
Rangareddy	201.33	–83.45	–25.45	7.57
Nizamabad	109.53	–0.38	–0.11	–9.03
Medak	78.07	17.54	6.40	–2.02
Mahaboob Nagar	161.49	–28.22	–14.53	–18.75
Nalgonda	–1600.03	1465.68	296.47	–62.12
Warangal	109.43	–4.18	–2.69	–2.57
Khammam	210.30	–81.62	–43.78	15.11
Karim Nagar	101.73	8.58	3.98	–14.30
Adilabad	179.86	–49.67	–38.05	7.86
Telangana	**142.13**	**–26.72**	**–11.91**	**–3.50**
Andhra Pradesh	**154.12**	**–37.70**	**–11.40**	**–5.02**
INDIA	**213.97**	**–11.29**	**–2.76**	**–99.82**

TABLE 4—PRODUCTIVITY (TONNES/HA) CLUSTERS OF DIFFERENT DISTRICTS IN ANDHRA PRADESH DURING PERIOD—I

S.N	Cluster—I (Low)		Cluster—II (Medium)		Cluster—III (High)	
	Name	Yield	Name	Yield	Name	Yield
1.	Ranga Reddy	0.96	East Godavari	1.98	West Godavari	2.51
2.	Mahaboobnagar	0.77	Kadapa	1.74	Krishna	2.02
3.	Adilabad	0.69	Chittoor	1.63	Guntur	2.01
4.	Srikakulam	1.46	Nizamabad	1.77	Nellore	2.19
5.	Vizianagaram	1.37	Nalgonda	1.58		
6.	Visakhapatnam	1.01	Karimanagar	1.96		
7.	Prakasam	1.41				
8.	KurnooI	1.04				
9.	Ananthapur	1.08				
10.	Medak	1.04				
11.	Warangal	1.37				
12.	Khammam	1.31				
	Average	1.13		1.78		2.18
	% to State productivity	1.53		1.53		1.53
	Share in State production (%)	36.44		29.31		34.24

NOTE 1 : State average productivity during period —I is 1.53 tonnes/ha

NOTE 2 : State average production during period —I is 1, 14, 83, 891 tones

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TABLE 5—PRODUCTIVITY (TONNES/HA) CLUSTERS OF DIFFERENT DISTRICTS IN PERIOD —II

S.N	Cluster—I (Low)		Cluster—II (Medium)		Cluster—III (High)	
	Name	Yield	Name	Yield	Name	Yield
1.	Vizianagaram	1.43	Srikakulam	1.52	East Godavari	2.58
2.	Visakhapatnam	1.13	Prakasam	1.78	West Godavari	3.44
3.	Kurnool	1.49	Kadapa	1.56	Krishna	2.35
4.	Ananthapur	1.32	Chittoor	1.85	Guntur	2.33
5.	Ranga Reddy	1.31	Nalgonda	1.90	Nellore	2.76
6.	Medak	1.43	Khammam	1.99	Nizamabad	2.29
7.	Mahaboobnagar	1.21			Warangal	2.25
8.	Adilabad	1.23			Karimanagar	2.90
	Average	1.32		1.76		2.61
	% to State productivity	2.02		2.02		2.02
	Share in State production (%)	19.08		18.56		59.72

NOTE 1: State average productivity during period —II is 2.02 tonnes/ha

NOTE 2: State average production during period —II is 1,41,27,359 tones

TABLE 6—CROSS TABULATED GROWTH AND INSTABILITY CLUSTERS IN PERIOD —I

(production in tones)

Growth Clusters / Instability Clusters	Cluster-I (Low) District Name	A.P*	Cluster-II (Medium) District Name	A.P*	Cluster-III (High) District Name	A.P*	All groups' share in state productio n (%)
					West		
	Ananthapur	218692	Krishna	1150591	Godavari	1201578	
	Kadapa	216888	Guntur	1026178	Prakasam	464176	
			Kurnool	407399	Nellore	554259	
Cluster—I			Ranga				
(Low)			Reddy	217068	Medak	385903	
			Nizamabad	462641	Nalgonda	690818	
					Khammam	435564	
					East		
					Godavari	1003513	
					Karimanagar	741221	
Each groups' share in state production (%)		**3.79**		**28.42**		**47.69**	**79.91**
					Visakha		
Cluster—II			Chittoor	251321	patnam	248879	
(Medium)	Nil		Mahabub		Warangal	427887	
			Nagar	393189			
					Adilabad	264848	
Each groups' share in state production (%)		**0.00**		**5.61**		**8.20**	**13.81**
Cluster—III	Nil				Srikakulam	435714	
(High)					Vizia		
					Nagaram	285089	
Each groups' share in state production (%)		**0.00**		**0.00**		**6.28**	**6.28**
All groups' share in state production (%)		3.79		34.03		62.17	100

NOTE: State average production during period —I IS 1, 14,83,891 tones.

* A.P = Average production (tonnes) in period —I for the respective districts.

TABLE 7—CROSS TABULATED GROWTH AND INSTABILITY CLUSTERS IN PERIOD —II

(production in tones)

Growth Clusters / Instability Cluster	Cluster—I (Low) Name	A.P*	Cluster—II (Medium) Name	A.P*	Cluster—III (High) Name	A.P*	All groups' share (%) in state production
		117434	Visakha				
	Krishna	5	patnam	226550	Srikakulam	421414	
			West	1599308	East	1341734	
	Ananthapur	222277	Godavari	8	Godavari	4	

TABLE 7—CROSS TABULATED GROWTH AND INSTABILITY CLUSTERS IN PERIOD —II—*Contd.*

(production in tones)

Growth Clusters / Instability Cluster	Cluster—I (Low) Name	A.P*	Cluster—II (Medium) Name	A.P*	Cluster—III (High) Name	A.P*	All groups' share (%) in state production
Cluster—I (Low)			Guntur	1164696	Kurnool	564242	
			Nellore	673358	Ranga Reddy	253634	
					Mahaboob		
			Medak	578714	nagar	560373	
					Warangal	708690	
					Adilabad	372669	
Each groups' share in state production (%)		**9.89**		**30.03**		**29.89**	**69.81**
	Vizia						
Cluster—II	nagaram	289073	Nizamabad	611478	Prakasam	571570	
(Medium)	Kadapa	197966	Nalgonda	697974	Khammam	535676	
	Chittoor	197700			Karimnagar	1163847	
Each groups' share in state production (%)		**4.85**		**9.27**		**16.08**	**30.19**
Cluster—III (High)	Nil		Nil		Nil		
Each groups' share in state production (%)		**0**		**0**		**0**	**0**
All groups' share in state production (%)		**14.73**		**39.30**		**45.97**	**100**

Note: State average production during period —II is 1,41,27,359 tones

* A.P = Average production (tonnes) in period —II for the respective districts

Do Market Facilities Influence Market Arrivals? Evidence From Karnataka

SOUMYA MANJUNATH AND ELUMALAI KANNAN*

Introduction

A dynamic agricultural sector is crucial for overall economic development. There are various factors affect the performance of agricultural sector in the state of Karnataka. Among others,agricultural marketing plays a crucial role in stimulating production and consumption of agricultural produce as it acts as a critical link between farm production sector and the non-farm sector. A lack of an efficient marketing system can affect the welfare of both producers and consumers. The distance to the market, manipulation of weighing machines, lack of proper grading, and proliferation of middlemen who charge enormous' commissions can be listed as some of the problems that farmers who choose to sell the produce at the unregulated markets (Acharya, 2004). Higher agricultural production does not necessarily mean high returns to the farmer unless there is an orderly marketing system that ensures fair prices. The absence of such a fair system could also deprive the consumer of the benefits of a good cropping season. Recognizing the importance of marketing for development of agriculture, the Government of India emphasized the need for taking steps to make the marketing system more efficient. The government intervention was initially thought to be necessary to protect the interests of farmers from the vagaries of market regime, trade malpractices and high marketing cost. But, in view of the emergence of global markets, development of a competitive marketing system with adequate infrastructure facilities and professional management of existing market yards has become imperative in the country.

Building up of new market complexes with modern amenities would influence the market structure and pricing mechanism by increasing efficiency of the market (Kerur et al, .2008). Further, provision of market amenities would assist in better handling of the produce and reduce storage losses, thereby offering higher prices to growers. An efficient regulated marketing system would, therefore, attract greater market arrivals due to effectiveness in pricing and efficiency in the movement of agricultural commodities (Shilpi and Umali-Deininger, 2007). On the other hand, in the absence of a fair marketing system, farmers would sell agricultural produce either at the farmgate or at the private markets risking aplethora of problems. Nevertheless, Agricultural Produce Market Committees (APMC) have greater role in motivating the farmers to sell their produce at the regulated market yard. This could be achieved by offering better accessibility, remunerative prices, and infrastructure for trading. The success of the APMC markets, therefore, needs to be measured in terms of quantity of market arrival, which is basically the marketed surplus of various' agricultural produce. It is important note here that the marketed surplus and market arrivals do not always match. This is because the farmer may choose to store part of the produce for sale at a later date. An efficient APMC marketing system could help in reducing this gap between marketed surplus and market arrivals for a given period.

Farmers' desire to sell any agricultural produce at regulated markets depends on the facilities/amenities available rather than just the presence of regulated markets per se in the area. But, empirical evidences available in this regard are not comprehensive and are mixed in nature. Khunt and Gajipara (2008) reported that Rajkot market in Rajasthan could attract consistently high quantity of arrivals due to both the high rate of investment in providing superior infrastructural facilities and transport-connectivity of the market (Khunt and Gajipara, 2008). An analysis of four regulated markets in northern Karnataka revealed that producer-sellers experienced problems due to improper weighing of products and inadequate grading facilities (Vaikunthe, 2000).

A World Bank study in Tamil Nadu concluded that the likelihood of sales at the market increased significantly with an improvement in market facilities and with decrease in travel time from the village to the market (Shilpi and Umali-Deininger, 2007). Studies have also emphasized the positive relationship between market arrivals and price (Gote et aI, 2010; Atteri and Bisaria, 2003). Better market infrastructure helps in curbing marketing losses (Rangi et aI, 2002; Atteri and Bisaria, 2003). However, few empirical studies have analysed the influence of market facilities in attracting market arrivals of agricultural commodities in India. In this context, the present study makes an attempt to understand the role of market facilities in attracting arrivals of agricultural commodities in the state of Karnataka.

Data and Methodology

The present study is based on the secondary data compiled from various published sources. Data on area, production and yield of major agricultural crops were collected from Statistical Abstract of Karnataka. The

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marketed surplus ratios (MSR) of major agricultural commodities were collected from the Agricultural Statistics at a Glance for various years. Since data on marketed surplus ratios were not available at the district level in Karnataka"three years average (2006-07, 2007-08 and 2008-09) of state marketed surplus ratios were used to estimate the district marketed surpluses of major crops viz., paddy, jowar, maize and ragi. The district level quantity of marketed surplus, thus estimated was used to work out the per cent market arrival of respective commodities in various markets falling in a particular district. Data on monthly quantity of arrivals and wholesale prices of these crops were collected for 144 APMCs from AGMARKNET portal (www.agmarknet.nic.in) for the year 2009-10. The details of market physical infrastructures and facilities across APMCs were also compiled from the same source. To examine the relationship between market facilities and market arrival, a multiple regression analysis was carried out with market arrival as percentage of marketed surplus as the dependent variable and number of market facilities, price, district road length and area of the principal market yard (ha) as the explanatory variables.

Growth Performance of Major Crops in Karnataka

TABLE 1—Compound Annual Growth Rates of Area, Production and Yield of Major Crops in Karnataka

(Per cent)

Period	1980-81 to 1989-90			1990-91 to 2007-08			1980-81 to 2007-08		
Crops	Area	Production	Yield	Area	Production	Yield	Area	production	Yield
Rice	0.25	0.01	–0.24	0.31	1.11	0.7	0.79***	2.05***	1.20***
Bajra	–2.89**	0.37	3.17*	0.09	1.86	1.42	1.98***	–0.14	1.73***
Jowar	1.43	–0.05	–1.47	–2.49	–1.45	0.71	1.60***	–0.76*	0.69
Maize	6.14***	7.02***	0.82	8.60***	7.82***	–0.97	7.75***	8.06***	0.16
Ragi	0.90*	0.64	–1.72	1.87***	–0.72	1.08	1.26***	0.41	1.32***
Small Millets	–6.86***	–5.76**	1.17	6.81 ***	–6.14***	0.79	–8.20***	–6.78***	1.58***
Wheat	–3.77***	–6.44**	5.51 ***	1.31 ***	1.94	0.63	–0.66**	0.78	1.65***
Cereals	0.19	0.42	0.24	–0.28	1.59*	1.50**	–0.43***	1.85***	2.11 ***
Arhar	4.22***	2.03	–2.09	2.66***	6.17***	3.42**	1.69***	2.51 ***	0.84
Gram	6.13***	3.04	3.93***	5.74***	8.11 ***	3.29***	5.28***	6.8***	1.84***
Pulses	1.71**	0.07	–1.05	2.16**	3.09***	1.22	1.42***	2.16***	1.01 ***
Foodgrains	0.36	0.41	0.05	0.345*	1.712**	1.19	–0.003	1.87***	1.78***
Groundnut	5.04***	7.10***	1.97	2.69***	–4.32***	–2.15**	–0.12	–0.35	–0.5
Sunflower	32.07***	26.77***	–4.001 *	0.18	1.29	1.36	7.05***	6.83***	–0.1
Total Oilseeds	7.73***	9.17***	0.83	–1.75**	–1.89**	–0.43	1.25**	1.23*	–0.2
Cotton	–7.31	1.72	9.74***	3.06***	–3.07**	3.05	–2.79***	–0.49	3.68***
Sugarcane	4.72***	5.36***	0.59	–0.33	–1.41	–0.57	2.46***	2.48***	0.22
Tobacco	–0.62	1.42	1.93	4.61 ***	1.57**	2.95***	3.25***	2.52***	–0.75*
Fruits and nuts	—	—	—	10.83*	15.96	18.16**	—	—	—
Vegetables	—	—	—	1.24	15.9	16.27*	—	—	—

Note: (*=p<0.l, **=p<0.05, ***=p<0.0l)

Source: Statistical Abstract of Karnataka (Various issues), Government of Karnataka

The compound annual growth rates of area, production and yield of major agricultural commodities worked out for the period of 1980-81 to 2007-08 are shown in Table 1. The entire period has been divided into two sub-periods viz., 1980-81 to 1989-90 and 1990-91 to 2007-08 to examine the differential performance of various crops in different periods in Karnataka. Among crops, rice, jowar, ragi, wheat, gram, and sunflower registered negative growth in yield during 1980-81 to 1989-90. Growth in area for bajra, small millets, wheat and cotton was negative and statistically significant during the same period. It is important to note that maize recorded growth rate of about 7 per cent in production and this was contributed by growth in area (6.1 per cent). The compound annual growth in area under food grains was 0.3 per cent during 1980-81 to 1989-90 and its growth in production was low and not significant at 0.4 per cent. A cursory look at the performance of other crops indicates that the period 1980-81 to 1989-90 witnessed stagnation in production as has been discussed in the Report of the Expert Committee (1993). The production of cereals grew from 0.4 per cent per annum during 1980-81 to 1989-90 to 1.59 per cent per annum during 1990-91 to 2007-08. This growth has been contributed by increases in yield as the expansion in area for cereals was almost stagnant.

Notwithstanding, growth in area and yield was positive and significant for most other crops during 1990-91 to 2007-08. The compound annual growth rate in area under foodgrains remained at around 0.3 per cent during 1990-91 to 2007-08. However, growth in food grains production was high at 1.7 per cent compared to the earlier period. This comparatively high growth rate was due to growth in area under food grains (0.35 per cent). Despite a fall in area, cereals registered a significant growth in production at 1.6 per cent mainly contributed by growth in yield at 1.5 per cent. Maize continued to perform well in this period as well with growth in production at around 7.8 per cent contributed by growth in area (8.6 per cent) despite negative yield growth.

During the overall period from 1980-81 to 2007-08, the performance of agriculture in Karnataka was relatively good. Notable achievements were made on the fronts of production and yield growth. Overall growth in production of cereals, pulses, foodgrains, and total oilseeds was commendable. Rice registered approximately 2 per cent growth in production during this period contributed both by growth in area (0.8 per cent) and yield (1.2 per cent). Unfortunately, growth in area was negative for bajra, jowar, ragi, wheat, small millets, groundnut, and cotton. Though area under foodgrains recorded a negative growth, its production registered annual growth rate of 1.8 per cent which was mainly contributed by growth in yield. Thus, it can be understood from the analysis of growth performance that increased production leads to increased marketed surplus. However, arrivals at the market yards depend on the willingness of the producer to sell it at the regulated markets which, of course, depend on a variety of factors such as price, infrastructures, accessibility and finance.

Marketed Surplus Ratios (MSR) of Major Agricultural Commodities

Table 2 depicts the comparison of marketed surplus ratios of major agricultural products in Karnataka and India. The marketed surplus ratios of paddy, jowar, maize,. ragi, arhar, and groundnut have been fluctuating over the years in Karnataka. Nevertheless, the marketed surplus ratios of these major grains were higher than all India weighted average. Any increase in marketed surplus always places demands for better transport, storage and grading facilities.

TABLE 2—MARKETED SURPLUS RATIOS OF MAJOR AGRICULTURAL COMMODITIES IN KARNATAKA

(Percent)

	Karnataka					All India				
Crops	2000-01	2004-05	2005-06	2006-07	2007-08	2000-01	2004-05	2005-06	2006-07	2007-08
Paddy	92.9	84.41	94.35	94.59	85.47	73.8	71.37	71.25	79.17	72.64
Jowar	71.5	51.01	96.85	55.33	98.79	62.7	53.44	80.01	61.02	82.87
Maize	96.4	93.47	41.19	96.54	58.84	69.1	76.22	46.25	78.56	61.46
Ragi	33.6	57.54	66.33	27.58	22.17	35.1	57.74	80.9	30.02	22.17
Arhar	72.7	73.7	90.93	98.13	93.98	—	85.26	77.78	83.61	79.16
Groundnut	93.8	97.5	65.77	85.35	82.56	—	88.75	80.2	91.6	88.61
Sugarcane	—	97.17	100	100	100	—	98.23	76.8	100	100
Cotton	98.8	82.91	100	100	100	—	94.94	94.1	96.23	96.15
Onion	96.9	82.91	99.46	99.62	99.46	—	82.91	—	99.62	42.13

Source: Agricultural Statistics at a Glance (various issues), Government of India.

Distribution of Regulated Markets by Districts in Karnataka

Table 3 presents the distribution of regulated markets by districts during 2007-08. The density of regulated market, which is measured in terms of the number of regulated markets per lakh hectare of geographical area, is also presented. There are a total of 498 regulated markets in Karnataka which are well distributed between Northern and Southern districts. The districts Tumkur, Belgaum, Gulbarga and Uttara Kannada have greater number of regulated markets than others. It can be noticed that Northern Karnataka has around 53 per cent of the total regulated markets in the state. However, the main markets in the state do not seem to be distributed uniformly across the districts.

TABLE 3—DISTRIBUTION OF AGRICULTURAL REGULATED MARKETS BY DISTRICTS IN KARNATAKA: 2007-08

Districts	Main Market	Sub-Market	Total Markets	Distribution of Markets (%)	Market density
Southern Karnataka					
Bangalore (U)	2	7	9	1.81	4.14
Bangalore(R)	1	5	6	1.2	2.39
Chitradurga	4	10	14	2.81	1.82
Davanagere	6	8	14	2.81	'2.34
Kolar	5	7	12	2.41	3.08
Shimoga	4	18	22	4.42	.2.6
Tumkur	9	25	34	6.83	3.19
Chikmagalur	6	9	15	3.01	2.08
D. Kannada	5	9	14	2.81	2.93
Udupi	3	3	6	1.2	1.68
Hassan	6	17	23	4.62	3.47
Kodagu	3	4	7	1.41	1.7
Mandya	6	10	16	3.21	3.21
Mysore	7	8	15	3.01	2.22
Chamarajanagar	3	4	7	1.41	1.23
Total	70	144	214	42.97	2.53
Northern Karnataka					
Belgaum	10	37	47	9.44	3.5
Bijapur	3	14	17	3.41	1.61
Bagalkot	5	15	20	4.02	3.04
Dharwad	5	11	16	3.21	3.74
Gadag	5	17	22	4.42	4.72
Haveri	7	12	19	3.82	3.92
U. Kannada	8	20	28	5.62	2.73
Bellary	6	14	20	4.02	2.46
Bidar	5	9	14	2.81	2.58
Gulbarga	7	22	29	5.82	1.8
Raichur	4	11	15	3.01	1.79
Koppal	4	13	17	3.41	3.08
Total	69	195	264	53.01	2.69
State	**146**	**352**	**498**	**100**	**2.61**

Source: Director of Agriculture Marketing, Government of Karnataka and Authors' calculation.

Distribution of Physical Market Infrastructures and Facilities

Table 4 reveals the distribution of regulated markets with respect to the percentage of markets having physical infrastructure and facilities. The study has classified the facilities provided in the APMC markets into two groups on the basis of the type of facilities, namely 'physical infrastructure' and 'market facilities'. Physical infrastructure refers to those facilities that are required during the actual process of sale of produce at the regulated market. They include items such as input/sundry shops, auction platforms, grading and analysing laboratory, mechanical graders, sieves, market office building and warehouse. Physical infrastructure must be present in any market for smooth conduct of transactions. Market facilities refer to those amenities/conveniences that are provided in the APMC market including information notice board/electric display board, canteen, toilets, internal roads, parking, fencing, post office, bank, fire extinguishers, rest houses for farmers, drinking water, electricity, garbage disposal system, sweeping facilities and extension unit.

TABLE 5—PERCENTAGE OF APMC MARKETS HAVING PHYSICAL INFRASTRUCTURE AND FACILITIES

Physical Infrastructure	Northern Karnataka	Southern Karnataka
Input/Sundry Shops	86.9	71.1
Auction Platform	78.7	83.1
Grading and Analysing Laboratory	21.3	9.6
Mechanical Graders	4.9	6.0
Sieves	21.3	15.7
Market office building	98.4	91.6
Storage facilities (Warehouse)	60.7	57.8
Market Facilities		
Information Notice Board/Electric Display Board	100	96.4
Canteen	68.9	68.7
Toilets	86.9	90.4
Internal Roads	98.4	91.6
Parking	86.9	81.9
Fencing	85.2	77.1
Post office	47.5	16.9
Bank	47.5	25.3
Fire extinguishers	47.5	21.7
Rest houses for farmers	82.0	74.7
Drinking water	98.4	92.8
Electricity	100	95.2
Garbage Disposal System	31.1	38.6
Sweeping facilities	57.4	69.9
Extension unit	21.3	19.3

Source: agmarknet.nic.in

The number of market facilities was higher than physical infrastructures in both Northern and Southern Karnataka. Physical infrastructure such as mechanical graders, grading and analysing laboratory and sieves are very poorly developed in both the regions though these are very basic to the proper functioning of the market. Among market facilities, extension unit and garbage disposal system are poorly developed in the regulated markets. It is commendable to note that in both the regions, internal roads that are crucial for market access are well developed. Market amenities such as parking, fencing, rest houses for farmers, and toilets are fairly well developed in both the regions. Banks, post offices and fire extinguishers are better developed in Northern Karnataka when compared to South. Further, it is important to note that by and large markets in Northern

Karnataka are better ernuipped with market facilities than the markets in Southern region.

Analysis of Relation between Facilities and Market Arrival

Table 6 presents the results of the regression analysis. The market-level regression analysis was carried out to examine the relationship between the arrivals and market facilities. For this purpose, the study has estimated two models. In Model 1, market arrivals as percentage of marketed surplus was regressed on market facilities. In model 2 we regress on market facilities by inclusion of other variables such as price, district road length, area of the principal market yard. Price has been one of the most important determinants of the market arrivals in the regulated markets. An efficient marketing system can help in stabilizing the price level.

In the case of paddy in model 1, the coefficient of market facility was positive and significant. It implies that better market facilities enable greater arrival of paddy in APMC yards. However, when other explanatory variables included as shown in model 2, the coefficient of market facilities was positive, but turned insignificant. Area of principal yard and price showed expected positive relation and were significant, indicating that they played an important role in determining the quantity of market arrivals. Similar results were obtained in the case of jowar too. In model 1, market facilities were positive and significant. In model 2, all the explanatory variables were statistically not significant. It would be interesting to note that the coefficient of district road length showed a negative sign indicating that better transport might not necessarily lead to greater market arrivals. However, in both the models, no explanatory variable turned out significant in case of maize. In fact, as observed in jowar, district road length recorded a negative sign. Price, market facilities, and area of principal yard showed positive relation but were found to be statistically not significant. In the case of ragi, model 1 showed market facilities as significant and positive thereby stressing that facilities at the market yard attracted greater market arrivals. In Model 2, the regression results showed that all the explanatory variables were significant. However, coefficients of district road length and area of the principal yard turned out negative.

TABLE 6—REGRESSION ANALYSIS OF MARKET FACILITIES AND MARKET ARRIVAL

Dependent variable : Market arrival as percentage of marketed surplus

Variables	Paddy		Jowar		Maize		Ragi	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Market facility	1.017* (1. 77)	0.632 (1.11)	2.324* (1.97)	2.009 (1.61)	1.953 (1.19)	1.376.. (0.81)	0.999** (2.64)	0.738** (2.1)
Price		0.014* (1.92)		0.167 (0.14)		0.051 (1.6)		0.011 ** (2.53)
District road length		0.001 (0.21)		–0.007 (–1.45)		–0.013 (–1.45)		–0.008*** (–3.36)
Area of principal yard		0.156** (2.41)		0.012 (0.09)		0.044 (.29)		–0.048* (–1.68)
Constant	–3.864 (–0.49)	–14.854 (–1.25)	–27.876 (–1.58)	–15.616 (–0.75)	–3.297 (–0.14)	–7.099 (–0.18)	–7.912 (–1.45)	7.610 (1.08)
No of observations	81	81	49	49	86	86	39	39
R^2	0.0381	0.1549	0.0766	0.1360	0.0165	0.0754	0.1582	0.4157

NOTE: Figures in parenthesis are't' values; *** significant at 1 % level, ** significant at 5% level and * significant at 10% level.

Overall, regression results indicated a positive relationship between market facilities and market arrivals. The differentials in the influence could be due to absence of produce-specific facilities, geographic location of the markets, and the cropping pattern of areas served by different markets. Further, coefficient of district road length, a proxy for market access, was expected to be positive and significant. However, unfortunately it turned out to be negative in most cases, which might be due to data problems as consistent data on road length at district level are not available. Further, the present study considered only the district road length, which did not include national and state highways, and village roads.

Conclusions

The study indicates that the regulated foodgrain markets within the state are beset with a number of imperfections and are found wanting in amenities and infrastructural facilities for promoting orderly and efficient marketing. Consequently, the regulated markets have been attracting low arrivals despite substantial increase in marketed surpluses over time. The present study has attempted to examine the relationship between market facilities and arrival in the APMC markets of Karnataka by using regression analysis at market level. The analysis of the distribution of market infrastructure reveals that the main markets are fairly distributed equally between Northern and Southern Karnataka. However, markets in Northern Karnataka are better equipped with market facilities than the markets in Southern region.

Regression analysis has showed that the coefficient of market facilities was positive but its statistical significance varied across crops. Market facilities differed in their effectiveness in inducing market arrivals of different crops. The differentials in the influence could be due to absence of produce-specific market facilities, geographic location of the markets, and the cropping pattern of areas served by different markets. Nevertheless, it is important to note that higher production need not lead to higher market arrivals in a district. Despite relatively lower production in a given year, market arrivals could still remain high due to delayed sale of crops made possible by better storage facilities.

Thus, the study shows that the regulated markets have greater capacity to attract market arrivals and therefore, there is scope for large scale increase in agricultural production. It needs to be stated here that only a few major crops have been considered in this analysis. Also, inclusion of more explanatory variables could have strengthened the analysis. Further analysis could cover more periods of time to examine the possibility of a trend in the market arrivals since any improvement in market facilities could have long-term impacts on the market arrivals. The data available on the public domain with regard to the market infrastructure is provided on 'as-on-date' basis which restricts the possibility of a time-series analysis of the advancement of market facilities. Nevertheless, there is a need to strengthen the functioning of these regulated markets by the state government and market committees in a way that the knowledge is disseminated on profitable marketing to the farmers and at the same time facilitate availability of produce to the non-farming population at affordable prices.

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Inter-district Analysis of Production Instability of Cotton in Tamil Nadu State

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Introduction

Instability in cotton production has been a matter of concern in the context of agricultural development in Tamil Nadu state in recent years. The growth of cotton in districts of Tamil Nadu does not follow a smooth path but shows irregularities that can be described as deviations from or fluctuations around such a smooth path. This kind of instability can be observed and measured. For example production may show irregular changes during some years (apart from seasonal variations) or over a period of years there may be changes in area or yearly changes that deviate from some yield trend. Sometimes there may be technological changes causing instability in supply and demand conditions. Hence, one has to be careful about these changes for understanding the nature of instability in cotton production at the Tamil Nadu level. A number of attempts have been made earlier on time series analysis of cotton production and also on examining the extent of instability in crop production. But, so far, one has not come across any study on the instability in cotton production in districts of Tamil Nadu in recent times. It is in this context an attempt has been made to study cotton production instability in districts of Tamil Nadu. The relevant methodology is built upon the line of work by Mehra and Hazell.

Methodology and Data

The instability in cotton production in Tamil Nadu is measured in the two time periods namely in pre-reform period (1971-72 to 1989-90) and post-reform period (1990-91 to 2009-10). Here an attempt is made to break down the growth of production during the pre-reform period from 1971-72 to 1979-80 and from 1980-81 to 1989-90. Again the growth of production during the post-reform period is divided into two time periods from 1990-91 to 1999-2000 and from 2000-01 to 2009-10.

$$Z_t = a + b_t + e_t$$

Where Z_t denotes the dependent variable (area or yield), t is time, a, b are constants and e_t residual term with zero mean and variance σ^2. Separate regressions are run for each of the two time periods to ensure that $\sum_t e_t = 0$ for each period.

LInear relations are deliberately used as they do not assume a deterministic part to any relation between the variance of Z and time t. The variance of Z is simply σ^2 and by estimating separate equations for the two periods, the estimated variances can take on any relation to each other. The variances of Z, as well as the covariances between Zs for the cotton crop are obtained from the variance, covariance matrix of the residuals e_t. Specifically

$$\text{Cov}(z_i, Z_j) = \text{Cov}(e_i, e_j)$$

After detrending, the residuals were centered around their mean areas or yields for each period z resulting in detrended time—series data of the form.

$$\hat{Z}_t = e_t + \bar{Z}$$

Time series data on detrended production are then calculated as the product of the detrended area and yield for districts of Tamil Nadu for two time periods. In order to analyse the problem more completely a formal decomposition procedure is developed. The procedure can be used to separate the components of the changes in production variability.

The variance of aggregate production of cotton in districts of Tamil Nadu was decomposed into ten components. These components are analysed to know the accurate ideas on the sources of instability in the production of cotton in Tamil Nadu. The following variables are taken into account to explain the meas.ures of instability in production.

Let Q denote production. A—Area sown and Y—Yield. Then total production Q=Ay.

The variance of production can be expressed as

$$V(Q) = \bar{A}^2 V(y) + \bar{Y}^2 V(A) + 2\bar{A}\bar{Y}\,\text{Cov}(A, Y) - \text{Cov}(A,Y)^2 + R \quad \ldots\ldots\ldots(1)$$

Where

$\bar{A}$ = average area

$\bar{Y}$ = average yield

R = residual term

The objective of the decomposition analysis is to partition the changes in V(Q) and E(Q) between the first and second period into constituent parts which can be attributed separately to

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changes in means, variances and co-variances of areas and yields.

The average production in the first period is expressed as

$$E(Q_1) = \bar{A}_1 \bar{Y}_1 + Cov(A_1, Y_1) \quad .....(2)$$

Similarly the avarage production in the second period becomes

$$E(Q_2) = A_2 Y_2 + Cov(A_2, Y_2) \quad .....(3)$$

For convenience each variable in the second period can be expressed in terms of its counterpart in the first period plus the change in the variables between the two periods.

For example

$$\bar{A}_2 = \bar{A}_2 + \Delta\bar{A} \quad .....(4)$$

Where

$$\Delta\bar{A} = \bar{A}_2 - \bar{A}_1 \quad .....(5)$$

The equation 3 can be written as

$$E(Q2) = (\bar{A}_1 + \Delta\bar{A})(\bar{Y}_1 + \Delta\bar{Y}) + Cov(A_1, Y_1) + \Delta Cov(A, Y) \quad .....(6)$$

$\Delta E(Q)$ is then obtained by subtracting equation (2) from (6)

$$\Delta E(Q) = E(Q_2) - E(Q_1) \quad .....(7)$$

$$= \bar{A}_1 \Delta\bar{Y} + \bar{Y}_1 \Delta\bar{A} + \Delta\bar{A}\,\Delta\bar{Y} + \Delta Cov(A, Y)$$

There are four sources of changes in E(Q). Two parts $\Delta\bar{A}_1\ \Delta\bar{Y}$ and $\Delta\bar{Y}_1\ \Delta A$ arise from the changes in mean yield and mean area which are called pure effects. The term $\Delta\bar{Y}\ \Delta\bar{A}$ is an interaction effect which arises from simultaneous occurrence of change in mean yield and mean area. The last term ΔCov (A, Y) arises from change in variability of area and yield. The following Table identifies the pure effects and interaction effects of the components of change in variance of production.

COMPONENTS OF CHANGE IN THE VARIANCE OF PRODUCTION IN TAMIL NADU

S. No.	Sources of Change Description	Symbol	Components of Change
1.	Change in mean yield	$\Delta\bar{Y}$	$2\bar{A}_1\Delta\bar{Y}\,Cov(Y_1A_1)+[2\bar{Y}_1\Delta\bar{Y}+(\Delta\bar{Y})^2]V(A_1)$
2.	Change in mean area	$\Delta\bar{A}$	$2\bar{Y}_1\Delta\bar{A}\,Cov(Y_1A_1)+[2\bar{A}_1\Delta\bar{A}+(\Delta\bar{A})^2]V(Y_1)$
3.	Change in yield variance	$\Delta V(Y)$	$(\bar{A}_1)^2\,\Delta V(Y)$
4.	Change in area variance	$\Delta V(A)$	$(\bar{Y}_1)^2\Delta V(A)$
5.	Interaction between changes in mean yield and mean area	$\Delta\bar{Y}, \Delta\bar{A}$	$2\Delta\bar{Y}\,\Delta\bar{A}Cov(Y_1A_1)$
6.	Change in area-yield co-variance	$\Delta Cov(Y,A)$	$[2\bar{A}_1\bar{Y}_1 - 2Cov(Y_1A_1)\Delta Cov(Y,A)] - [\Delta Cov(YA)]^2$
7.	Interaction between changes in mean area and yield variance	$\Delta\bar{A},\Delta V(Y)$	$[2\bar{A}_1\Delta\bar{A}+(\Delta\bar{A})^2]\Delta V(Y)$
8.	Interaction between changes in mean yield and area variance	$\Delta\bar{Y},\ \Delta V(A)$	$[2\bar{Y}_1\Delta\bar{Y}+(\Delta\bar{Y})^2]\Delta V(A)$
9.	Interaction between changes in mean area and yield and changes in area -yield co-varIance	$\Delta\bar{Y},, \Delta\bar{A},$ $\Delta Cov(Y,A)$	$[2\bar{Y}_1\Delta\bar{A}+2\bar{A}_1\Delta Y+2\Delta\bar{A}\Delta\bar{Y}]$ $\Delta Cov(Y,A)$
10.	Change in residual	ΔR	$\Delta V(A\,Y)$ - sum of the other components

Source: Compiled by the Principal Investigator from Peter B.R. Hazell's work on "Instability in Indian Foodgrains Production" Research report 30, International Food Policy Research Institute, Washington, D.C. May, 1982.

At present there are 32 districts in Tamil Nadu state. Because of the non-availability of data these 32 districts have been merged into 10 districts in pre-reform period and 13 districts in post-reform period. District-Wise decomposition analysis is carried out to find the magnitude of fluctuations in cotton production in pre and post reform periods in Tamil Nadu.

Pre-Reform Period Chengalpattu-MGR

Table-I presents a summary of the components of change in the variance of cotton crop in Chengalpattu-MGR region. Interaction between changes in mean area and yield and changes in area- yield covariance accounts for a considerable share of changes in the variance of production of cotton. The change in residual appears to have a more stabilising influence on cotton in Chengalpattu region. The interaction between changes in mean yield and mean area is very low followed by interaction between changes in mean yield and area variance. Contrary to this, change in mean area and the interaction between changes in mean area and yield variance account for large share of change in the variance of cotton in this region in pre reform period.

South Arcot

It can be seen from Table-I that the interactions between changes in mean area and yield and changes in area - yield covariance account for large share of the change in the variance of cotton in South Arcot district. Change in residual, change in mean area, change in mean yield and the interaction between changes in mean yield and mean area are the important components of the stability of cotton production in this district. The maximum stability in cotton was mainly due to the change in residual. Change in area variance and the interaction between changes in mean area and yield and changes in area—yield covariance are not considered as important components of the variance of production of cotton in pre reform period in South Arcot district of Tamil Nadu.

North Arcot—Ambedkar—Thiruvannamalai—Sambuvarayar

It is evident from Table I that is region the interaction between changes in mean area and yield and changes in area—yield covariance was the important factor responsible for instability in cotton. The effect of change in yield variance, interaction between changes in mean area yield variance and the interaction between changes in mean yields and mean areas are very low for variance of production of cotton in this region. The change in residual appears to have a more stabilising influence on cotton production. All other components account for large share of the changes in the variance of production of cotton in this study area.

Salem—Dharmapuri

Table I shows that, by and large, production stability for cotton was more in these districts. Change in residual appears to have a more stabilising influence for cotton production. Similarly when the change in mean yield, change in mean area, change in yield variance, interactions between (i) changes in mean yield and mean area and (ii) changes in mean area and yield variance are considered together, they account for a positive effect towards increase in cotton production. It can further be seen that change in area — yield co-variance accounts for substantial share of the increase in the variance of production of cotton. All other components are very important in explaining the changes in the variance of cotton production in this region and these components together account for instability of cotton production.

Coimbatore—Periyar

The results indicate a summary of the components of change in the variance of cotton crop in this area. Interaction between changes in mean area and yield and changes in area—yield covariance accounts for large share of the change in the variance of cotton. Change in mean area, change in area variance and interaction between changes in mean area and yield variance had a good effect on the variance of cotton production. A comparison of the influence of interaction between changes in mean yield and mean area and interaction between changes in mean area and yield variance showed that both these interaction terms do not contribute significantly in the variance of cotton production. Change in area yield covariance appears to have a more stable influence on cotton. Cotton production stable was also due to change in yield variance followed by change in residual in this region.

Tiruchirappalli—Pudukottai.

It may be recalled from Table I that the factors contributing to the highest reduction in variability of production of cotton were the change in area variance, change in mean area, change in mean yield and to a little extent interaction between changes in mean yield and area variance. Interaction between changes in mean yield and mean area and change in residual, account for a small share of the increase in the stability of cotton crop. Contrary to change in area variance, change in area yield covariance contributes to the stability of cotton production. Along with this component, change in yield variance and interaction between changes in mean area and yield and changes in area - yield covariance account for stability of cotton production in this study region. Interaction between changes in mean area and yield variance contributes a small share of the change in the variance of production of cotton.

TABLE I—COMPONENTS OF CHANGE IN THE VARIANCE OF PRODUCTION OF COTTON CROP IN PRE-REFORM PERIOD IN ALL DISTRICTS OF TAMIL NADU AND STATE AS A WHOLE

Description	Chengal-MGR	South Arcot	North Amebed-kar-Thiruvan-namalai-Sambu-varayar	Salem-Dharma-puri	Coimba-tore-Periyar	Tiruchira-ppalli-Pudukottai	Thanjavur	Madurai-Dindigul	Ramanatha-puram -Kamarajar-Pasumpon Muthur-ramlingam	Tirunelveli-Chidam-baranar	Tamil Nadu
Change in mean yield	5.08	-2.71	126.16	-208.22	-19.55	-24.31	4.32	145.11	194.51	49.80	-1137.62
Change in mean area	19.01	-6.73	16.47	-49.35	331.06	-36.67	37.01	-75.77	-111.59	-12.64	1323.57
Change in yield variance	7.01	18.00	8.45	-94.25	-110.39	100.58	7.35	27.07	66.60	78.62	-1140.71
Change in area variance	11.23	4.86	29.79	68.98	271.17	-356.08	42.24	7.87	-5.50	-0.86	262.00
Interaction between changes in mean yield and mean area	1.52	-3.56	15.33	-10.65	4.48	-0.52	4.28	-11.93	-44.63	-7.45	173.18
Change in area yield co variance	7.82	93.67	74.52	865.92	-949.88	348.99	4.02	-323.46	-153.57	-4.80	2390.88
Interaction between changes in mean area and yield variance	12.39	15.35	12.73	-33.11	153.68	5.22	165.20	-8.06	-29.12	-25.98	388.62
Interaction between changes in mean yield and area variance	2.45	5.19	31.13	56.85	9.68	-13.21	21.59	3.63	-8.49	-2.09	86.03
Interaction between changes in mean area and yield and changes in area - yield covariance	133.63	184.10	155.49	450.60	599.18	76.30	68.90	-4.71	-43.11	-3.92	-167.89
Change in residual	-100.14	-208.17	-370.07	-946.77	-189.43	-0.33	-254.91	340.23	235.90	29.32	-2078.06
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source : Compiled by the Authoress.

Thanjavur

As regards cotton production it can been seen that change in residual is the only component associated with stability of cotton production. All other components together are associated with instability in cotton production. The highest instability of cotton production was due to interaction between changes in mean area and yield variance followed by interaction between changes in mean area and yield and changes in area yield covariance, change in area variance, change in mean area and interaction between changes in mean yield and area variance. The remaining components showed a very little effect on change in the variance of production.

Madurai—Dindigul

It can been seen from Table I that, change in residual accounts for substantial share of the increase in the variance of production of cotton. The change in area yield covariance acted very well to reduce the variability of production of cotton. Change in mean yield is very important in explaining the changes in the variance of cotton production. Again change in yield variance reveals a negative effect on the stability of production of cotton. Components like change in mean area, interaction between changes in mean yield and mean area, interaction between mean area and yield variance and finally interaction between changes in mean area and yield and changes in area yield covariance account for stability in cotton production. All other components do not have significant influence in the change in the variance of production of cotton crop in these districts.

Ramanathapuram—Kamarajar—Pasumpon Muthuramalingam

With regard to the results of Ramanathapuram—Kamarajar—Pasumpon Muthuramalingam districts that by and large production instability in cotton was mainly due to the influence of the change in residual followed by change in mean yield. To a certain extent change in yield variance also contributes to change in the variance of cotton production. The remaining components account for stabilising effect on cotton production. Of these remaining components interaction between changes in mean yield and mean area and interaction between changes in mean area and yield and changes in area—yield covariance almost equally contribute towards stability in cotton production. Change in area-yield covariance and change in mean area are the major components accounting for stabilising effect on cotton production.

Tirunelveli—Chidambaranar

Table I presents a summary of the components of change in .the variance of cotton crop in this study area. Interaction between changes in mean area and yield variance is the main factor responsible for stability in cotton production. The negative entries of change in mean area, interaction between changes in mean yield and mean area, change in area —yield covariance, interaction between changes in mean area and yield and changes in area — yield covariance and interaction between changes in mean yield and area variance contribute to production stability of cotton. Change in yield variance, change in mean yield and change in residual are the three components responsible for change in the variance of production. The remaining components showed insignificant effect towards stability in cotton crop in this region.

Tamil Nadu

For the state as a whole, change in area - yield covariance accounts for substantial share of the increase in the variance of production of cotton crop. Change in mean area accounts for large share of the changes in the variance of production of cotton. With the exception of interaction between changes in mean area and yield and changes in area -yield covariance, all other interaction terms are very important in explaining the changes in the variance of cotton production and these interactions together associated with instability of production. Change in residual followed by change in yield variance and change in mean yield explain the positive effect on the stability of production of cotton. Interaction between changes in mean area and yield and changes in area—yield covariance is the fourth component of stability for cotton production.

Components Of Change in the Variance of Production of Cotton Crop in All Districts of Tamil Nadu and State as a Whole in Pre-reform Period

Components of change in variance of production of cotton crop in pre-reform period defect from district to district in Tamil Nadu. It may be noted from Table values that Change in mean yield, Interaction between changes in mean area and yield variance and Change in residual in Salem - Dharmapuri, Change in mean area, Interaction between changes in mean yield and mean area, Interaction between changes in mean area and yield and changes in area - yield covariance in Ramanathapuram - Kamarajar—Pasumpon Muthuramalingam, Change in yield variance and Change in area yield co variance in Coimbatore—Periyar, Change in area variance and Interaction between changes in mean yield and area variance in Tiruchirappalli—Pudukottai districts are found to be highly stable in Tamil Nadu and for the state as a whole change in residual brings stability in cotton production.

Thus the decomposition model enables to measure the contribution of different components of change in the variance of cotton crop production in all districts of Tamil Nadu state in pre-reform period.

Post-Reform Period Chengalpattu—Chennai—Kancheepuram—Thiruvallur

The contribution of different components of change in the variance of production of cotton in this region is shown in Table II. Change in area - yield covariance appears to have more destabilising influence of the change in the variance of production of cotton. Change in mean area, interaction terms (i) between changes in mean area and yield variance and (ii) between changes in mean yield and mean area are also the components responsible to the increase in the variability of cotton production, Change in residual contributes to the highest reduction in variability of cotton production in this study region. Interaction between changes in mean area and yield and changes in area - yield covariance is also responsible for the decrease in variability of cotton production. Again change in area variance, change in yield variance, change in mean yield and the interaction between changes in mean yield and area variance do have a more stabilising influence on production of cotton crop. The remaining components have caused in stability in cotton crop.

South Arcot—Cuddalore—Villupuram

The results in Table II shows that the factor contnbuting to the highest reduction in variability of cotton production was a change in area - yield covariance followed by change in mean area. Change in residual is associated with an increase in variance of production. Interaction between changes in mean area and yield and changes in area—yield covariance also accounts for instability in cotton production in this region. The change in production variance was noticed for change in yield variance, Interaction between changes in mean yield and mean area, change in area variance and change in yield variance contribute to the increase in the variability of cotton production. Contrary to this change in mean yield, interaction between changes in mean area and yield variance and interaction between changes in mean yield and area variance are responsible for the decrease in the variability of cotton production.

North Arcot—Vellore—Thiruvannamalai

It is evident from the Table II that change in residual appears to have more stabilising influence on cotton production. The negative entries of Interaction between changes in mean area and yield and changes in area — yield covariance, Change in mean yield, Change in yield variance have contributed to stability in production growth. Change in area—yield covariance has contributed the largest share in the variance of cotton production. Next to this component, change in area variance accounts for instability in production. The components namely change in mean area, interaction between changes in mean area and yield variance account for more or less same percentage share contributing to the increase in variability of production. The last component namely Interaction between changes in mean yield and mean area is responsible for the lowest change in production variance.

Salem—Namakkal

Table II presents a summary of the components of change in- variance of production of cotton in this study area. Change in area-yield co variance appears to have more destabilising effect on cotton crop. Contrary to this change in residual is responsible for the decrease in the variability of cotton production. Change in mean area, Interaction between changes in mean area and yield variance and Interaction between changes in mean yield and mean area are also associated with the reduction in variability of cotton production. As against this, Change in mean yield, Interaction between changes in mean area and yield and changes in area—yield covariance, and Change in yield variance are associated with instability in production. Though components like Change in area variance and Interaction between changes in mean yield and area variance are associated with the instability in production, the percentage share of these components is found to be low in this region.

Dharmapuri—Krishnagiri

Table II it can be seen that change in residual accounts for substahtial share of the increase in the variance of production. In addition, Interaction between changes in mean area and yield and changes in area—yield covariance and Change in area variance are together associated with instability in cotton production. The maximum stability in cotton production was due to the influence of Change in area-yield co variance. The negative entries of the Interaction between changes in mean yield and area variance, Change in mean yield and to a limited extent Interaction between changes in mean yield and mean area exhibit stability in cotton production. The remaining components namely Change in yield variance, Change in mean area and Interaction between changes in mean area and yield variance has also contributed to stability irn cotton production growth.

Coimbatore—Thiruppur

Table II shows that by and large production instability is mainly due to the influence of Interaction between changes in mean area and yield variance. Contrary to this almost equal but negative entry of Change in yield variance has contributed to stability in production growth. The other negative entries of Interaction between changes in mean area and yield and changes in area—yield covariance, Change in residual, Interaction between changes in mean yield and mean area and to a minimum extent of Interaction between changes in mean yield and area variance have contributed to stability in cotton production. Change in area—yield co variance, Change in mean area, Change in mean yield and Change in area variance

TABLE II—COMPONENTS OF CHANGE IN THE VARIANCE OF PRODUCTION OF COTTON CROP IN POST-REFORM PERIOD IN ALL DISTRICTS OF TAMIL NADU AND STATE AS A WHOLE

Description	Chengalpattu-Chennai-Kancheepuram-Thiruvallur	South Arcot-Cuddalore-Villupiram	North Arcot-Vellore-Thiruvannamalai	Salem-Namakkal	Dhamapuri-Krishnagiri	Coimbatore-Thiruppur	Erode	Tiruchirappalli-Karur-Perambalur-Ariyalur	Pudukottai	Thanjavur-Thiruvarur- Nagai Quid-e-milleth-Nagapattinam	Madurai-Theni-Dindigul	Ramanathapuram-Virudhunagar-Kamarajar-Pasumpon Muthuramalingam-Sivagangai	Thirunelveli-Thoothukudi	State
Change in mean yield	–17.42	–544.60	–127.38	35.93	–31.36	94.44	–135.03	–9.43	20.70	–12.87	–19.50	64.19	–52.94	–0.49
Change in mean area	28.76	–1291.96	46.23	–39.18	11.91	149.43	373.71	32.17	–221.08	5.55	–114.53	136.94	217.31	–69.73
Change in yield variance	–28.22	301.70	–89.57	19.00	8.56	–794.16	261.51	5.20	–26.87	–3.58	–532.56	21.42	9.75	–36.12
Change in area variance	–78.96	148.45	290.67	9.05	118.04	27.64	122.19	30.21	176.92	–953.04	–12.38	104.89	159.17	–3.23
Interaction between changes in mean yield and mean area	0.86	267.27	4.78	–3.85	–5.05	–25.50	121.07	6.81	20.87	–0.48	20.60	–3.94	12.63	0.29
Change in area yield co variance	613.26	–5590.75	530.87	492.63	–784.06	304.68	2425.99	334.54	–168.12	1387.43	342.01	295.49	38.09	1.65
Interaction between changes in mean area and yield variance	14.09	–171.01	48.48	–7.97	0.79	715.14	–201.89	–2.98	21.12	–0.08	424.87	–17.55	–9.07	27.51
Interaction between changes in mean yield and area variance	–7.41	–45.59	85.94	8.08	–62.90	–10.89	78.97	9.68	–30.0	134.25	1.87	–30.61	32.98	0.02
Interaction between changes in mean area and yield and changes in area – yield covariance	–140.37	2301.15	–115.31	27.54	227.56	–230.41	–1065.47	–89.55	80.21	–74.77	–191.47	–186.08	–28.59	183.95
Change in residual	–284.59	4725.34	–574.71	–441.23	616.53	–130.37	–1881.05	–216.67	226.24	–382.47	181.11	–284.75	–279.29	–3.85
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Compiled by the Authoress.

are together associated with stability in cotton production and hence these components do not account for change in the variance of production of cotton.

Erode

Table II presents a summary of the components of change in the variance of cotton crop in Erode district. Change in residual and Interaction between changes in mean area and yield and changes in area - yield covariance account for stability in cotton production. In addition Change in mean yield and Interaction between changes in mean area and yield variance are also associated with stability in cotton production. On the other hand Change in area—yield covariance accounts for a considerable share of changes in the variance of production of cotton. The remaining components namely Change in mean area, Change in yield variance, Change in area variance, Interaction between changes in mean yield and mean area and Interaction between changes in mean yield and area variance have contributed stability in cotton production in the post reform period in this district of Tamil Nadu.

Tiruchirappalli—Karur—Perambalur—Ariyalur

It can be seen from tneTable II that the Change in area-yield co variance accounts for large share of the change in the variance of cotton in this region. Change in residual, Interaction between changes in mean area and yield and changes in area - yield covariance are the important components of the stability of cotton production in this region. The maximum stability in cotton was mainly due to the Change in residual. Change in mean yield and Interaction between changes in mean area and yield variance are not considered as very important components of stability in cotton production for the simple reason that the percentage share of these components is found to be low. All other components are associated with the instability of production of cotton.

Pudukottai

It can be seen from the Table II that the Change in mean area accounts for stability of cotton production in this region. Change in area-yield covariance is also the important component of the stability of cotton production. With these two components, Change in yield variance and Interaction between changes in mean yield and area variance have more stabilising effect on cotton crop. Change in residual accounts for large share of the change in the variance of cotton. Change in area variance has also significantly contributed for change in the variance of production. This is followed by the positive entry of Interaction between changes in mean area and yield and changes in area - yield covariance. Components like Change in mean yield, Interaction between changes in mean yield and mean area and Interaction between changes in mean area and yield variance have equally contributed to the increase in percentage variability of cotton production.

Thanjavur—Thiruvarur—Nagai—Quide-Milleth—Nagapattinam

It is evident from the Table II that the Change in area-yield co variance was the important factor responsible for instability in cotton. As against this change in area variance followed by Change in residual are the factors responsible for stability in cotton. In addition Interaction between changes in mean area and yield and changes in area - yield covariance, Change in mean yield, Change in yield variance, Interaction between changes in mean yield and mean area and Interaction between changes in mean area and yield variance are associated with the stability of production of cotton. Components like Change in mean area and Interaction between changes in mean yield and area variance are associated with instability of production of cotton in this study region.

Madurai—Theni—Dindigul

Table II shows that, by and large, production stability for cotton was more due to the influence of the component Change in yield variance. Similarly when the Interaction between changes in mean area and yield and changes in area - yield covariance and Change in mean area are considered together they account for a positive effect towards increase in cotton production. It can further be seen that Change in mean yield and Change in area variance account for stability in production of cotton. Interaction between changes in mean area and yield variance and Change in area-yield co variance contribute a substantial share of the increase in the variance of production of cotton. The other two components namely Interaction between changes in mean yield and mean area and Interaction between changes in mean yield and area variance are also important in explaining the changes in the variance of cotton production in this region.

Ramanathapuram—Virudhunagar—Kamarajar—Pasumpon Muthuramalingam—Sivagangai

Table II presents a summary of the components of change in the variance of cotton crop in this area. Change in area-yield co-variance accounts for large share of the change in the variance of cotton. Change in mean area and Change in area variance had a good effect on the variance of cotton production. The positive entry of change in mean yield reveals a small change in the variance of production of cotton crop. A comparison of the influence of Change in residual and Interaction between changes in mean area and yield and changes in area - yield covariance showed that both these components contribute significantly to the stability of cotton production. The other interaction terms namely (i) Interaction between changes in mean yield and area variance, (ii) Interaction between changes in mean area and yield variance and (iii) Interaction between changes in mean yield and mean area appear to have a more stability influence on cotton.

Tirunelveli—Thoothukudi

Table II shows that the factor contributing to the highest reduction in variability of production of cotton was the change in residual. Change in mean yield, Interaction between changes in mean area and yield and changes in area - yield covariance and Interaction between changes in mean area and yield variance account for a small share of the increase in the stability of cotton crop. The highest instability of cotton production was due to Change in mean area followed by Change in area variance. Components like Change in area-yield co-variance and Interaction between changes in mean yield and area variance almost equally contribute to the change in the variance of production. Interaction between changes in mean yield and mean area and Change in yield variance showed a very little effect on change in the variance of production.

Tamil Nadu

Table II shows that the factors contributing to the highest reduction in variability of production of cotton were Change in mean area and Change in yield variance. Change in area variance, Change in residual and Change in mean yield account for a small share of the increase in the stability of cotton crop. Contrary to these components, Interaction between changes in mean area and yield and changes in area - yield covariance contributes to the highest instability of cotton production. Along with this component, Interaction between changes in mean area and yield variance is responsible for the change in the variance of production. The remaining components namely Change in area-yield co variance, Interaction between changes in mean yield and mean area and Interaction between changes in mean yield and area variance contribute a small share of the change in the variance of production of cotton.

Components of Change in the Variance of Production of Cotton Crop in Post-reform Period in all Districts of Tamil Nadu and State as a Whole

Table II reveals that components of change in variance or production of cotton crop in post-reform period are different in different districts of Tamil Nadu. It may be recalled from the table values that Change in mean yield, Change in mean area and Change in area yield co variance in South Arcot—Cuddalore—Villupuram, Change in yield variance and Interaction between changes in mean yield and mean area in Coimbatore—Thiruppur, Change in area variance in Thanjavur—Thiruvarur—Nagai -Quid-e-milleth —Nagapattinam, Interaction between changes in mean area and yield variance, Interaction between changes in mean area and yield and changes in area—yield covariance in Erode district, Interaction between changes in mean yield and area variance in Dharmapuri—Krishnagiri and component Change in residual in North Arcot—Vellore—Thiruvannamalai are found to be stable in Tamil Nadu state. For the state as a whole change in mean area is stable for cotton production.

Conclusion

Thus the instability model measures the contribution of different components of change in the variance of cotton production in different districts of Tamil Nadu state in pre and post-reform periods. But it does not specify why they arose. It explains change in yield variance, change in mean area and change in residual were the important components in generating production instability. But a large part of the increase in instability has to be accepted as a necessary consequence of total cotton growth.

The conclusion from this study is that crop production instability is an inevitable consequence of growth of crop and there is little that can effectively be done about it with the existing crop pattern. Because continued growth in cotton crop is of paramount importance to Tamil Nadu state, the most promising approach is to change the crop plan in the most efficient way so that desired crop reallocations consistent with policy objectives bring beneficial results.

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Impact of Emerging Marketing Channels in Agricultural Marketing in Uttar Pradesh

1. Backdrop

Indian fanning is characterized by small and marginal holdings. They contribute about 54 per cent of marketable surplus. Hence, they should be protected by providing the remunerative prices of their produces. On account of convenience, the producers had used to dispose off their produces at door step at unreasonable price instead of going to the markets. Under this process, the middle men were swallowing off major part of price paid by the consumers. Prior to implementation of APMC Act 1963, the malpractices were peak in rural markets. Different type of deductions was also taken by buyers in rural markets. The correct weight of commodities was also not done properly. The rural markets were only buyers markets. The payment was also not made at time of purchase of commodities. The producers were much exploited by different purchasing agents. After independence, it was prime priority of Government of India to provide reasonable prices to the farmers of their produces. In order to eliminate the exploitation from market functionaries, the Government of India has passed Agricultural Produce Marketing Committee (APMC) Act 1963. Under this act, all rural markets across the country is being governed by state Governments and has come under ambit of APMC. All the states and union territorys were asked to implement the APMC Act 1963 in their respective states to safeguard the interest of producers. The sale and purchase activities have been chanelized through regulated markets and licensed traders. In order to increase the marketing efficiency, 7161 markets were covered under APMC Act 1963 by the 27 state Governments of the country.

With the passage of time, there have been manifold changes in agricultural marketing system. The regulated markets were not able to fulfill the total requirements and demands of producers and market functionaries due to lack of effective implementation of market regulations in regulated markets. The public control on functioning of regulated markets was not upto the mark and market infrastructural facilities were also inadequate. In order to improve the regulated market system and functions, the Government of India felt necessary to reform and change in market legislation of APMC Act, 1963. In order to change in various provisions in APMC Act 1963, the Inter Ministerial Task Force had recommended for remodeling in APMC Act 1963. The Model Act 2003, encourages the procurement of agricultural commodities from farmers field and also establish effective forward and backward linkages. As per provision of Model Act 2003, corporate sectors were also allowed to purchase direct from producers. This also facilitates the promotion of Public Private Partnership (PPP) in the development of agricultural market across the country.

In order to know the benefit of remodeling of APMC Act 1963, which has been amended (Model Act 2003) in 2006. The Ministry of Agriculture, Government of India had allotted a study on "Impact of Emerging Marketing Channels in Agricultural Marketing, Benefit to Producers sellers and Marketing Costs and Margins of Major Agricultural Commodities" to all the Agro-Economic Research Centres located across the country under coordinatorship of Institute of Economic Growth, New Delhi.

2. Objectives

The objectives that have been framed for this study to compare the economic benefits of Emerging Marketing Channels (EMC) over Traditional Marketing Channels (TMC) are:

(i) To observe the share of the farmers in the final consumers rupee in an emerging marketing model vis-a-vis the traditional marketing channel.

(ii) To observe the degree of market efficiency and incidence of post harvest losses in emerging marketing channel vis-a-vis traditional marketing channel.

(iii) To note market practices and services of agencies involved in emerging channel and observe if they are superior to that of traditional channels.

(iv) To observe the constraints faced by farmers and market functionaries in the emerging marketing channel as compared to the traditional marketing channel.

3. Methodology

As per guideline of coordinator, Institute of Economic Growth, New Delhi of this study, the research methodology of this study had been adopted by this centre. Two horticultural crops namely potato and aonla were selected from U.P. for this study because both crops have very much economic potential in U.P. Since, area and production

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of potato was maximum in Agra district in 2009 among all the districts of U.P. so this district was selected for potato. Out of total 15 blocks of the district, one block namely Khandauli was selected on the basis of maximum area and production of potato in 2009. Thirty-five potato growers of a village of Khandauli block were selected to know the Traditional Marketing Channels (TMC). In case of Emerging Marketing Channels (EMC) twenty-five potato growers from Hathrash district were selected from provided list by Pepsico.

The area and production of aonla were maximum in Pratapgarh district among all the districts of U.P. in 2009. Hence, this district was selected for aonla. Among the 16 blocks of this district, Magroora block was selected for the study to know the Traditional Marketing Channels. Thirty-five orchardists from Narharpur village of Magroora block of Pratapgarh district were selected for TMC. In case of Emerging Marketing Channels, twenty-five orchardists of Goadaygoan village of Sadar block of Pratapgarh district who had sold aonla directly to local processing units were selected.

The sample size for survey of farmers is presented below

Crop	District	Channels	
		Traditional Marketing Channel	Emerging Marketing Channel
Potato	Agra	35	—
	Hathrash	—	25
Aonla	Pratapgarh	35	25

Apart from selection of potato growers and orchardists of aonla, intermediaries, retailers and consumers were also selected for this study. The details of selected intermediaries, retailers and consumers are presented below :

The sample size for Intermediaries

Crops	Districts	Intermediaries	Channels	
			Traditional Marketing Channel	Emerging Marketing Channel
Potato	Agra/Hathrash	Intermediaries	15	1 (Pepsico)
		Retailers	15	5
		Consumers	15	5
Aonla	Pratapgarh	Intermediaries	15	1 (processing Units)
		Retailers	15	.5
		Consumers	15	5

Reference Year: The reference year of this study was 2009-2010

4. Major Findings of the Study

The following are the major findings of the study.

The APMC Act 1963 was actually enforced in 1965-66 in Uttar Pradesh. There were only 2 regulated markets in U.P. during 1965-66 which has gone upto 249 by end of January, 1967. Apart from this, 381 sub mandis were also attached with main mandis. The main source of income of regulated markets is market fee and development charge followed by license fee from the traders / commission agents. The mandi samiti charges 2 per cent of total value of sale of commodities as market fee and 0.50 per cent as development charge. The total income of all the regulated markets of U.P. was Rs. 1.92 crore during 1972-73 which has gone upto Rs. 507.21 crore during 2007-08. The Uttar Pradesh Krishi Utpadan Mandi Parishad has received prestigious award "Kosamb" by Government of India for its outsanding good administrative management and conducting of various welfare programmes for the farmers. Since the implementation of APMC Act 1964, a number of development activities have been taking place in and out side the regulated markets of U.P. to provide full facilities to sellers and buyers. The construction of market yards for fruits vegetables, fish, milk and flowers have also been taken up in regulated markets. The sale of agricultural produces through auction method, correc weighing, prompt

payment without undue deductions, availability of amenities etc, are basic activities of regulated markets of Uttar Pradesh.

The Interference of bureaucrats is more prevalent because the election could not be held up for a long time in almost all the regulated markets of Uttar Pradesh. Most of regulated markets of the state were not fully equipped as per norm of APMC Act 1963.

As far as sample farmers are concerned, the analysis reveals that the majority of sample farmers of potato as well as aonla of both channels belonged to small and marginal categories. The agriculture was main occupation of all the selected households of potato and aonla. The area under potato as well as aonla was fully irrigated. None of the sample farmers of both crops had micro irrigation devices. Per hectare paid out cost of potato in TMC was higher by 13.04 per cent over Rs. 72,776 in case of EMC. Out of total paid out costs, seed alone accounted for 46.55 per cent and 52.21 per cent in TMC and EMC respectively. Two varieties of potato namely chipsona and LR have been only preferred by Pepsico.

As far as aonla is concerned, the analysis reveals that per hectare paid out cost was Rs. 59,633 in case of TMC against Rs. 51,961 in case of EMC. Out of total per hectare paid out costs, maximum cost in both channels was incurred for hired labour.

The productivity of potato in case of TMC was 299 quintals against 296 quintals in case of EMC. The productivity of aonla was 249 quintal in case of EMC against 246 quintal in case of TMC. The sample farmers of potato had received the price of 512 per quintal under TMC against Rs. 588 under EMC. The per quintal net profit on paid out cost was Rs. 253 under TMC against Rs. 342 per quintal under EMC. The sample farmers of potato had gained much higher price sold through EMC than sold through TMC.

The per quintal price of aonla was Rs. 544 in TMC as compared to price of Rs. 553 per quintal ir case of TMC. The per quintal net profit of aonla on paid out cost was Rs. 311 in case of EMC against Rs. 290 in case of TMC. The analysis shows that sample farmers of potato and aonla, were getting better price sold through EMC than that of TMC in the study areas during the reference year.

5. Price Spread and Marketing Costs

As far as price spread and marketing cost of potato are concerned table-l reveals that producer share in consumer's rupee in case of TMC was 75.55 per cent and total marketing costs incurred by a producer accounted for 3.02 per cent of consumer's price. The price spread in case of TMC was 165.70 per quintal of which, the share of wholesaler was 3.32 per cent from producer price and 2.51 per cent retailer's price. The net margin retained by wholesaler and retailer in APMC was estimated at 2.51 per cent and 3.60 per cent of consumer's price respectively. The marketing efficiency was worked out of 0.36 in case of TMC.

As far as price spread in marketing of potato through EMC is concerned, Pepsico had purchased potato only for their own processing units. Hence, Pepsico neither sold the potato in Super Market/ Big Bazar nor through mall. The retailers were not involved in the marketing of potato in EMC in the study area. The producers had sold potato at the rate of Rs. 588 per quintal to Pepsico against Rs. 512 in APMC Agra. Thus, the producer received net margin of 76 per quinta in case of EMC than sold through TMC.

TABLE 1—PRICE SPREAD AND MARKETING COST FOR POTATO (2009)

Sr. No.	Price Spread	TMC	EMC
I	**Price received by farmer**	512	588
II	**Total marketing costs of farmer**	20.50	—
	(a) Transport to APMC	15.00	—
	(b) Loading and Unloading	3	—
	(c) Weighing & other related expenses	1.50	—
	(d) Commission, sorting etc.	1.00	—
	(e) Standard deduction considered as wastage	00	—
	Net price received by farmer	**491.50**	**588**
	Net profit (Net price received on paid out cost)	208.50	336
III	Marketing costs of wholesalers	51.30	—
	(a) Market fee	12.80	—
	(b) Gunny bags	36.00	—
	(c) Stitching gunny bag	0.50	—

TABLE 1—PRICE SPREAD AND MARKETING COST FOR POTATO (2009)—*Contd.*

Sr. No.	Price Spread	TMC	EMC
	(d) Hamali	2.00	—
	(e) Wastage during transport	00	—
	(t) Transport to terminal market	00	—
	(g) Wholesaler's margin	17.00	—
	Purchase price of wholesaler plus marketing cost	**563.30**	—
IV	Marketing cost of retailers	73.00	—
	(a) Hamali from point of purchase to tempo	2.00	—
	(b) Transport to retail outlet	15.00	—
	(c) Miscellaneous expenses such as cess to corporation, watchman for unsold stock, supermarket overheads, etc.	46.00	—
	(d) Wastage	10.00	—
	(e) Retailer's margin	24.40	—
	sale price of retailers	677.70	—
V	Share of farmer % in retailer's price	75.55	—
VI	Marketing Costs as % of retailer's price	21.37	—
VII	Marketing margins as % of retailer's price	6.11	—
VIII	Modified Measure of Marketing Efficiency	0.36	—

Source: computed from field survey data.

In spite of this, the producer had incurred Rs. 20.50 per quintal as marketing cost under TMC while it was nil in case of EMC. Besides this, the producers had not paid commission to commission agents and also free from exploitation from irtermediaries when he had sold potato to Pepsico.

As far as price spread of aonla is concerned a number of deductions either in kind or cash are made in aonla by various intermediaries in regulated market of Pratapgarh. The Producers share in consumer's rupee of aonla was 72.53 per cent in case of TMC. The marketing costs and margins accounted for 15.08 per cent and 17.12 per cent of retailer's price respectively. The marketing cost incurred on consumer's price by sample farmers was 4.73 per cent as compared to 7.01 per cent and 3.33 per cent by wholesaler and retailer respectively. The retailer margin was higher being 14.73 per cent than wholesaler margin of 2.39 per cent of the consumer's price. (Table-2)

TABLE 2—PRICE SPREAD AND MARKETING COST FOR AONLA (2009)

Sr. No.	Price Spread	TMC	EMC
I	**Price received by farmer**	544.00	533.00
II	**Total marketing costs of farmer**	35.50	—
	(a) Transport to APMC	30.00	—
	(b) Loading and Unloading	3.00	—
	(c) Weighing & other related expenses	1.50	—
	(d) Commission, sorting and stacking	1.00	—
	(e) Standard deduction considered as wastage	0.00	—
	Net price received by farmer	**508.50**	**533.00**

TABLE 2—PRICE SPREAD AND MARKETING COST FOR AONLA (2009)—*Contd.*

Sr. No.	Price Spread	TMC	TMC
	Net profit (Net price received on paid out cost)	242.50	—
III	Marketing costs of wholesalers	52.60	—
	(a) Market fee	13.60	—
	(b) Gunny bags	36.00	—
	(c) Stitching gunny bag	1.00	—
	(d) Hamali	2.00	—
	(e) Wastage during transport	0.00	—
	(f) Transport to terminal market	0.00	—
	(g) Wholesaler's margin	17.90	—
	Purchase price of wholesaler plus marketing cost		
IV	Marketing cost of retailers	25.00	—
	(a) Hamali from point of purchase to tempo	5.00	—
	(b) Transport to retail outlet	10.00	—
	(c) Miscellaneous expenses such as cess to corporation, watchman for unsold stock, supermarket overheads, etc.	10.00	—
	(d) Wastage	0.00	—
	(e) Retailer's margin	110.50	—
	(f) sale price of retailer	750.00	—
V	Share of farmer % in retailer's price	72.53	—
VI	Marketing Costs as % of retailer's price	15.08	—
VII	Marketing margins as % of retailer's price	17.12	—
VIII	Modified Measure of Marketing Efficiency	0.44	—

Source: computed from field survey data.

With respect to sale of aonla through EMC, retailers were also not involved. The total purchased quantity of aonla by processing units was utilized for preparation of processed products. The producer had received the price of Rs. 533 per quintal of aonla from processing units against Rs. 544 per quintal from traders in regulated market of Pratapgarh. In this way, the producer received net profit of Rs. 533 per quintal under EMC against Rs. 508.50 under TMC. The reason of the higher profit in case of EMC was no involvement of marketing costs.

TABLE-3—BENEFIT COST RATIO FOR POTATO AND AONLA

Particulars	TMC (cost of production includes only paid out costs)	EMC (cost of production includes only paid out costs)	TMC (cost of production' includes family labour)	EMC (cost of production includes family labour)
BCR for Potato	1.86	2.39	1.83	2.34
BCR for Aonla	2.25	2.49	2.14	2.43

Source: Computed from field survey data

The benefit cost ratio (HCR) was also higher in EMC for both crops as compared to TMC. The reason for higher BCR under EMC as compared to TMC for both crops was due to higher price under EMC than that of TMC during the study period. Thus EMC was found more profitable in both horticultural crops namely potato and aonla in the study area during the reference year (Table-3).

The post harvest losses in potato in case ofTMC were 1 kg per quintal at farm level followed by 0.50 kg during transportation. The loss at retailer level was not reported. Since potato had been directly sold to Pepsico, therefore, there was no losses occurred at farm level. In case of aonla none of sample farmers of both channels had reported post harvest losses at any stage (Table-4).

TABLE 4—PER QUINTAL POST HARVEST LOSSES

Post harvest loss	Potato				Aonla			
	TMC		EMC		TMC		EMC	
	Qty.	SD	Qty.	SD	Qty.	SD	Qty.	SD
Loss on the farm (kg)	1.00	—	—	—	—	—	—	—
Loss during transport	0.50	—	—	—	—	—	—	—
Loss at retail level	—	—	—	—	—	—	—	—

Source: Field survey data.

Perception of Sample Farmers

The perception of sample farmers with regard to marketing activities of potato and aonla under EMC and TMC are as follows:

(i) The commission agents were main source of information regarding the prevailing price of potato and aonla in the market. The personal visit in the market was also good source of price information. None of sample farmers of both crops got information from AGMARK Net.

(ii) The chances of cheating are much more when commodities are sold through commission agents in regulated markets. While chances of cheating are more or less negligible in case of EMC.

(iii) The deduction in price of sold quantity of potato and aonla had not been made in case of EMC, while it was prevailing in regulated markets.

(iv) Majority of sample farmers were fully satisfied with timely availability of full payment in EMC as well as TMC.

(v) The commission agents are generally much biased towards the traders than the producers in market yard. This type of biasness does not exist in EMC.

(vi) None of the sample farmers of potato under EMC and TMC had taken loan from private financial institutions during the reference period.

(vii) None of loanee of sample farmers was defaulter.

(viii) Majority of sample farmers of Agra and Pratapgarh were not satisfied with availability of amenities in the regulated markets. The banking facilities, computer system, telephone etc. were also not functioning properly in both selected markets. The price display system of commodities was not found functioning in both markets.

(ix) The sample farmers of both crops in TMC had average view with respect of auction arrangement. The supervision of staff of regulated market was also not found upto the mark. They were extremely busy in issuing only 9R and 6R. This above analysis reflects that immense short comings and drawback are still persisting in APMC Agra and Pratapgarh districts.

(x) The sample farmers in EMC had expressed their opinion that processing units had purchased only better quality of produces. Therefore, the producers had to sell the rejected quantity of commodities through TMC in regulated markets at throw away price.

7. Suggestions and Policy Implication

Following suggestions are given on the basis of personal observations, perception of farmers and market functionaries. Apart from these, the state government officials, Secretaries of APMC Agra and Pratapgarh districts and representatives of processing units of Pepsico and Satkar Food Products were also interviewed to get their suggestions for improving the marketing efficiency.

(i) First and foremost suggestion was that the Government of Uttar Pradesh should implement Model Act, 2003 across the state to safeguard the interest of millions of farmers and consumers of

the state. This would not only increase the income of farmers but also open new avenues for export of agricultural and horticultural produces from the state. The Private and Public Partnership will also develop to improve the marketing efficiency of agricultural and horticultural produces.

(ii) The State Government should also motivate the private sectors to establish the processing units in potential pockets of the state to avoid distress sale of agricultural and horticultural produces during bumper production of crops.

(iii) Almost all the APMCs of the state have been earning good income throughout the year but the investment on the infrastructural facilities and basic amenities is not being done properly neither outside the markets nor inside the market. The investment according to income of the market should be made on the development of infrastructure facilities to provide better facilities to sellers and buyers during marketing of commodities.

(iv) The mini cold storages should be constructed in market yard or near by the market to protect the losses of unsold fruits, vegetables, flowers etc. for a long duration.

(v) The deduction practices in cash or kind is still persisting in market yard. This should not be allowed at any cost.

(vi) The rules and regulations of APMC Act 1963, should be totally enforced in the regulated markets. Any type of harassment of farmers should not be done by commission agents, traders and others. The staff of regulated market should keep vigilant watch on these imbroglio to protect the farmers.

(vii) The auction of commodities and fixation of its prices should be made more transparent Total accountability should be fixed on the staff of regulated market in this regard.

(viii) The state intervention is also needed in case of horticultural produces when its price goes down quite low during the huge arrival in the market. The state government should take immediate step to supply these commodities to deficit places to maintain the price equilibrium.

(ix) Since a long time, election of Marketing Board has not been held in almost all regulated markets of the state, hence the election of Marketing Board should take place as soon as possible across the state to provide public representation in the decision making process

(x) The farmers are still cheated and exploited in the regulated markets by the market functionaries in different ways. Therefore, the authorities of regulated markets should be more vigilant and active to eliminate the foul activities and operations in the market.

(xi) Since, the association of intermediaries is very strong and well united, therefore authority of regulated market should give more protection to producers rather than intermediaries.

(xii) The commission agents and wholesalers are well acquainted with price of different commodities in different markets of places outside the state. They are getting information of prices of different commodities through land line telephone, mobile, internet etc. while the producers are generally ignorant in this regard. Therefore, the State Government should take concrete step to provide the upto date information of prices of commodities to the farmers through print and electronic media. The proper display of latest price list of prices of different commodities should be posted on the gate of market.

(xiii) The maximum attention is needed to develop the rural roads to facilitate the farmers of remote villages to bring their produces in Mandi without any botheration.

(xiv) The Central and U.P. Governments should allot maximum amount to establish cold chains system across the state to protect the quality and quantity losses of horticultural produces.

(xv) The farmers of Uttar Pradesh should get pledge loan from APMCs to get higher prices of their commodities during the lean period.

D. Commodity Reviews

(i) Foodgrains

During the month of October, 2012 the Wholesale Prices of food grains displayed a declining trend. Wholesale Price Index (Base 2004-05=100) of Food grains fell by 0.33% while that of pulses and cereals rose by 1.68% and 0.15% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of October 2012	WPI for the Month of September 2012	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	196.4	194.8	176.3	0.82	11 .40
Wheat	1.116	198.0	198.0	165.3	0.00	19.78
Jowar	0.096	234.5	234.8	248.7	–0.13	–5.71
Bajra	0.115	219.0	232.3	184.5	–5.73	18.70
Maize	0.217	231.4	235.1	194.1	–1.57	19.22
Barley	0.017	198.2	200.6	174.6	–1.20	13.52
Ragi	0.019	284.8	269.9	208.7	5.52	36.46
Cereals	3.373	201.6	201.3	176.3	0.15	14.35
Pulses	0.717	265.8	261.4	214.0	1.68	24.21
Foodgrains	4.09	211.2	211.9	182.9	–0.33	15.47

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

Behaviour of Wholesale Prices

The following Table indicates the State wise trend of Wholesale Prices of Cereals during the month of October, 2012.

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Rice	Mixed			Jharkhand Haryana Kerala Uttar Pradesh Karnataka Tamil Nadu	Assam Gujarat West Bengal
Wheat	Mixed	M.P. Haryana	Kamataka Jharkhand	Gujarat Rajasthan Uttar Pradesh	
Jowar	Falling	Maharashtra	Gujarat Karnataka Tamil Nadu	Rajasthan A.P.	U.P.
Bajra	Steady & Falling	A.P.	Tamil Nadu Rajasthan	Gujarat	U.P. Karnataka
Maize	Falling	U.P. Jharkhand	Gujarat A.P. Karnataka	Haryana Rajasthan	M.P.

Procurement of Rice

7938 thousand tonnes of Rice (including paddy converted into rice) was procured during October, 2012, as against 8200 thousand tonnes of Rice (including paddy converted into rice) procured during October 2011.The total procurement of Rice in the current marketing season i.e 2012-2013, upto 31.10.2012 stood at 7938 thousand tonnes, as against 8200 thousand 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 2012-13 (up to 31-10-2012)		Corresponding Period of last Year 2011-12		Marketing Year (October-September) 2011-12		2010-11	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	0	0.00	0	0.00	7540	22.05	9610	30.00
Chhatisgarh	0	0.00	0	0.00	4115	12.03	3746	11.69
Haryana	2101	26.47	1715	20.91	2007	5.87	1687	5.27
Maharashtra	0	0.00	0	0.00	178	0.52	308	0.96
Punjab	5825	73.38	6297	76.79	7731	22.61	8635	26.96
Tamil Nadu	1	0.01	161	1.96	1596	4.67	1543	4.82
Uttar Pradesh	1	0.01	6	0.07	3355	9.81	2554	7.97
Uttarakhand	1	0.01	1	0.01	378	1.11	422	1.32
Others	9	0.11	20	0.24	8131	23.78	5693	17.77
Total	**7938**	**100.00**	**8200**	**100.00**	**35031**	**100.00**	**34198**	**100.00**

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2012-2013 upto August, 2012 is 38148 thousand tonnes against a total of 28148 thousand tonnes of wheat procured during last year. The details are given in the following table :

PROCUREMENT OF WHEAT

(in thousand tonnes)

State	Marketing Season 2012-13 (up to 2-08-2012)		Corresponding Period of last Year (2011-12)		Marketing Year (April-March) 2011-12		2010-11	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	8665	22.71	6882	24.45	6928	24.45	6347	28.19
Madhya Pradesh	8493	22.26	4905	17.43	4965	17.52	3539	15.72
Punjab	12834	33.64	10957	38.93	10958	38.67	10209	45.35
Rajasthan	1964	5.15	1303	4.63	1303	4.60	476	2.11
Uttar Pradesh	5063	13.27	3461	12.30	3461	12.21	1645	7.31
Others	1129	2.96	640	2.27	720	2.54	298	1.32
Total	**38148**	**100.00**	**28148**	**100.00**	**28335**	**100.00**	**22514**	**100.00**

Source: Department of Food & Public Distribution.

(ii) Commercial Crops

Oil Seeds and Edible Oils :

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 196.6 in October, 2012 showing a fall of 5.0 per cent over the previous month.However, it increased by 27.2 per cent over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Rape & Mustard (4.5 per cent), Sunflower (2.7 per cent) and Cottonseed (1.0 per cent) increased over the previous month. However, the WPI of Soyabean (-21.7 per cent), Niger Seed (-9.1 per cent), Gingelly seed (-5.1 per cent), Safflower seed (-2.5 per cent), Copra (-1.7 per cent) and Groundnut seed (-0.7 per cent) decreased over the previous month. The Wholesale Price Index (WPI) of Edible Oils as a group stood 148.1 in October, 2012 showing a fall of 1.9 per cent over the previous month. However, it increased by 9.4 per cent over the previous year. The, WPI of Groundnut Oil (4.6 per cent), Soyabean Oil (3.1 per cent), Mustard Oil (1.5 per cent), Sunflower Oil (1.3 per cent), Gingelly Oil (1.2 per cent), Cottonseed Oil (1.0 per cent) and Copra oil (0.8 per cent) decreased over the previous month.

Fruits and Vegetable :

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 192.9 in October, 2012 showing a fall of 1.0 per cent and 2.9 per cent over the previous month and over the previous year.

Potato :

The Wholesale Price Index (WPI) of Potato stood at 231.0 in October, 2012 showing a fall of 4.8 per cent over the previous month. However, it increased by 49.1 per cent over the previous year.

Onion :

The Wholesale Price Index (WPI) of Onion stood 210.2 in October, 2012 showing an increase of 8.4 per cent over the previous month. However, it decreased by 9.1 per cent over the previous year.

Condiments and Spices :

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 208.8 in October, 2012 showing a fall of 0.7 per cent and 18.3 per cent over the previous month and over the previous year.

The Wholesale Price Index of Black Pepper, Chillies (Dry) and Turmeric decreased by 0.2 per cent, 1.7 per cent and 1.3 per cent, respectively over the previous month.

Raw Cotton :

The Wholesale Price Index (WPI) of Raw Cotton stood at 200.9 in October, 2012 showing a fall of 5.1 per cent and 9.5 per cent over the previous month and over the previous year.

Raw Jute :

The Wholesale Price Index (WPI) of Raw Jute stood at 241.9 in October, 2012 showing a fall of 5.2 per cent over the previous month. However, it increased by 15.4 per cent over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF OCTOBER, 2012

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percent Variation over the	
	Oct., 2012	Sep., 2012	Oct., 2011	Month	Year
Oil Seeds	196.6	207.0	154.5	–5.0	27.2
Groundnut Seed	241.3	243.0	196.9	–0.7	22.5
Rape and Mustard Seed	224.4	214.8	150.4	4.5	49.2
Cotton Seed	174.6	172.8	148.0	1.0	18.0
Copra (Coconut)	88.4	89.9	111.0	–1.7	–20.4
Gingelly Seed (Sesamum)	300.4	316.6	201.4	–5.1	49.2
Niger Seed	191.8	210.9	174.9	–9.1	9.7
Safflower (Kardi Seed)	150.4	154.2	126.8	–2.5	18.6
Sunflower	184.3	179.5	156.5	2.7	17.8
Soyabean	189.1	241.4	124.8	–21.7	51.5
Edible Oils	148.1	150.9	135.4	–1.9	9.4
Groundnut Oil	183.2	192.0	161.1	–4.6	13.7
Cotton Seed Oil	186.7	188.6	150.9	–1.0	23.7
Mustard and Rapeseed Oil	154.8	157.2	136.7	–1.5	13.2
Soyabean Oil	163.4	168.6	147.0	–3.1	11.2
Copra Oil	111.6	112.5	123.7	–0.8	–9.8
Sunflower Oil	137.1	138.9	134.8	–1.3	1.7
Gingelly Oil	163.9	165.9	143.2	–1.2	14.5
Fruits and Vegetables	192.9	194.9	198.7	–1.0	–2.9
Potato	231.0	242.7	154.9	–4.8	49.1
Onion	210.2	194.0	231.3	8.4	–9.1
Condiments and Spices	208.8	210.2	255.5	–0.7	–18.3
Black Pepper	530.3	531.1	433.7	–0.2	22.3
Chillies (Dry)	226.4	230.4	295.6	–1.7	–23.4
Turmeric	169.1	171.4	190.1	–1.3	–11.0
Raw Cotton	200.9	211.7	222.1	–5.1	–9.5
Raw Jute	241.9	255.3	209.6	–5.2	15.4

PART II—Statistical Tables

A. Wages

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

(in Rupees)

State/Distt.	Village	Month and Year	Normal Daily Working Hours	Field Labour			Other Agri. Labour			Herdsman			Skilled Labour		
				Man	Woman	Non Adult	Man	Woman	Non Adult	Man	Woman	Non Adult	Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Andhra Pradesh															
Krishna	Ghantasala	Dec., 2011	8	250.00	100.00	NA	250.00	130.00	NA	NA	NA	NA	NA	NA	NA
Guntur	Tadikonda	Dec., 2011	8	200.00	175.00	110.00	200.00	160.00	110.00	160.00	NA	NA	NA	NA	NA
Rangareddy	Arutla	Dec., 2011	8	200.00	120.00	NA	150.00	120.00	NA	150.00	120.00	NA	220.00	200.00	NA
Karnataka															
Bangalore	Harisandra	May to June, 2012	8	200.00	150.00	NA	200.00	150.00	NA	250.00	180.00	NA	300.00	300.00	NA
Tumkur	Gedlahali	May to June, 2012	8	160.00	160.00	NA	180.00	160.00	NA	180.00	160.00	NA	180.00	180.00	NA
Maharashtra															
Nagpur	Mauda	Dec., 2009	8	100.00	80.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ahmednagar	Akole	June, 2009	8	80.00	70.00	NA	NA	NA	NA	NA	NA	NA	83.5	85.00	85.00
Jharkhand															
Ranchi	Gaintalsood	April, 2012	8	100.00	100.00	NA	90.00	90.00	NA	58.00	58.00	NA	170.00	150.00	NA

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

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Assam													
Barpeta	Loharapara	March, 12	M	8	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
			W	8	NA	NA	160.00	160.00	160.00	NA	NA	NA	NA
Bihar													
Muzaffarpur	Bhalui Rasul	Feb. and,	M	8	104.00	104.00	104.00	104.00	104.00	NA	150.00	150.00	150.00
		March, 2010	W	8	NA	104.00	104.00	104.00	104.00	NA	NA	NA	NA
Shekhpura	Kutaut	May and	M	8	150.00	NA	NA	NA	150.00	NA	220.00	NA	NA
		June, 2010	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh													
Dhamtari	Sihaba	July, 2012	M	8	350.00	100.00	100.00	NA	80.00	80.00	200.00	100.00	80.00
			W	8	NA	80.00	80.00	NA	60.00	NA	NA	NA	NA
Gujarat													
Rajkot	Rajkot	March, 2012	M	8	247.00	270.00	164.00	197.00	168.00	140.00	408.00	358.00	240.00
			W	8	NA	182.00	142.00	167.00	167.00	100.00	NA	NA	NA
Dahod	Dahod	March, 2012	M	8	71.00	71.00	71.00	71.00	71.00	NA	143.00	150.00	150.00
			W	8	NA	71.00	71.00	71.00	71.00	NA	NA	NA	NA
Haryana													
Panipat	Ugarakheri	May and	M	8	180.00	180.00	180.00	200.00	180.00	NA	NA	NA	NA
		June, 2012	W	8	NA	150.00	150.00	180.00	150.00	NA	NA	NA	NA

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

0 (in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Himachal Pradesh													
Mandi	Mandi	Nov., to Dec. 2010	M	8	300.00	110.00	110.00	110.00	110.00	110.00	200.00	200.00	NA
			W	8	NA	110.00	110.00	110.00	110.00	110.00	NA	NA	NA
Kerala													
Kozhikode	Koduvally	Feb., and March, 2012	M	4 to 8	720.00	450.00	NA	450.00	572.05	NA	500.00	NA	NA
			W	4 to 8	NA	NA	350.00	350.00	350.00	NA	NA	NA	NA
Palakkad	Elappally	Feb., and March, 2012	M	4 to 8	400.00	300.00	NA	275.00	368.75	NA	400.00	NA	NA
			W	4 to 8	NA	NA	150.00	200.00	160.00	NA	NA	NA	NA
Madhya Pradesh													
Hoshangabad	Sangarkhera	Aug., 2012	M	8	150.00	130.00	150.00	150.00	125.00	100.00	350.00	350.00	NA
			W	8	NA	130.00	150.00	150.00	125.00	100.00	NA	NA	NA
Satna	Kotar	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shyopur Kala	Vijaypur	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Orissa													
Bhadrak	Chandbali	May, 2012	M	8	220.00	150.00	NA	NA	166.66	150.00	250.00	140.00	140.00
			W	8	NA	NA	NA	NA	106.66	100.00	NA	NA	NA
Ganjam	Aska	May, 2012	M	8	250.00	150.00	150.00	150.00	168.33	150.00	300.00	150.00	150.00
			W	8	NA	100.00	100.00	100.00	100.00	100.00	NA	NA	NA
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	NA	NA	90.00	95.00	NA	99.44	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan													
Barmer	Vishala	July, 2012	M	8					—NA—				
			W	8					—NA—				
Jalore	Panwa	July, 2012	M	8	NA	NA	NA	NA	NA	50.00	100.00	50.00	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu													
Thanjavur	Pulvarnatham	Aug., 2012	M	6					—NA—				
			M	5									
Tirunelveli	Malayakulam (Kurvikulam)	Aug., 2012	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	100.00	NA	NA	NA	NA	NA	NA
Tripura													
Agartala	Govt. Agri. Farm		M						—NA—				
			W										
*Uttar Pradesh**													
Meerut	Ganeshpur	July, 2012	M	8	208.00	205.00	205.00	207.00	204.00	NA	306.00	NA	NA
			W	8	NA	175.00	175.00	177.00	176.00	NA	NA	NA	NA
Aurraiya#	Aurraiya	July, 2012	M	8	120.00	120.00	120.00	132.9	120.00	NA	257.1	NA	NA
			W	8	NA	NA	120.00	132.9	120.00	NA	NA	NA	NA
Chandauli	Chandauli	July, 2012	M	8	NA	NA	NA	125.00	125.00	NA	236.00	NA	NA
			W	8	NA	NA	NA	125.00	125.00	NA	NA	NA	NA

M-Man, W-Woman,

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

*- Uttar Pradesh reports its district-wise average rural wage data rather than from selected centre/village.

New district is opted to replace Chandbali.

B. PRICES

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Oct.-12	Sep.-12	Oct.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1450	1450	1155
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1400	1450	1050
Wheat	—	Quintal	Madhya Pradesh	Sagar	2000	2000	1500
Jowar	—	Quintal	Maharashtra	Mumbai	2000	2100	2100
Gram	—	Quintal	Punjab	Abohar	NA	NA	NA
Maize	Yellow	Quintal	Uttar Pradesh	Bahraich	1165	1120	1035
Gram Split	—	Quintal	Maharashtra	Mumbai	6350	5800	4500
Gram Split	—	Quintal	Bihar	Patna	5400	5460	4560
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6700	7000	NT
Arhar Split	—	Quintal	Maharashtra	Mumbai	6625	6250	6000
Arhar Split	Sort-II	Quintal	Tamil Nadu	Chennai	6000	6100	5200
Arhar Split	—	Quintal	Bihar	Patna	5900	5850	5750
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2675	3050	2350
Gur	Sort-II	Quintal	Tamil Nadu	Chennai	NA	3200	3000
Gur	—	Quintal	Maharashtra	Mumbai	3400	3350	2800
Mustard Seed	Rai UP	Quintal	West Bengal	Kolkata	4300	4425	3300
Mustard Seed	Raira	Quintal	West Bengal	Kolkata	NA	NA	NA
Mustard Seed	Black(S)	Quintal	Uttar Pradesh	Kanpur	4120	4190	2925
Linseed	—	Quintal	Maharashtra	Nagpur	4100	4000	2950
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4350	4270	3100
Cotton Seed	Superior	Quintal	Maharashtra	Jalgaon	NA	NA	NQ
Castor Seed	—	Quintal	Andhra Pradesh	Badepalli	NA	NA	NA
Sesamum Seed	Black	Quintal	Tamil Nadu	Chennai	NA	4500	4500
Cotton Seed	—	Quintal	Maharashtra	Mumbai	NA	NA	NA
Copra	FAQ	Quintal	Kerala	Alleppey	4100	4050	5450
Groundnut	—	Quintal	Maharashtra	Mumbai	8200	7900	5600
Groundnut	TMV-7	Quintal	Tamil Nadu	Chennai	NA	4280	4280
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1403	1395	1175
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1335	1328	1065
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1695	1688	1290
Groundnut Oil	—	15 Kg.	Tamil Nadu	Chennai	1725	1650	1320
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1467	1455	1197
Castor Oil	—	15 Kg.	Uttar Pradesh	Kanpur	NA	NA	NA
Sesamum Oil	Agmark	15 Kg.	Tamil Nadu	Chennai	2400	2400	1875
Sesamum Oil	—	15 Kg.	Maharashtra	Mumbai	NA	NA	NA
Coconut Oil	—	15 Kg.	Kerala	Cochin	900	885	1170
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	2170	2150	1130
Groundnut Cake	—	Quintal	Uttar Pradesh	Kanpur	NA	NA	NA
Cotton/Kapas	F-414	Quintal	Punjab	Abohar	NA	NA	NA
Cotton/Kapas	LR-A	Quintal	Tamil Nadu	Thiruppur	NA	NA	NA
Wool	Fine	Quintal	Madhya Pradesh	Dabra	NA	NA	NA
Jute Raw	TD-5	Quintal	West Bengal	Kolkata	2450	2500	2150

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Oct.-12	Sept.-12	Oct.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jute Raw	W-5	Quintal	West Bengal	Kolkata	2450	2500	2150
Oranges	—	100 No.	Maharashtra	Mumbai	NA	NA	NA
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	NA	NA	NA
Oranges	Big	100 No.	Tamil Nadu	Chennai	600	540	640
Banana	Basarai	100 No.	Maharashtra	Jalgaon	220	210	NA
Banana	Singapore	100 No.	West Bengal	Kolkata	350	350	NA
Cashewnuts	—	Quintal	Maharashtra	Mumbai	50000	52500	60000
Almonds	—	Quintal	Maharashtra	Mumbai	45500	45000	45000
Walnuts	—	Quintal	Maharashtra	Mumbai	51250	52500	70000
Kishmish	—	Quintal	Maharashtra	Mumbai	11000	11000	15250
Peas Green	—	Quintal	Tamil Nadu	Chennai	NA	NA	10000
Tomatoes	—	Quintal	Tamil Nadu	Chennai	1500	1200	2300
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	2000	2000	1800
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1100	1100	1000
Potatoes	Red	Quintal	Bihar	Patna	1200	1230	650
Potatoes	Deshi	Quintal	West Bengal	Kolkata	1200	1060	530
Potatoes	Sort-I	Quintal	Tamil Nadu	Mettuppalayam	2365	NA	1333
Onions	Bombay	Quintal	West Bengal	Kolkata	NA	NA	NA
Turmeric	Erode	Quintal	West Bengal	Kolkata	8200	8000	NA
Turmeric	Nadan	Quintal	Kerala	Cochin	8200	7850	8500
Chillies	—	Quintal	Bihar	Patna	7100	6800	9400
Black Pepper	Palai	Quintal	Kerala	Alleppey	NT	NT	NT
Ginger	Dry	Quintal	Kerala	Cochin	11250	11100	12200
Cardamom	Big	Quintal	West Bengal	Kolkata	82000	82000	110000
Cardamom	Small	Quintal	West Bengal	Kolkata	100000	100000	80000
Milk	Cow	100	NCT of Delhi	Delhi	3600	3600	3400
Milk	Buffalo	100	West Bengal	Kolkata	3200	3200	3000
Ghee Deshi	Agmark	Quintal	West Bengal	Kolkata	33000	33000	NA
Ghee Deshi	—	Quintal	Uttar Pradesh	Khurja	23950	NA	NA
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	NA	25250	28000
Fish	Rohu	Quintal	West Bengal	Kolkata	14000	13000	NA
Fish	Sea Prawns	Quintal	Tamil Nadu	Chennai	—	15000	21000
Eggs	Madras	1000 No.	West Bengal	Kolkata	4000	4000	3000
Tea	Medium	Quintal	Assam	Guwahati	21000	20000	14000
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	NA	NA	13000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26000	26000	30000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	14000	14000	12400
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2700	2500	2300
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2530	2400	2200
Tobacco	Bidi /Tobacco	Quintal	West Bengal	Kolkata	4000	4000	3200
Rubber	—	Quintal	Kerala	Kottayam	16700	18200	20200
Arecanut	Rashi	Quintal	Tamil Nadu	Chennai	NA	30000	29500

NA :—Not Available

NT :—Not Transaction

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2012

Commodity	Variety	Country	Centre		Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.
Barley		Canada	Winni-	Dollar/M.T.	213.00	214.00	216.00	220.00	220.00	220.00	220.00	—	—
			peg	Rs./Qtl.	1072.88	1048.81	1100.30	1175.68	1183.38	1203.40	1211.54	—	—
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T.	15000.00	11000.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00
				Rs./Qtl.	118395.06	85536.00	101825.00	106650.00	108412.50	109250.00	108737.50	110125.00	110062.50
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/1bs	4.12	4.03	4.00	4.06	4.03	3.80	3.65	3.55	3.53
				Rs./Qtl.	71672.23	69067.37	71815.14	76346.38	77034.63	73199.25	69979.98	68931.20	68503.96
Castor Oil	Any Origin ex	Nether-	—	Dollar/M.T.	1880.00	1875.00	1700.00	1600.00	1500.00	1500.00	1680.00	1760.00	1600.00
	tank Rotterdam	lands		Rs./Qtl.	9687.64	9185.63	8649.60	8392.00	8305.50	8346.00	9282.00	9771.52	8688.00
Celery Seed	ASTA cif	India	—	Dollar/M.T.	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00
				Rs./Qtl.	7729.50	7348.50	7632.00	7867.50	8305.50	8346.00	8287.50	8328.00	8145.00
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T.	5500.00	6500.00	5900.00	5900.00	5650.00	5650.00	5650.00	5650.00	5650.00
				Rs./Qtl.	28341.50	31843.50	30019.20	30945.50	31284.05	31436.60	31216.25	31368.80	30679.50
Cinnamon Bark		Mada-	—	Dollar/M.T.	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00
		gascar		Rs./Qtl.	5668.30	5388.90	5596.80	5769.50	6090.70	6120.40	6077.50	6107.20	5973.00
Cloves	Singapore	Mada-	—	Dollar/M.T.	10875.00	12000.00	12000.00	12000.00	12000.00	10300.00	10500.00	9500.00	9500.00
		gascar		Rs./Qtl.	56038.88	58788.00	61056.00	62940.00	66444.00	57309.20	58012.50	52744.00	51585.00
Coconut Oil	Crude Phillipine/ Indonesia	Nether-	—	Dollar/M.T.	1430.00	1430.00	1315.00	1325.00	1030.00	1095.00	1000.00	995.00	990.00
		lands		Rs./Qtl.	7368.79	7005.57	6690.72	6949.63	5703.11	6092.58	5525.00	5524.24	5375.70
Copra	Phillipines cif Rotterdam	Philli	—	Dollar/M.T.	901.50	905.00	835.00	825.50	648.00	692.00	616.00	648.00	609.50
		pine		Rs./Qtl.	4645.43	4433.60	4248.48	4329.75	3587.98	3850.29	3403.40	33597.70	3309.59
Corriander		India	—	Dollar/M.T.	1150.00	1150.00	1150.00	1150.00	1150.00	1150.00	1150.00	1150.00	1150.00
				Rs./Qtl.	5925.95	5633.85	5851.20	6031.75	6367.55	6398.60	6353.75	6384.80	6244.50
Cummin Seed		India	—	Dollar.M.T.	3800.00	3800.00	3800.00	3800.00	3800.00	2800.00	2800.00	2800.00	2800.00
				Rs./Qtl.	19581.40	18616.20	19334.40	19931.00	21040.60	15579.20	15470.00	15545.60	15204.00
Fennel seed		India	—	Dollar/M.T.	2600.00	2600.00	2600.00	2600.00	2600.00	2600.00	2600.00	2600.00	2600.00
				Rs./Qtl.	13397.80	12737.40	13228.80	13637.0	14396.20	14466.40	14365.00	14435.20	14118.00
Ginger	Split	Nigeria	—	Dollar/M.T.	3800.00	3400.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
				Rs./Qtl.	19581.40	16656.60	12974.40	13374.75	14119.35	14188.20	14088.75	14157.60	13846.50
Groundnut kerrnels	US 2005, 40/50 cif Rotterdam	European	—	Dollar/M.T	-	-	-	2400.00	1725.00	1650.00	1595.00	1555.00	1400.00
		Ports		Rs./Qtl.	-	-	-	12588.00	9551.33	9180.60	8812.38	6412.56	7602.00
Groundnut Oil	Crude Any Ori gin cif Rotterdam	U.K.	—	Dollar/M.T	-	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	—	2200.00
				Rs./Qtl.	-	17107.20	17921.20	18770.40	19080.60	19228.00	1917.80	—	19371.00
Lentils	Turkish Red Split Crop 1+1 water	U.K.	—	Pound/M.T	587.57	567.02	562.08	553.32	574.59	572.94	571.55	519.93	508.84
				Rs./Qtl.	4637.69	4409.15	4578.70	4720.93	4983.42	5007.50	4971.91	4580.58	4480.34
Maize		U.S.A	Chic-	C/56 lbs.	658.00	630.00	630.50	607.00	601.25	645.50	790.00	789.75	782.50
			ago	Rs./Qtl	1332.53	1212.94	1260.74	1251.20	1308.34	1411.48	1715.35	1723.58	1669.85
Oats		Canada	Winni-	Dollar/M.T.	209.31	211.40	211.23	207.59	217.72	215.14	212.19	370.30	375.82
			peg	Rs./Qtl.	1054.29	1036.07	1076.01	1109.36	1171.12	1176.82	1168.53	2084.79	2101.59
Palm Kernal Oil	Crude Malaysia/ Indonesia	Nether- lands	—	Dollar/M.T.	1355.00	1410.00	1370.00	1375.00	1180.00	1070.00	1000.00	1040.00	990.00
			—	Rs./Qtl.	6982.32	6907.59	6970.56	7211.88	6533.66	5953.48	5525.00	5774.08	5375.70
Palm Oil	Crude	Nether-	—	Dollar/M.T.	1063.00	1125.00	1163.00	1178.00	1015.00	1013.00	990.00	998.00	1000.00

3. MONTH-END WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2012—*Contd.*

Commodity	Variety	Country	Centre		Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.
	Malaysian/ Sumatra	lands	—	Rs./Qtl.	5477.64	5511.38	5917.34	6178.61	5620.06	5636.33	5469.75	5540.90	5430.00
Rapeseed	Canola	Canada	Winni- peg	Can Dollar/M.T	524.80	559.50	606.90	620.50	610.80	632.10	605.00	621.40	627.30
					2643.42	2742.11	3091.55	3315.95	3285.49	3457.59	3331.74	3498.48	3507.86
	U.K. delivered rapeseed, delivered	U.K.	—	Pound/M.T.	365.00	372.00	394.00	397.00	364.00	378.00	390.00	393.00	385.00
				Rs./Qtl.	2880.95	2892.67	3209.52	3387.20	3156.97	3303.72	3392.61	3462.33	3389.93
Rapeseed Meal	UK produced HP 37% DO, Resell Erith	U.K.	—	Pound/M.T.	171.00	176.00	166.00	178.00	197.00	199.00	221.00	—	—
				Rs/Qtl.	1349.70	1368.58	1352.24	1518.70	1708.58	1739.26	1922.48	—	—
Rapeseed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	911.00	914.00	909.00	913.00	851.00	870.00	870.00	873.00	894.00
				Rs/Qtl.	7190.52	7107.26	7404.71	7789.72	7380.72	7603.80	7568.13	7691.13	7871.67
Soyabean	U.K. produced	U.K.	—	Pound/M.T.	264.00	269.00	302.00	292.00	354.00	365.00	459.00	49800	487.00
Meal	49% oil & protein			Rs./Qtl.	2083.75	2091.74	2460.09	2491.34	3070.24	3190.10	3992.84	4387.38	4288.04
Soyabean Oil		U.S.A.	—	C/lbs Rs./Qtl.	52.15	54.00	55.02	55.72	50.40	50.87	51.73	55.87	56.10
					5922.79	5830.59	6169.92	6441.22	6150.59	6238.22	6299.21	6824.36	6713.89
	Refined bleached and deodorised	U.K.	—	Pound/M.T.	843.00	874.00	875.00	871.00	823.00	834.00	864.00	865.00	867.00
				Rs/Qtl.	6653.80	6796.22	7127.75	7431.37	7137.88	72.89.16	7515.94	7620.65	7633.94
Soyabeans		U.S.A.	—	C/60 lbs	1208.50	1267.75	1370.75	1465.00	1382.50	1471.50	1645.50	1736.00	1700.25
				Rs./Qtl	2285.46	2279.33	2559.60	2820.00	2809.35	3004.79	3336.54	3537.25	3388.28
	US No. 2 yellow	Nether- lands	Chi- cago	Dollar/M.T.	503.90	527.50	558.20	591.70	556.40	606.30	676.10	707.50	700.40
				Rs./Qtl	2596.60	2584.22	2840.12	3103.47	3080.79	3373.45	3735.45	3928.04	3803.17
Sunflower Seed	US hulled ex-store	U.K.	—	Pound/M.T.	979.28	945.03	936.80	922.20	957.64	—	—	—	—
				Rs./Qtl	7729.46	7348.55	7631.17	7868.21	8305.61	—	—	—	—
Sunflower Seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T.	964.00	985.00	981.00	1004.00	1038.00	1026.00	981.00	988.00	995.00
				Rs./Qtl	7608.85	7659.36	7991.23	8566.13	9002.57	8967.24	8533.72	8704.28	8760.98
Tallow	High grade delivered	U.K.	Lon- don	Pound/M.T.	550.00	550.00	550.00	550.00	570.00	570.00	570.00	570.00	600.00
				Rs./Qtl	4341.15	4276.80	4480.30	4692.60	4943.61	4981.80	4958.43	5021.70	5283.00
Turmeric	Madras finger spot/cif	India	—	Dollar/M.T.	4100.00	4100.00	4100.00	4100.00	4100.00	850.00	850.00	850.00	850.00
				Rs./Qtl	21127.30	20085.90	20860.80	21504.50	22701.70	4729.40	4696.25	4719.20	4615.50
Walnuts	Indian light halves	U.K.	—	Pound/M.T.	6750.0	6300.00	6350.00	6350.00	6350.00	6775.00	5900.00	5900.00	5900.00
				Rs./Qtl	53277.75	48988.80	51727.10	54178.20	55073.55	59213.50	51324.10	51979.00	51949.50
Wheat		U.S.A.	Chic- ago	C/60 lbs	646.50	633.00	639.50	624.50	683.00	727.50	880.25	854.75	864.00
				Rs../Qtl	1222.63	1138.09	1194.14	1202.11	1387.91	1485.55	1784.86	1741.62	1721.79

Source : Public Ledger.

Exchange Rate

	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug.	Sep.
US Dollar	51.53	48.99	50.88	52.45	55.37	55.64	55.25	55.52	54.30
CAN Dollar	50.37	49.01	50.94	53.44	53.79	54.70	55.07	56.30	55.92
UK	78.93	77.76	81.46	85.32	86.73	87.40	86.99	88.10	88.05

C. CROP PRODUCTION

4. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF DECEMBER, 2012

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

(K)—Kharif. (R)—Rabi.

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