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PART I

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Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Cooperation 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.

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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.

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A. General Survey

Trends in Foodgrain Prices :

During the month of March, 2012 the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains increased by 1.04 per cent from 183.4 in February, 2012 to 185.3 in March, 2012 .

Similarly, the Wholesale Price Index Number of Cereals showed an increase of 1.07 per cent from 178.0 to 179.9 whereas Pulses showed an increase of 0.72 per cent from 208.7 to 210.2.

The Wholesale Price Index Number of Wheat and Rice increased by 1.30 per cent from 1.10 per cent respectively during the same period.

Wheather, Rainfall and Reservoir Situation during April, 2012

1. Rainfall (Pre-Monsoon Season) reported for the country as a whole during 1st March to 25th April, 2012 is around 44.6 mm which is 27 per cent less than Long Period Average (LPA). Rainfall (as % departure from normal) reported in the broad geographical divisions of the country during the above period was North West India (-39%), Central India (-52%), South Peninsula (-11%) and East and North East India (-15%).

2. The total live storage in 82 important reservoirs in different parts of the country as on 26th April, 2012 was 42.63 BCM against 49.98 BCM in the corresponding period of last year. Current live storage is 28 per cent of live capacity at Full Reservoir Level (FRL) as against 33 per cent in the corresponding period of last year.

3. As per the third Advance Estimates of 2011-12 released on 23rd April, 2012, around 104% of the normal area under Rabi crops have been sown. Area sown under all crops taken together is around 624.11 lakh ha. as compared to 632.62 lakh ha. during 2010-11(Final Estimate). Area coverage was higher hy 7.5 lakh ha. under Wheat 4.0 lakh ha. under Urad and 2.0 lakh ha. under Groundnut and lower by 9.5 lakh ha. under Rice, 5.5 lakh ha. under Jowar, 2.2 lakh ha. under, Gram and 9.0 lakh ha. under Rapeseed and Mustard.

4. A statement indicating comparative position of area coverage under major Rabi crops during 2011-12 (Third Advance Estimate 2011-12) and the last year is given in the Annexure.

ALL INDIA CROP SITUATION—RABI (2011-12)

Crop Name	Normal Area	Area sown reported (in lakh hectares)			Absolute Change over Last Year
		3rd Adv. Estimates Rabi 2011-12	% of Normal	Final Estimates Rabi 2010-11	
Wheat	277.45	298.22	107.5	290.69	7.5
Rice	44.11	38.79	87.9	48.30	–9.5
Jowar	46.18	37.59	81.4	43.10	–5.5
Maize	10.48	12.45	118.8	12.71	–0.3
Barley	6.42	7.08	110.3	7.05	0.0
Total Coarse Cereals	63.08	57.12	90.56	62.86	–5.7
Total Cereals	384.64	394.13	102.5	401.84	–7.7
Gram	76.05	89.62	117.8	91.86	–2.2
Urad	7.28	11.36	156.1	7.41	4.0
Moong	6.29	7.31	116.2	6.61	0.7
Others	33.09	40.84	123.4	34.95	5.9
Total Pulses	122.71	149.12	121.5	140.82	8.3
Total Foodgrains	507.35	543.25	107.1	542.66	0.6

ALL INDIA CROP SITUATION—RABI (2011-12)—*Contd.*

Crop Name	Normal Area	Area sown reported (in lakh hectares)			Absolute Change over Last Year
		3rd Adv. Estimates Rabi 2011-12	% of Normal	Final Estimates Rabi 2010-11	
Rapeseed & Mustard	63.56	59.98	94.4	69.01	–9.0
Groundnut	9.10	10.80	118.6	8.79	2.0
Safflower	3.29	1.77	53.8	2.44	–0.7
Sunflower	11.87	4.77	40.2	6.14	–1.4
Linseed	4.18	3.53	84.4	3.59	–0.1
Total Oilseed (Nine)	94.52	80.85	85.5	89.96	–9.1
All-Crops	601.87	624.11	103.7	632.62	–8.5

3rd Advance Estimate of 2011-12 as on 23rd April, 2012.

All India production of foodgrains: As per the 3rd advance estimates released by Ministry of Agriculture on 23-04-2012, production of foodgrains during 2011-12 is estimated at 252.56 million tonnes compared to 244.78 million tonnes in 2010-11(final estimates).

Procurement : Procurement of rice as on 1st March, 2012 (Kharif Marketing Season 2011-12) at 34.2 million tonnes represents an increase of 6.48 per cent compared to the corresponding date last year. Wheat procurement during Rabi Marketing Season 2011-12 is 28.34 million tonnes as compared to 22.51 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	34.2	30.0*	0
Wheat (Apr.-Mar.)	22.5	28.3	32.9	3.96**
Total	**54.53**	**62.5**	**62.9**	**3.96**

* Position as on 1-3-2012. ** Position as on 16-04-2012.

Off-take: Off-take of rice during the month of February, 2012 was 26.29 lakh tonnes This comprises 20.57 lakh tonnes under TPDS and 5.72 lakh tonnes under other schemes. In respect of wheat, the total off take was 22.05 lakh tonnes comprising of 16.21lakh tonnes under TPDS and 5.84 lakh tonnes under other schemes.

Stocks : Stocks of food-grains (rice and wheat) held by FCI as on March 1,2012 were 54.43 million tonnes, which is higher by 18.7 per cent over the level of 45.89 million tonnes as on March 1,2011.

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

	Off-take			Stocks	
	2009-10	2010-11	2011-12 (Up to Feb. 2012)	1-Mar. 2011	1-Mar.-12
Rice	27.37	29.93	29.41	28.7	33.2
Wheat	22.34	23.07	22.17	17.15	21.25
Total	**49.71**	**53.00**	**51.58**	**45.89**	**54.45**

Growth of Economy

As per the latest Advanced Estimates (AE) of Central Statistics Office (CSO), the growth in GDP at factor cost at constant (2004-05) prices was estimated at 6.9 per cent in 2011-12 as compared to 8.4 per cent in 2010-11 (Quick Estimate). At disaggregated level, this (AE 2011-12) comprises growth of 2.5 per cent in agriculture and allied activities, 3.9 per cent in industry and 9.4 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.The growth in real Gross Domestic Product (GDP) is placed at 6.1 per cent in the third quarter of 2011-12; agriculture grew by 2.7 per cent; industry by 2.6 per cent and services by 8.9 per cent.

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

(at 2004-05 Prices)

Industry	Growth			Percentage Share in GDP		
	2009-10PE	2010-11 QE	2011-12 AE	2009-10 PE	2010-11 QE	2011-12 AE
1. Agriculture, forestry and fishing	1.0	7.0	2.5	14.7	14.5	13.9
2. Industry	**8.4**	**7.2**	**3.9**	**28.1**	**27.8**	**27.0**
a. Mining and quarrying	6.3	5.0	–2.2	2.3	2.2	2.0
b. Manufacturing	9.7	7.6	3.9	16.0	15.8	15.4
c. Electricity, gas and water supply	6.3	3.0	8.3	2.0	1.9	1.9
d. Construction	7.0	8.0	4.8	7.9	7.9	7.7
3. Services	**10.5**	**9.3**	**9.4**	**57.2**	**57.7**	**59.0**
a. Trade, hotels, transport and communication	10.3	11.1	11.2	26.6	27.2	28.3
b. Financing, insurance, real estate and business services	9.4	10.4	9.1	17.1	17.4	17.8
c. Community, social and personal services	12.0	4.5	5.9	13.5	13.1	12.9
4. GDP at factor cost	**8.4**	**8.4**	**6.9**	**100.0**	**100.0**	**100.00**

PE: Provisional Estimates; QE: Quick Estimates; AE: Advanced Estimates

TABLE 4—QUARTERLY ESTIMATE OF GDP

(Year-on-year in per cent)

Items	2009-10				2010-11				2011-12		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1. Agriculture, forestry & fishing	**1.6**	**2.5**	**–1.4**	**1.1**	**3.1**	**4.9**	**11.0**	**7.5**	**3.9**	**3.2**	**2.7**
Industry	5.3	7.7	9.7	12.4	8.3	5.7	7.6	6.1	5.0	3.2	2.6
2. Mining & quarrying	7.5	7.0	5.4	8.9	6.9	7.3	6.1	1.7	1.8	–2.9	–3.1
3. Manufacturing	5.4	8.9	11.3	15.2	9.1	6.1	7.8	5.5	7.2	2.7	0.4
4. Electricity, gas & water supply	5.9	7.0	4.0	7.3	2.9	0.3	3.8	7.8	7.2	9.8	9.0
5. Construction	4.4	5.8	9.2	9.2	8.4	6.0	8.7	8.2	1.2	4.3	7.2
Services	**10.2**	**12.5**	**9.3**	**10.2**	**10.0**	**9.1**	**7.7**	**8.7**	**10.0**	**9.3**	**8.9**
6. Trade, hotels, transport and communication	8.4	10.3	10.6	13.7	12.7	10.8	9.8	9.3	12.7	9.8	9.2
7. Financing, insurance, real estate and bus.	11.2	10.6	8.3	6.3	10.0	10.4	11.2	9.0	9.0	10.5	9.0
8. Community, social & personal services	13.0	19.3	8.0	8.3	4.4	4.5	–0.8	7.0	5.6	6.6	7.9
9. GDP at factor cost (total I to 8)	**7.5**	**9.8**	**7.4**	**9.4**	**8.5**	**7.6**	**8.3**	**7.8**	**7.7**	**6.9**	**6.1**

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B. Articles

Inter-zone Analysis of Cotton Production in Tamil Nadu State

DR. R. MEENAKSHI*

Introduction

Cotton is one of the non–food crops in the world and by far the most important leading cash crop in agricultural map of the globe. Presently as many as 80 countries in the world grow cotton on a commercial scale. About 61 percent of the crop is grown in leading cotton producing countries like India, U.S.A and China. The remaining crop of about 39 percent is grown in countries like Pakistan, Turkey, Uzbekistan, Egypt to name a few. As per International Cotton Advisory Committee (ICAC) 2011 report, World cultivated land under cotton is estimated as 30.44 million hectares. World cotton production is about 102.7 million bales. World cotton yield has registered 735 kg/lint/hectare in 2009–10.

Cotton has been known in India since 3000 B.C. Cotton is grown over 10.13 million hectares in India. The production of cotton has touched a record figure of 24.02 million bales and the yield was estimated as 403 kg/lint/hectare during the period 2009 –10.

Cotton is grown in India in nine major states over an area of about 33.3 percent the largest in the world. Though it is an important commercial crop grown all over the country, its production is concentrated mainly in states like Gujarat, Maharashtra, Andhra Pradesh, Haryana, Madhya Pradesh, Punjab, Rajasthan, Karnataka and Tamil Nadu. These states together account for 97 percent of production in India.

In Tamil Nadu cotton is cultivated in 104095 hectares and accounts for about 7.1 percentage of non–food crops and 1.87 percentage of total cropped area. The production of cotton is reported to be 38326 tonnes. The productivity of cotton was estimated as 368 kg/lint/hectare in 2009–10.

Data and Methodology

Currently there are six zones in Tamil Nadu state. These zones are North Eastern Zone (Chennai, Kancheepuram, Tiruvallur, Cuddalore, Villupuram, Vellore, Thirvannamalai), North Western Zone (Salem, Namakkal, Dharmapuri, Krishnagiri), Western Zone (Coimbatore, Erode, Thiruppur), Cauvery Delta Zone (Thiruchirappalli, Karur, Perambalur, Ariyalur, Pudukottai, Thanjavur, Thiruvarur, Nagapattinam), Southern Zone (Madurai, Dindigul, Theni, Virudhunagar, Ramanathapuram, Sivagangai, Tirunelveli, Thoothukudi) and High Rainfall Zone (Kanyakumari and the Nilgiris). Hence the data of 32 districts in Tamil Nadu have been grouped into 6 zones. Since the cultivation of cotton is very low in Kanyakumari and Nilgiris districts, the zone consisting of these two districts is not taken into account for the present study. Therefore the analysis in this study pertains to five zones of Tamil Nadu state and state as a whole.

The purpose of the present study is to examine the pattern of growth of cotton in all zones of Tamil Nadu during the post reform period from 1991-92 to 2009-10 and thereby to provide a systematic study of the components of the change in cotton production in all zones of Tamil Nadu using Minhas and Vaidyanathan seven factor model.

Data on acreage, yield, crop pattern and price were collected from the Directorate of Economics and Statistics, Tamil Nadu, Season and Crop Reports of Tamil Nadu for the post reform period 1990-91 through 2009-10. The growth of cotton production for the purpose of decomposition analysis has been compiled as change in output of current period (last three years average 2007-08, 2008-09, 2009-2010) over the base period (first three years average 1990-91, 1991-92, 1992-93). The changes in components have also been similarly computed on the basis of three year average of base and current years. Constant price weights have been assigned to cotton crop based on the three year average of cotton prices for 1990-91, 1991-92 and 1992-93.

Results and Discussion

Different variables i.e. acreage, yield and change in crop pattern were estimated in table numbers I, II, III & IV with a view to identify their relative contribution to production.

* Head and Associate professor of Economics, Sri Sarada College for Women, Salem-4. The authoress is greatful to S. Deepa Lakshmi, Project, Fellow for data collection and tabulation.

TABLE I—TOTAL CROPPED AREA (HECTARES) IN BASE AND CURRENT PERIODS IN COTTON GROWING ZONES OF TAMIL NADU

Period	North Eastern Zone I	North Western Zone II	Western Zone III	Cauvery Delta Zone IV	Southern Zone V	Tamil Nadu
Base Period						
1990-91	1574680	1028097	698105	1500680	1650250	6631761
1991-92	1830901	1150697	735957	1537208	1540888	6977129
1992-93	1794693	1121744	778840	1588083	1602062	7067217
Average (A_{io}) (Hectares)	1733425	1100179	737634	1541990	1597733	6892036
Current period						
2007-08	1431076	769999	629924	1492046	1323557	5815174
2008-09	1398525	797361	631942	1498570	1331536	5824248
2009-10	1329933	782304	611589	1418374	1264046	5571710
Average (A_{it}) (Hectares)	1386511	783221	624485	146966	1306380	5737044

Source: Compiled from Season and Crop Reports of Tamil Nadu.

TABLE II—CROP PATTERN IN BASE AND CURRENT PERIODS IN COTTON GROWING ZONES OF TAMIL NADU

Period	North Eastern Zone I	North Western Zone II	Western Zone III	Cauvery Delta Zone IV	Southern Zone V	Tamil Nadu
Base Period						
1990-91 to 1992-93						
(a) . Average cotton average (Hectares)	19488	31809	25355	24658	153503	254862
(b) Proportion of total cropped average (C_{io})	0.01124	0.02891	0.03437	0.01599	0.09608	0.03698
Current period						
2007-08 to 2009-10						
(a) Average cotton average (Hectares)	18904	24821	3353	3312	25780	105982
(b) Proportion of total cropped average (C_{it})	0.0136	0.0317	0.0054	0.0225	0.0197	0.0185

Source: Compiled from Season and Crop Reports of Tamil Nadu.

TABLE III—YIELD LEVEL (KG/LINT/HECTARE) IN BASE AND CURRENT PERIODS IN COTTON GROWING ZONES OF TAMIL NADU

Period	North Eastern Zone I	North Western Zone II	Western Zone III	Cauvery Delta Zone IV	Southern Zone V	Tamil Nadu
Base Period						
1990-91	375	275	349	355	284	290
1991-92	331	293	343	405	261	270
1992-93	355	362	476	384	313	289
Average cotton yield (kg/lint/hec) (Y_{io})	354	310	389	381	286	283
Current period						
2007-08	402	485	407	385	277	343
2008-09	359	361	419	328	301	279
2009-10	362	387	780	443	358	368
Average cotton yield (kg/lint/hec) (Y_{it})	374	411	533	385	312	330

Source: Compiled from Season and Crop Reports of Tamil Nadu.

TABLE IV—WEIGHTS BASED ON FARM HARVEST COTTON PRICES IN COTTON GROWING ZONES OF TAMIL NADU

Zone	1990-91	1991-92	1992-93	Average	Price per-Quintal (Weight)
I North Eastern Zone	2845.46	3847.28	4399.18	3697.31	0.2042
II North Western Zone	2845.46	3847.28	4399.18	3697.31	0.2042
III Western Zone	2845.46	3847.28	5194.29	3962.34	0.2188
N Cauvery Delta Zone	2845.46	3511.23	2808.98	3055.22	0.1687
V Southern Zone	2845.46	3847.28	4399.18	3697.31	0.2042
Tamil Nadu	2845.46	3847.28	4399.18	3697.31	0.2042

Source: Compiled from Season and Crop Reports of Tamil Nadu.

Substituting these variables (Tables I to IV) in ***Minhas Vaidyanathan Seven Factor Model***, the contribution of different factors i.e. acreage, yield, cropping pattern, area and yield, yield and cropping pattern and cropping pattern and area, yield and cropping pattern towards additional production is indicated in Table V.

TABLE V—PERCENTAGE CONTRIBUTION OF DIFFERENT VARIABLES TO TOTAL INCREASED COTTON PRODUCTION IN ZONES OF TAMIL NADU

Variables	North Eastern Zone I	North Western Zone II	Western Zone III	Cauvery Delta Zone IV	Southern Zone V	Tamil Nadu
1. Acreage	–691.06	–90.71	18.73	105.65	22.33	32.53
2. Yield	204.44	102.81	–45.02	–1.26	–11.13	–32.24
3. Crop pattern	741.05	30.26	103.03	–47.76	97.28	97.15
4. I order interaction between area and yield	–40.92	–29.62	6.91	1.14	2.03	5.40
5. I order interaction between yield and crop pattern	43.49	98.82	37.99	–0.51	8.84	16.14
6. I order interaction between area and crop pattern	–148.31	–8.72	–15.80	43.20	–17.74	–16.28
7. II order interaction between area, yield and crop pattern	–8.70	–2.85	–5.83	–0.4 7	–1.61	–2.70

Source: Compiled by the Authoress.

Zone wise contribution of components to the cotton production in the state was examined to have better understanding.

North Eastern Zone

The results in table No V reveal that as for as the influence of crop pattern (741.05%) is concerned, it is responsible for the significant increase in total cotton production in this zone. The yield factor (204.44%) has also added a positive effect towards increase in production. But area component (-691.06%) has a significant destablising effect on production. When the interaction between area and yield (-40.92%) is taken together it fails to contribute for the growth of production for the simple reason that area component does have a destablising influence on cotton production. The contribution of the first order interaction between yield and crop pattern (43.49%) is positive. However the first order interaction between area and crop pattern (-148.31 %) accounted for decrease in production of cotton. A small decrease in production was noticed by the second order interaction between area, yield and crop pattern (-8.70%). Thus in North Eastern Zone increase in cotton production was brought out by crop pattern component followed by yield.

North Western Zone

As regards cotton production in North western zone, it may be recalled from table No.V that the yield (102.81%) is considered to be an important component of the cotton production in this zone. The crop pattern (30.26%) has also added a positive effect towards increase in production. Cotton crop shows a negative trend in respect of area (-90.71%). This had led to the poor contribution of the first order interaction between area and yield (-29.62%) and first order interaction between area and crop pattern (-8.72%). A positive share of the cotton production is seen through first order interaction between yield and crop pattern (98.82%). The second order interaction between area, yield and crop pattern (-2.85%) has a negative effect towards production. Thus yield component is responsible for increase in cotton production in this zone.

Western Zone

A summary of components of cotton production in western zone reveals that the large share of the increase in cotton production is mainly due to the influence of crop pattern (103.03%). Contrary to this, the yield component (-45.02%) did not account for increase in production and has a destablishing effect on cotton growth. To certain extent acreage (18.75%) also accounts for a positive effect towards production. First order interactions between area and yield (6.91 %) and the yield and crop pattern (37.99%) account for the stablising effects on cotton production. First order interaction between area and crop pattern (-15.80%) and second order interaction between area, yield and crop pattern (-5.83%) have the destablising effects

towards the growth of cotton production. In short in western zone, the whole increase in cotton production was brought out by crop pattern component.

Cauvery Delta Zone

It may be recalled from table No.V that the component acreage (105.65%) is responsible for the significant increase in cotton production in Cauvery delta zone. Next to this, the yield component (-1.26%) did not account for increase in production and has a destablising effect on cotton growth. The crop pattern component (-47.76%) also fails to contribute for the growth of cotton production .A part of production is reduced by the interaction between yield and crop pattern (-0.51 %). Taking the interactions between area and yield (1.14%) and area and crop pattern (43.20%) they account for increase in cotton production. The second order interaction between area, yield and crop pattern (-0.47%) has provided a negative effect towards increase in production. In general area component does have a more stablising effect on cotton production in this zone.

Southern Zone

Moving further down it can be seen from table No. V that of the increase in cotton production experienced in this zone, more percentage was contributed by crop pattern (97.28%) followed by area (22.32%). The percentage of yield (-11.13%) has registered a decrease in production. It should be noted that area cum cropping pattern (-17.74%) have contributed to the decrease in pmduction under the first order interaction. The other interaction terms namely interaction between area and yield (2.03%), interaction between yield and crop pattern (8.84%) accounted for increase in production. Second order interaction between area, yield and crop pattern (-1.61 %) has added a negative effect towards cotton production.

Tamil Nadu

Table No. V shows that the crop pattern (97.15%) contributed positively and significantly towards increase in cotton production in Tamil Nadu state. The contribution of acreage (32.58%) is also positive towards production. But the interaction between area and crop pattern is found to be negative (-16.4%). Again when the interaction between area and yield (5.40%) is taken together, it contributes for the growth of production. The interaction between yield and crop pattern (16.14%) is also positive. But the second order interaction between area, yield and crop pattern (-2.70%) has a negative effect towards increase in production. Thus for the state as a whole, crop pattern was the important component towards increase in cotton production.

TABLE VI—PERCENTAGE CONTRIBUTION OF DIFFERENT VARIABLES TO TOTAL INCREASED COTTON PRODUCTION IN FIVE ZONES TAKEN TOGETHER AND TAMIL NADU STATE

Variables Contribution to Additional Output

S.No	Variables	For all Five Zones together	Tamil Nadu State
1.	Acreage	57.80	32.53
2.	Yield	-28.98	-32.24
3.	Crop pattern	79.49	97.15
4.	I order Interaction between area and yield	10.64	5.40
5.	I order Interaction between yield and crop pattern	16.17	16.14
6.	I order Interaction between area and crop pattern	-29.18	-16.28
7.	II order Interaction between area, yield and crop pattern	-5.94	-2.70

Source: Compiled by the Authoress.

Table VI presents a contribution of different components of production of cotton in five zones together and for the Tamil Nadu state as a whole. The analysis showed that the major contribution to increase in cotton production came through the crop pattern. In Tamil Nadu state the contribution of crop pattern is significantly positive while in the five zones taken together, it is positive. Again a positive share of the increase in cotton production is accounted for by the acreage component followed by the interaction terms namely area and yield and yield and crop pattern. Other components are not responsible for the increase in cotton production. One is therefore led to believe that crop pattern is an important component of the increase in

cotton production in most of the zones of Tamil Nadu state.

Conclusion

The analysis showed that the growth behaviour of the three components namely area, yield and crop pattern, when considered independently clearly revealed that with the exception of the Cauvery delta zone major contribution to cotton production came through crop pattern. It is really surprising to note that yield component is found to be discouraging factor for the most of the zones and state as a whole. Hence care should be taken to improve cotton crop yield through scientific management and in this direction lies a tremendous potential for increasing cotton production in Tamil Nadu State.

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Indigenous Knowledge of Forecasting Drought, Mitigation Measures and Socio-Economic Impacts

M. Osman[1], Shaik Haffis[1], P. K. Mishra[2] and P. Vijaya Kumar[1]

Introduction

Drought is a recurring unavoidable natural calamity faced by India and many other countries in the world. The section of the rural society in the country depending on agriculture in general and rainfed farming in particular is the first causality. It is the least understood of all natural hazards affecting more people than any other hazard (Hagman, 1984). Drought's beginning is subtle, its progress is insidious and its effects can be devastating. Since it lasts for a long time (months and years) and affects very large area, it has adverse impact on economy, ecological resources and food security of the nation. Over 29 per cent of the country's total area is drought prone and approximately 50 million people are annually affected by droughts (NDMI, 2001). In India, about 69 per cent of total sown area of the country is susceptible to drought at one time or the other (Sinha, 2001).

Kulshrestha (1997) has analyzed and presented a detailed account of droughts in India. In the past two centuries (1800—2010), there were 42 drought years, of which seven were severe and five phenomenal. In other words, on an average, every 5th year was a drought year, every 20th year was a severe drought and every 40th year was severe devastating drought year. About 20-25 per cent districts suffer from droughts of varying intensities almost every year in India.

The impacts of these major droughts on socio-economic and bio-physical resources varied across regions and years. The 1972 drought had adverse impact on foodgrains production while in 1987 'crop losses and consequent fall in farm incomes' were found to be the major constraints.

Most of the drought mitigation measures/programmes concentrate on relief rather than pro-active measures. A need was felt to study the impacts of 2002-03 year drought across the regions and sections of the society in the State of Andhra Pradesh and collate the local wisdom on coping mechanisms. This would enable the planners, policy makers and programme implementers in meeting the aspirations of local communities and establish a safety net to cope with recurring droughts. The present study focuses on compilation of indigenous knowledge on forecasting drought, mitigation measures and impact on various sections of the society across different regions in the State of Andhra Pradesh.

Materials and Methods

Data were collected for the present study from both the (i) primary and (ii) secondary stakeholders to know the important parameters for defining drought, its impact, forecasting mechanisms and mitigating strategies. Socio-economic survey was conducted during 2002-03 involving primary stakeholders in the three regions of Andhra Pradesh namely Ralayaseema, Telangana and Coastal regions. Primary data were collected through focus group discussions. Two-stage random sampling design was followed for selecting the sample. In the first stage, three mandals were selected randomly from each district in the three regions of Andhra Pradesh representing different revenue divisions and micro-farming situations. In the second stage, one revenue village per mandaI was selected randomly from each of the three mandals. Villages were selected based on the discussions made with the State Agriculture/Revenue department officials in each district. Focus group discussions were held separately for different sections of the society namely farmers, women, artisans and landless community from each revenue village. About half of the households participated from each of the different sections of the rural community. Data were collected from 66 villages in 22 districts in the three regions of Andhra Pradesh using semi-structured schedule and focus group interactions were made for different sections (groups) of the society, viz., farmers, artisans, women folk, landless (agricultural labour).

Model

Data collected from primary stakeholders were analyzed using Garrett's ranking technique given below :

$$G_p = \frac{100\,(R_{ij}-0.50)}{N_j}$$

Where,

G_p = Percentage position

R_{ij} = Rank given for the ith constraint by the jth individual group of rural society, namely farmers, women, artisans and landless

[1] Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059.

[2]Director, Central Soil and Water Conservation Research and Training Institute, Dehradun-248 195.

N_j = No. of constraints ranked by the j^{th} individual group of rural society

The 'percentage position' of each rank was converted into scores using Garrett table. For each constraint, scores of respondents (individual section/group of rural society) were added together and were divided by total number of groups of rural community for whom scores were added. Thus, mean score for each parameter was ranked by arranging them in a descending order. The first ten parameters ranked in a serial order are retained and treated as major factors and hence considered for the present study.

Pre-designed questionnaires relating to declaration of drought and proactive measures for mitigating early, mid and late season drought were sent to secondary stakeholders with varied experiences in Government and non-Government organizations engaged in drought relief programmes. Rank Based Quotient (RBQ) was worked out to know the major parameters considered for defining drought and mitigation measures with the help of following formula used by Sabharathnam (2002) and Sabharathnam and Vennila (1996).

$$RBQ = \frac{\sum_{i=1}^{n} (F_i)(n+1-i)}{N_n}$$

Where, RBQ = Rank based quotient

F_i = Frequency of the secondary stakeholders for the i^{th} rank of the problem

N = Number of secondary stakeholders contacted for problem identification

n = The maximum number of ranks given for the various problems by each stakeholder among all the secondary stakeholders contacted

Results and Discussion

Important Parameters for Declaring Drought

Ranking was done for the secondary stakeholders' data on important parameters considered for declaring/defining drought and set out in Table 1.

TABLE 1—IMPORTANT PARAMETERS FOR DEFINING DROUGHT

Parameters	RBQ	Rank
Amount of rainfall and its distribution	94.6	I
Water table in open wells and other water bodies	22.9	II
Ground water table	22.6	III
Condition of the crop/crop growth	20.2	IV
Period of dry spell more than two weeks at a stretch	18.2	V
Crop sown area	15.5	VI
Soil moisture index	14.5	VII
Percentage of area irrigated to total cropped area	9.4	VIII
Milk yield compared to normal year	4.7	IX
Crop yield of the year compared to the normal year	4.4	X

The table shows that among the important parameters, the 'amount of rainfall and its distribution' topped the list for declaring drought in India followed by water level in water bodies and ground water table (II and III, respectively), condition of the crop and its growth (IV), period of dry spell (V), crop sown area (VI), soil moisture index (VII), percentage of area irrigated to total cropped area (VIII), milk yield obtained compared to normal year (IX) and crop yield accrued of the year compared to the normal year (X).

Socio-Economic Drought: Impacts

Data collected on socio-economic drought impacts from the primary stakeholders were ranked and prioritized among different groups of rural community such as farmers, women, artisans and landless during the severe drought 2002 in Rayalaseema, Coastal and Telangana regions of Andhra Pradesh by using Garrett technique (Table 2).

It is observed that 'decline in livestock population' has occupied first position in Garrett score (56.3) among the major socio-economic drought impacts in Rayalaseema region followed by increase in level of migration (51.7 score), decrease in rural employment (46.8 score), shift in occupation by doing odd jobs (42.8 score), poor nutritional status (37.6 score), decrease in level of income (24.7 score), shortage of fodder (23.8 score), shortage of drinking water supply (18.8 score) and dropouts of school children (14. 1 score).

Table 2 shows that in coastal region decline in livestock population was found to be the kingpin (54.9 Garrett score) of all the constraints reported by different groups of rural community followed by increase in the level of migration (44.1 score), shift in occupation doing odd works (39.7 score), decrease in rural employment (31.6 score), shortage of fodder (23.9 score), poor nutritional status (23.5 score), decrease in level of income (21.6 score), drop out of school children (20.3 score), spread of infectious diseases (blue tongue) in sheep and goats (17.1 score) and shortage of drinking water (16.3 score).

In Telangana region, decline in livestock population (59.5 Garrett score) and increase in level of migration (48.6 score) were also identified as the major constraints (ranked in first and second positions) of all the constraints reported by the farmers (Table 2). The other constraints followed are poor nutritional status (40.1score), shift in occupation (39.7 score), decrease in rural employment (38.5 score), decrease in level of income (24.7 score) while the constraints viz., drop out of school children (20.3 score), spread of infectious diseases (blue tongue) in sheep and goats (19.3 score) and shortage of drinking water (16.3 score) registered eight, ninth and tenth positions in Telangana region as in the case of coastal region.

Evidently, decline in livestock population was found to be the top most constraint (56.9 Garrett score) among the major socio-economic impacts of drought across the State of Andhra Pradesh followed by increase in level of migration (48.1 score), shift in occupation (40.7 score), decrease in opportunity for employment in rural areas (39.0 score), decrease in consumption leading to poor nutritional status (33.8 score), shortage of fodder (23.8 score), decrease in level of income (23.6 score), spread of infectious diseases (blue tongue) in sheep and goats (18.6 score), drop out of school children (18.2 score) and shortage of drinking water (17 .1 score).

TABLE 2—SOCIO-ECONOMIC IMPACTS OF 2002-03 DROUGHT IN ANDHRA PRADESH

Region/Group of rural society	1	2	3	4	5	6	7	8	9	10
A. RAYALASEEMA REGION										
Farmers	—	—	77.3	86.9	40.9	68.2	—	95.5	—	—
Women	75.0	95.0	—	45.0	65.0	—	55.0	25.0	—	—
Artisans	—	—	—	93.8	31.3	68.8	43.8	—	81.3	56.3
Landless	—	—	—	—	50.0	70.0	—	30.0	90.0	—
Mean (Garrett score)	18.8	23.8	19.3	56.3	46.8	51.2	24.7	37.6	42.8	14.1
Rank	IX	VII	VIII	I	III	II	VI	V	IV	X
B. COASTAL REGION										
Farmers	—	—	68.2	40.9	22.7	50.0	—	59.1	—	—
Women	65.0	95.0	—	85.0	35.0	—	55.0	5.0	—	—
Artisans	—	—	—	93.8	18.8	56.3	31.3	—	68.8	81.3
Landless	—	—	—	—	50.0	70.0	—	30.0	90.0	—
Mean (Garrett score)	16.3	23.9	17.1	54.9	31.6	44.1	21.6	23.5	39.7	20.3
Rank	X	V	IX	I	IV	II	VII	VI	III	VIII
C. TELANGANA REGION										
Farmers	—	—	77.3	59.1	22.7	68.2	—	95.5	—	—
Women	65.0	95.0	—	85.0	75.0	—	55.0	35.0	—	—
Artisans	—	—	—	93.8	6.3	56.3	43.8	—	68.8	81.3
Landless	—	—	—	—	50.0	70.0	—	30.0	90.0	—
Mean (Garrett score)	16.3	23.8	19.3	59.5	38.5	48.6	24.7	40.1	39.7	20.3
Rank	X	VII	IX	I	V	II	VI	III	IV	VIII

TABLE 2—SOCIO-ECONOMIC IMPACTS OF 2002-03 DROUGHT IN ANDHRA PRADESH—*Contd.*

Region/Group of rural society	1	2	3	4	5	6	7	8	9	10
ANDHRA PRADESH STATE										
Farmers	—	—	74.2	62.3	28.8	62.1	—	83.3	—	—
Women	68.3	95.0	—	71.7	58.3	—	55.0	21.7	—	—
Artisans	—	—	—	93.8	18.8	60.4	39.6	—	72.9	72.9
Landless	—	—	—	—	50.0	70.0	—	30.0	90.0	—
Mean (Garrett score)	17.1	23.8	18.6	56.9	39.0	48.1	23.6	33.8	40.7	18.2
Rank	X	VI	VIII	I	IV	II	VII	V	III	IX

1. = Shortage of drinking water
2. = Shortage of fodder
3. = Spread of infectious diseases (blue tongue) in sheep & goats
4 = Decline in livestock population
5. = Decrease in rural employment
6. = Increase in level of migration
7. = Decrease in level of income
8. = Poor nutritional status
9. = Shift in occupation (doing old works)
10. = Drop out of school children

Forecasting of Drought: Indigenous Knowledge

Tables 3(A), 3(B) and 3(C) list out various forecasting criteria as perceived by the primary stakeholders at different locations in the State of Andhra Pradesh for occurrence and intensity of drought (Osman et aI., 2004). This indigenous knowledge is useful but need validation before adoption using science-based tools.

TABLE 3 (A)—WEATHER RELATED SYMPTOMS FOR FORECASTING DROUGHT

Symptoms	Details of information	Locations
Intensity of thunder (IV week of June)	If it thunders thrice loudly, it causes good rainfall If it thunders twice, it causes moderate rainfall If it thunders once, it causes scanty rainfall If it does not thunder, it causes drought	Malapadu (Chittoor district)
Solar eclipse	Incidence of 2-3 solar eclipses in an year causes drought	Karivemula (Kurnool district)
Winds	Cool breezes/winds, cloudy weather and rains during April, May lead to drought	Yavapur (Medak district)
Heavy fog	If heavy fog is seen before' Sankranthi' festival (II week of January), it is an indication of good rains and vice-versa	Velikatta (Warangal district)
Start of rains	If rains start from the Rohini kaarti (start of rains during the last week of May) then it is a symptom of sufficient rains in the rest of monsoon season	Desenenipalem (Khammam district)

TABLE 3 (B)—FLOWERING/FRUITING, SEED, LEAF, ROOTS/STEMS (FLORA) RELATED

Symptoms	Details of information	Locations
Round shape patches on leaves	When Silindram (round shape patches) are found on the leaves causing them to dry, is an indication of severe drought	Allikesam (Chittoor district)

TABLE 3 (B)—FLOWERING/FRUITING, SEED, LEAF, ROOTS/STEMS (FLORA) RELATED—*Contd.*

Symptoms	Details of information	Locations
Depending on the number of seed-bearing of *Butea monosperma* (Flame of the forest tree)	If Butea tree is seen 3-seeded fruit bearing then there will be a delay in the onset of monsoon If the tree has 2 seed-bearing fruits, rains will be from August	Naszdeek Singaram (Rangareddy district)
Stems & roots	If stems and roots shaped like corn, it is an indication of drought	Allikesam (Chittoor district)
Un-seasonal flowering and ripening of Neem *(Azadirachta indica) fruits*	Ripening of Neem fruits during rainy season, instead of summer, is an indication of drought	Desinanipalem, Garlavaddu (Khammam district)
Ripening of Balachu Fruit *(Canthium Parviflorum)*	If Balachu fruit is 100% ripped, then it is an indication of better monsoon (it is the best indicator for harvesting substantial yield of *paddy*)	Pathivadipalem (Srikakulam district)
Behavior of yield of sesamum *(gingelly) versus* other crops	High yields of *til* is inversely related to low yield levels of other crops is an indication for 'moderate drought'. Drastic fall of yield levels of *til* as well as other crops suggests *'severe drought'*	Penubarthi (Visakhapatnam district)

TABLE 3 (C)—BIRDS, FLIES AND ANTS (FAUNA) RELATED

Symptoms	Details of information	Locations
Behavioural movements of poultry birds	When the poultry birds viz., hens and cocks spread their wings reversely, it is an indication of rain	Allikesam (Chittoor district)
Birds' nests	If the nests of the birds are found on the top of the trees located near the irrigation wells, it is a symptom of severe drought If the nests are on the bottom, good rainfall If the nests are in between, it symbolizes almost no rain	Chowderpally (Nalgonda district), Pembarthi (Warangal district)
Group of dragon flies/butterflies	As long as a group of dragon flies are not seen flying from east to west direction, it is an indication of drought throughout that period	Karivemula (Kurnool district)
Wild ants	If wild ants line up, it is a symptom of rain	Chowderpally (Nalgonda district)
Termite mounds	If the height of the termite mounds remains unchanged in the village outskirts, it is an indication of drought If the height of termite mounds is going up, it is a symptom of good rainfall	Karivemula (Kurnool district)

Mitigating Measures

Prasad (1998) suggested some coping measures such as reduction in consumption spending, migration and borrowings. Hirway (2001) pinpointed the shortcomings of current drought policy of the government such as, treatment of drought relief and proofing as two separate activities, procedural delays in declaring a region as drought hit, delay in initiating relief works, restrictions on execution of works, paucity of funds, etc. Singh *et al.* (2007) made some important recommendations to mitigate the impact of drought such as, drought support policies like self-reliance among farmers, self-employment oriented schemes during the period of drought, drought preparedness including enhancing and sharing the expertise on weather forecasting, dissemination of information to the people, maintaining the stocks of foodgrains, seed, fodder, etc. along with effective and efficient delivery mechanism and quick delivery of rural credit and reduction in the premium of insurance should receive high priority. However, the mitigating measures suggested by primary and secondary stakeholders are given below :

i. Primary stakeholders

The information on mitigation measures suggested by the primary stakeholders was pooled and these measures are categorized into short term and long term, separately.

Short term

- ❖ Feed and fodder supply with transport facility, vaccines and medicines for curing infectious diseases in livestock, construction of water troughs at 3-4 points in each village, desilting of tanks, farm ponds and maintenance of check dams, percolation tanks, etc. are the suggestions made for mitigating drinking water problem, distress sale of livestock and decline in livestock population.
- ❖ Continuous supply of power for nine hours in the day time and a minimum distance of 40 m between two borewells have to be maintained for efficient cultivation of crops under irrigated conditions.
- ❖ Crop insurance is to be made on micro level (village as a unit), but not on macro level (district as a unit).
- ❖ Supply of LPG gas cylinders for the entire rural community affected by drought, raising of fuel wood lots, developing all community wastelands for fodder and planting of fuel wood/fodder trees are to be ensured.
- ❖ The bank loans for dairy development and sheep/goat rearing should be available in time besides supply of fodder seed and creation of employment opportunities.
- ❖ Rescheduling of loans and issue of fresh loan and increase of revolving fund should be done for effective and efficient functioning of self-help groups (SHGs).
- ❖ Organization of health camps at regular interval should be taken up in each village involving a lady medical officer and supply of medicines.
- ❖ Supply of coarse cereals like sorghum, pearlmillet and fingermillet at highly subsidized rate as a partial substitute to rice (fine cereal) for overcoming the problem of deficit consumption of food items and to overcome nutritional deficiencies.
- ❖ Supply of tool kit to artisans and market facility for the finished products are to be ensured.
- ❖ Stone crushers may be made available to quarry workers to develop quarry lands for creating employment opportunities and to reduce poverty and exploitation by middlemen.
- ❖ Landless community resorted to migration like daily commuting to nearby towns or urban centres for their livelihood during drought period. They suggested Minimum Wage Act for safeguarding the fall of wage rates particularly during drought years.

Long term

- ❖ Raising of fodder trees on the farm boundaries and fruit trees, such as, *Jammun, Sapota,* tamarind, citrus, guava, *aonla*, sweet orange, and custard apple with *Stylosanthes hamata* on field bunds were the suggestions made by the farmers as an alternative to crops to mitigate drought.
- ❖ Sheep/goats rearing was also preferred by the farmers to the extent of 40-60% as an alternative to crops. Thus, dryland horticulture and livestock rearing including large (cows and buffaloes) and small (sheep & goats) ruminants coupled with fodder trees were the major alternate enterprises suggested by the farmers.
- ❖ Ensure regular drinking water supply through effective implementation of rural water supply (RWS) scheme.
- ❖ Building capacity of educated women from rural area to work as para-medical worker to liaise with line departments and villagers for help regarding health, hygiene and sanitation must be initiated.

. ❖ Higher quota of foodgrains to nursing and pregnant women and school-going children through Public Distribution System (PDS) in addition to other essential commodities, such as pulses (dal), edible oils, soaps, clothes etc., should be made available.

❖ Medium and long-term bank loans at a nominal rate of interest for purchase of tools, instruments, and raw material should be made available to the artisans.

❖ Women artisans suggested non-agricultural occupations like small scale and agro-based industries for mitigation of drought. Mid-day meal welfare programme for school-going children and village development activities are the two main proposals made by them for government assistance.

❖ Strengthening of Food for Work (FFW), now called as Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) to generate employment opportunities and minimize the level of migration by the small and marginal farmers (SMFs) and landless. In the present instance, the MGNREGS stands as a great relief mechanism.

ii. Secondary stakeholders

The analysis of data collected from secondary stakeholders gives an insight into the proactive measures to be followed for mitigation of early season, mid season and late season droughts. The details are presented in Tables 4,5 and 6, respectively.

(a) Proactive measures for mitigating 'early season' drought

Proper planning with provision for short duration drought tolerant seed varieties of crops and intercropping with pulses registered the highest RBQ value (31.5) among the measures suggested by the respondents (Table 4). Repeated blade harrowing (RBQ 14.2), desilting of tanks (RBQ 11.2) and growing crops for fodder alone (RBQ 10.5) were the other important measures suggested followed by re-sowing if drought occurs within three weeks after sowing (RBQ 7.4), seed treatment with chemicals inducing tolerance to drought (RBQ 5.7), transplanting seedlings of millets (RBQ 5.5) and livestock rearing, soil & water conservation measures and ground water protection (each RBQ 3.7).

TABLE 4—PROACTIVE MEASURES FOR MITIGATING EARLY SEASON DROUGHT

Measures	RBQ	Rank
Crop planning (growing short duration drought tolerant seed varieties of crops and intercropping with pulses)	31.5	I
Repeated blade harrowing	14.2	II
Desilting of tanks	11.1	III
Growing crops for fodder alone	10.5	IV
Re-sowing if drought occurs within three weeks after sowing	7.4	V
Seed treatment with chemicals inducing tolerance to drought	5.7	VI
Transplanting seedlings of millets	5.5	VII
Livestock rearing	3.7	VIII
Soil and water conservation measures	3.7	VIII
Ground water protection	3.7	VIII

(b) Proactive measures for mitigating 'mid-season' drought

Storing water for life saving irrigation was found to be the most important factor recommended for mid-season drought based on the calculated value of RBQ (43.9) followed by reducing the plant population by thinning (RBQ 25.9), use of anti-transparents (RBQ 15.5) albeit other measures such as in-situ moisture conservation practices, making provision for foliar spray of water, soil mulch, intercropping, contingency crop planning and defoliation of leaves at the bottom of the plant (each RBQ 7.4) (Table 5). Evolving alternate cropping pattern was also suggested by the secondary stakeholders as the proactive measure for mitigating 'mid-season' drought which registered the least RBQ value (3.7).

TABLE 5—PROACTIVE MEASURES FOR MITIGATING MID-SEASON DROUGHT

Measures	RBQ	Rank
Rainwater harvesting for life saving irrigation	43.9	I
Reducing the plant population by thinning	25.9	II
Use of anti-transparents	15.6	III
In situ moisture conservation practices in every village	7.4	IV
Making provision for foliar spray of water	7.4	IV
Soil mulch (dust mulching)	7.4	IV
Intercropping to minimize crop loss	7.4	IV
Contingency crop planning	7.4	IV
Defoliation of leaves at the bottom of the plant	7.4	IV
Evolving alternate cropping pattern	3.7	V

(c) Proactive measures for mitigating 'late season' drought

Table 6 shows that harvesting of rainwater during rainy season to irrigate at critical stages of crop growth topped the list (RBQ 36.5) among measures suggested by the respondents for mitigating late season drought followed by replacing paddy with less water requiring crops (RBQ 11.1), harvesting and recycling of runoff water from farm ponds (RBQ 10.1), mulching at critical stages of crop growth (RBQ 8.5) and intercropping to minimize risks (RBQ 7.9). Other measures for mitigating late season drought include use of early harvesting and processing strategies, contour farming, strip farming and foliar irrigation (each RBQ3.7). Deep ploughing was also suggested which had the least RBQ value (1.6). Walker and Ryan (1990) suggested crop diversification as a mitigation measure for reducing the risk caused by drought.

TABLE 6—PROACTIVE MEASURES FOR MITIGATING LATE SEASON DROUGHT

Measures	RBQ	Rank
Harvesting of rainwater for irrigation at critical stages of crop growth	36.5	I
Replacing paddy with less water requiring crops	11.1	II
Harvesting and recycling of runoff water from farm ponds	10.1	III
Mulching at critical stages of crop growth	8.5	IV
Intercropping to minimize risks	7.9	V
Use of early harvesting and processing strategies	3.7	VI
Contour farming	3.7	VI
Strip farming	3.7	VI
Foliar irrigation	3.7	VI
Deep Ploughing	1.6	VII

Conclusions

Rainfall and its distribution, availability of surface and groundwater and the crop condition emerged as the most important parameters for studying the severity and norms for declaration of drought. The drought of 2002-03 had a very perceptible impact on the part of rural population who are largely dependent on agriculture and its subsidiary occupations for their livelihoods in general and the state of Andhra Pradesh in particular. Crop yields were adversely affected and consequently income was also reduced. The level of employment declined in agricultural sector. It had an indirect impact on other sectors of economy as well. On

the supply side, drought caused shortage of raw material to agro-based industries while on the demand side; it reduced the demand for industrial products due to diminished purchasing power of the rural consumers. The drought led to poor credit-worthiness and reduced the access to banking institutions and increased the burden of debt. It was difficult for the poor farmers to come out of the poverty cycle/ debt trap. There was a major shift in consumption pattern from high nutritional diet to poor due to lack of purchasing power. The migration was the main source of livelihood during droughts. Thus, the impact of drought impairs the level of economic activities (Hounam, 1975).

The most important measures suggested by primary stakeholders are management of fodder for livestock, supply of electricity (at least for 9 hours) for irrigation purpose and effective crops insurance mechanism, regular supply of drinking water, availability of LPG, credit flow, human health management, effective PDS, mid-day meal programme, supply of coarse cereals at subsidized rate, support services to village artisans, employment opportunities to prevent migration of labourers and strengthening of MGNREGS. The secondary stakeholders stressed upon the bio-physical measures in the form of intensification of soil and water conservation measures besides others to mitigate early, mid and late season droughts.

There is an urgent need of documenting indigenous knowledge on drought and extreme weather events occurrence and their severity across the country at Gram Panchayat level to validate on scientific lines and come up with resilience mechanism. The available state of art ICT facilities may be made use to disseminate the knowledge both indigenous and scientific for drought preparedness.

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AGRICULTURAL PRICES IN INDIA

It is an old adage that Agricultural prices mirror the economy of a country. It is more true in the case of an agricultural country like India. Viewed from this angle, it is quite an important publication. It gives information on index numbers, farm (Harvest) prices, wholesale and retail prices of various agricultural commodities, etc.

Marketing of Rain-fed Potato in India: Problems and Prospects for the Farmers

Arun Pandit[1], Nalini Ranjan Kumar[2] and Manik Chandra Pandit[3]

Introduction

Potato is the world's number one non-grain food commodity and world production reached a record 320 million tonnes in 2007. It is being grown in nearly 150 countries, and is the world's single most important tuber crop with a vital role in the global food system. It is the 4th major food crop after maize, wheat and rice in the world and contributes to the energy and nutritional needs of more than a billion people worldwide. It is a wholesome food and can play a major role in eradicating hunger and malnutrition, which is one of the important millennium development goals of United Nations. As such, potato produces more food and edible protein per unit area and time as compared to any other food crop. Potato produces about 47.6 kg food per day per hectare, whereas wheat, rice and maize produces 18.1, 12.4 and 9.1 kg food per day per hectare, respectively. Potato consumption is expanding strongly in developing countries, which now account for more than half of the global harvest. Low duration, ease of cultivation and high energy content made it a valuable cash crop for millions of farmers. The United Nations has declared the year 2008 as the International Year of Potato (IYP). The declaration of IYP reflects the importance of potato in food security, nutrition, poverty alleviation, environmental conservation and sustainable development. As being one of the principal cash crop, it gives handsome returns to the growers/farmers due to it's wide market demand nationally and internationally for different kinds of utilization.

India achieved a great success in potato production. Currently it ranks third in world potato production. Several years of potato research enables to release a number of potato HYVs suitable for various agro climatic regions of the country. Besides, development of 'seed plot technique' for seed production in North-Western Indo-Gangetic plains and standardization of crop management practices for different agro-climatic zones were the main forces behind the spectacular increase in potato production in India. In the TE 2007, potato crop contributed Rs. 6095 crores annually (at 1999-00 prices). However, potato marketing in India has its own peculiarities and problems. Firstly, potato being bulky and semi-perishable in nature its marketing is complex in comparison to other agricultural commodities. It requires specialized structures for storage and transportation. Even the storage requirements for potatoes to be used for ware, seed and processing purposes are not the same. Secondly, the lion's share of potato production is contributed by the Indo-Gangetic region during winter season and harvest is followed by rising hot summer season while the commodity is demanded round the year. Thirdly, though potato could be used for many purposes such as table, seed, and processing, still it enjoys only a vegetable status in India unlike food crop in the developed countries. Fourthly, the demand for fresh potatoes is relatively inelastic. In other words the potato consumption does not respond appropriately in relation to price variations. Apart from these characteristics, the infrastructural inadequacies and sometimes the segmented market structure have compounded the marketing problems of potato in India. Rainfed potato cultivation also suffers from same kind of problems, besides some specific problems of that area. Rainfed region generally lacks the modern market infrastructure, good all weather roads and slow transportation due to difficult geographical terrain.

Contribution of rainfed potato in total potato production of India

In India, potato is grown mainly as winter crop in the irrigated conditions of Indo-Gangetic plains. Around 85 per cent of total potato is produced from this region. Uttar Pradesh, West Bengal, Bihar and Punjab are the major contributors. Around 15 per cent of the potato is produced in the hills and plateau regions as a rainfed crop in different seasons. As a summer crop, it is grown in the Himalayan high hills and Southern hills during March/April to August/September; as a spring crop in Bengal and Sikkim hills during Jan/Feb to Jun/July; as a *kharif* crop during July/Aug to Sept/Oct in low Himalayan hills and plateau parts of central and west central India. The rainfed potato crop has special significance due to its availability in the off-season and they fetch premium price in the market. Moreover, they are also the important source of raw material for the processing industries.

[1]Central Rice Research Institute, Cuttack, [2]Central Institute of Fisheries Education, Mumbai,[3] Asstt. Commissioner, Ministry of Rural Development, Government of India, New Delhi.

TABLE 1—POTATO PRODUCING ZONES OF INDIA

Zone	Region	Crop season	Irrigated or rainfed
Hills	Himalayan very high hills 3,000-3,500 msl	Summer: June to September	Irrigated
	Himalayan high hills (1,800-3,000 msl)	Summer: March/April to August/September	*Rainfed*
	Himalayan mid-hills (1,000-1,800 msl)	Spring: January/ February to May/June Autumn: August/September to November/December	Irrigated Irrigated
	Low hills (600-1,000 msl)	Winter: November to February/March Kharif: July/August to September/October	Irrigated *Rainfed*
	Southern hills (1,000-2,000 msl)	Spring: January/February to May/June Summer: March/ April to August/September Autumn: September to December	Irrigated *Rainfed* Irrigated
	Bengal and Sikkim North-hills (1,000-2,000 msl)	Spring: January/February to June/July Autumn: September/ October to November/December	*Rainfed* Irrigated
Plains	North-western plains (< 300 msl)	Early autumn: September-November/December Main autumn: October to January/February Spring: December/January to April/May	Irrigated Irrigated Irrigated
	North-central plains < 300 msl)	Early autumn: September-November/December Main autumn: October to January/February Late autumn: November/December to March	Irrigated Irrigated Irrigated
	North-eastern Plains < 300 msl)	Winter: November to March	Irrigated
	Central Plains < 300 msl)	Winter: November to March	Irrigated
Plateau	Parts of central and west-central India (500-1,000 msl)	Winter: November to February/March Kharif: June-August to September/October	Irrigated *Rainfed*

Saource : Pandey, *et. al.* 2006.

Potato Marketing System: National Scenario

In India potato trade is mainly in the hands of private agencies. Dahiya et al. (2003) reported that Govt. intervention is limited primarily in the regulation of markets and cold storages. In this connection, the Directorate of Markting and Inspection (DMI), under the Ministry of Agriculture, plays a pivotal role in promotion of regulated marketing of farm produce and conducting national level studies on the marketing systems for various crops including potatoes. At the State level, State Agricultural Marketing Boards and Directorate of Agricultural Marketing develop and regulate the markets in an organized manner. They also collect and disseminate market arrivals and prices data under the Agricultural Produce Market (Regulation) Acts. At the national level, the National Horticulture Board (NHB), also collects and disseminates the information, arrivals and prices data. The National Agricultural Co-operative Marketing Federation Ltd. (NAFED) is the nodal agency for implementing market intervention schemes in co-operation with state agencies. State Seed certification agencies certify seed potatoes. The marketing system composes of alternative product flows called marketing channels, market functionaries and various market functions relating to grading and standardization, packing, assembling, storage, transportation, price fixation, financing etc. Producers, the co-operative marketing societies like LPS in Himachal Pradesh, commission agents, cold storages, wholesalers and wholesaler-cum-retailer and the retailers of all sorts together constitute the potato marketing system.

Constraints in Rain fed Potato Marketing

Fluctuations and Unremunerative Market Price

Fluctuations and unremunerative market price are the biggest challenges to potato growers. Due to high cost of inputs and low farm harvest price, farmers suffer huge

losses particularly during glut years. Price fluctuation is a common phenomenon in case of seasonal and perishable commodities like potato. Price fluctuation is mainly attributed to the seasonal production with consequent variation in market arrivals. Poor storage facilities and lack of retention power of the potato growers also contribute to the price fluctuation. Dahiya and Sharma (1980) while studying the problems of potato disposal and gluts, reported that potato prices at some terminal markets like Mumbai, Mettupalayam and Kolkata were more than 50 per cent higher during the peak arrival period as well as during the lean period. This price differential shot up to over 80 per cent during November to December. As a result consumers in those terminal markets had to pay higher price. Due to irregularity in price movements farmers can not do the proper farm plan.

Lack of Mechanical Grading

Grading is an important factor in the marketing process of potato. Grading helps the potato producer and seller to determine the price. It reduces the cost of marketing and helps the consumers to get standard potato at fair price. Grading is also done for value addition and convenience. Small and marginal farmers don't do proper grading which is also responsible for lower market price. Moreover, potato grading is done mostly manually. DMI reported that during the year 2002-03,24838 M.T. with an estimated value of Rs.2394.97 1akhs of potato was graded under grading at producers level as against 23170 M. T., with an estimated value of Rs. 2571.04 lakhs was graded in the year 2003-04. This volume is miniscule as compared to the national production of around 24 million MT. Hence, there is a need for mechanical grading at community level.

Lack of Attractive Packaging

Packaging is essential for protection, handling and convenience in retailing. Potato packaging is mostly done by gunny bags of size: 50 kg; 65 kg; 80 kg. Recently nylon bags of size 50 kgs are in vogue. Packaging should be done according to the customer choice and preferences of the domestic and export markets. Now a days it is preferable in sizes of 10, 15 and 20 kgs in retail markets. Hence, farmers have to use the packing material of these sizes.

Lack of Quick Transportation

Potato requires quick delivery. But in India, transport facilities are either insufficient or very costly. *Katcha* roads from villages to main roads and conventional mode of transportation (manual, rickshaw van and thela) are making the cost of transportation high and so to the cost of marketing. Non-availability of all weather roads, insufficient road network and quicker mode of transport etc. are some of the basic and major problems faced by potato growers which also lead to increase in marketing cost. Moreover, absence of village link roads to markets causes a major hurdle in disposal of potatoes by small growers. Long distance transportation in India is done mostly through trucks. There is lack of refrigerated trucks, interruption on interstate movements, bad roads and traffic corruption. Railways have also inadequate number of rail wagons leave alone refrigerated wagons. Thefts and spoilage also occurs during the movement. According to a rough estimate, about 25 to 30 per cent of total production is lost due to lack of adequate transport and storage facilities. In monetary terms it is about Rs. 500 crores per year (Dahiya *et al.*, 1994). Moreover, lack of adequate transport facilities hamper the efficient potato distribution in the country. Hence, the markets are not properly integrated rather they are segmented.

Lack of Adequate Market Infrastructure

Village markets generally lacks basic market infrastructure like electric supply, water supply, electronic display boards, auctioning system, computer operated weigh bridges and other amenities. These markets also lack transparent price fixing policies.

Lack of Popularization of on-farm Storage Methods

The practice of storage helps to stabilize the prices in the market. Storing potatoes for longer period in normal temperature is not possible as it is a living material and through respiration, the changes occurs due to heat, resulting in loss of dry matter and ultimate deterioration of quality of tubers. Higher hills do not require cold storage structure. However, traditional storage practices, where potato is being stored in the heaps, pits, room & machan etc needs to be developed and popularized specially in lower hills and plateau regions. To avoid sprout, suppressant like Isopropyl N-Chlorophenyl Carbamate (CPIC), TNCB, MH may be used. The irradiation process has also been found effective for sprout inhibition. The condition and health of the tuber while in storage is important coupled with good management during storage also plays an important role.

High Marketing Costs and Margins

Potato marketing costs are generally higher due to costly transportation, high losses and high margins earned by the intermediaries. There is a need for promoting producer's co-operative in potato growing areas to garner the benefit of economy of scale and better bargaining power.

Lack of Market Information

Agricultural Marketing Information comprises of collection, analysis and compilation of agricultural marketing related information as well as dissemination of right information to the people in need, at right place, at right time and in right form. In a marketing system, market information is an important function which facilitates the marketing decisions and regulates the competitive market processes and mechanisms. It is helpful to the farmers for

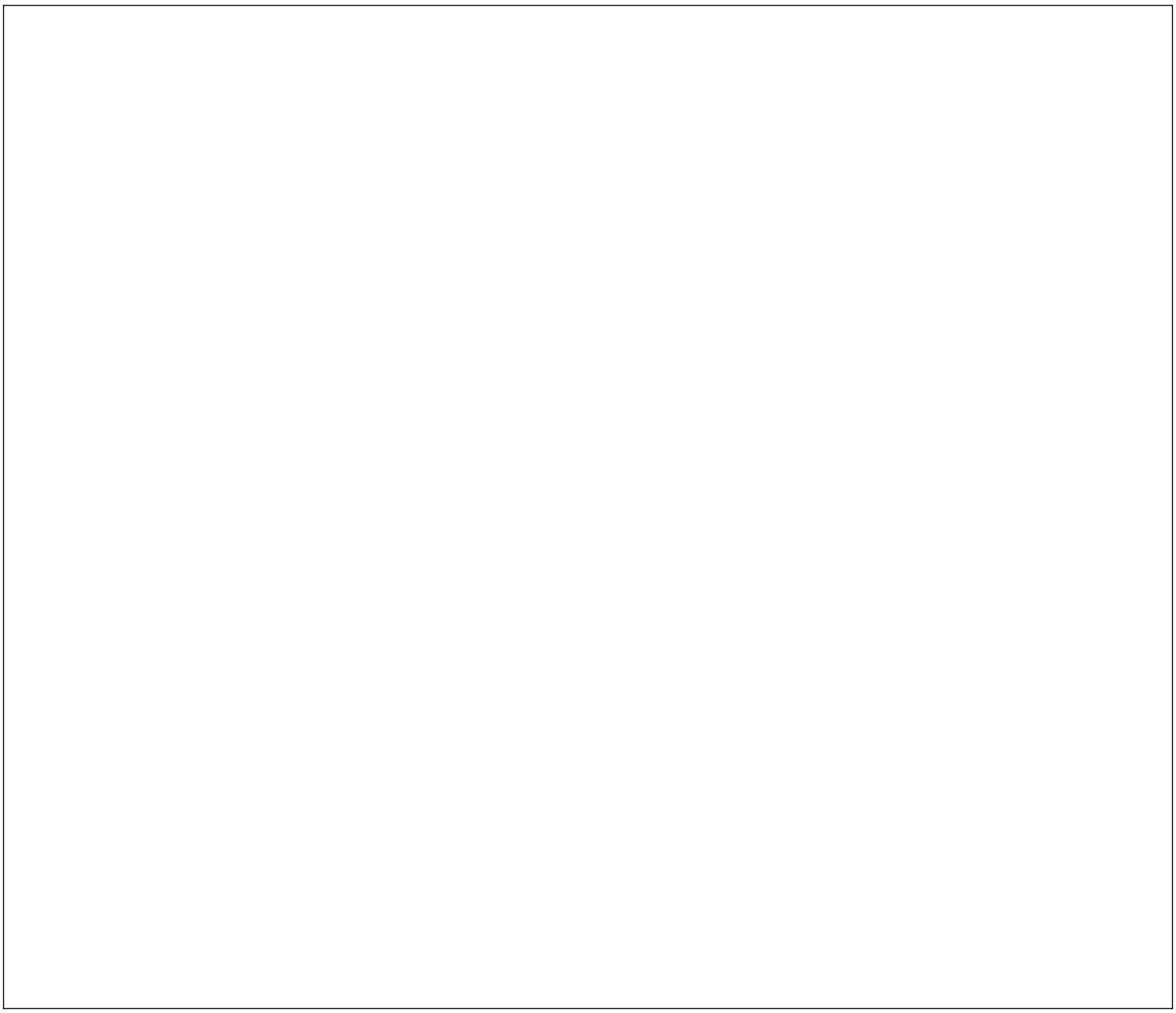
planning, production and marketing of their commodities. It is also the key to achieve operational and pricing efficiency in a marketing system. However, small and marginal farmers, which form bulk of the farmers group, hardly get any market information. They are left with the mercy of market middlemen, who cheats them very often. In the present context of global agricnltural scenario, the potato farmers should have access of the market information to increase their bargaining power.

Lengthy Market Channels

Marketing channels are the routes through which the product moves from the producers to the consumers. The Directorate of Marketing and Inspection identified 12 channels for potato marketing in India (Fig 1). In the rainfed hills and plateau regions these channels are also present, only the channels involving cold store are not there. From the figure it is clear that a number of intermediaries are involved between producer and consumer which is not beneficial to both of them. When the length of marketing channel increases the producer's share in consumer rupee decreases.

In marketing of potatoes the various intermediaries like commission agents, wholesalers, retailers etc. create various utilities for the satisfaction of consumer demand. Hence they deserve reasonable margins. But the research conducted across the states showed that they received the margins disproportionate to their service which in turn gave rise to low producer's share in consumer rupee (Pajankar *et al*., 1998). DMI (1984) reported that on an average Indian potato producer received 59 per cent of consumer rupee which was found to be lowest (42%) in Bihar and highest (73%) in Karnataka. Even when market price is higher, the producer's share is less than proportionate to the rate of rise in market price. The benefit of increased market price is absorbed by retailers and other intermediaries and is not reverted back to the producers (Johl *et al*., 1994; Arya, 1995).

Fig 1 ; Marketing Channels of Potato



(**Note** : Channels are indicated by straight line arrows. Figures in the box indicates the flow of the channels. Source : DMI)

Limited Market Access for Poor Farmers

Majority of the potato farmers of the rain fed areas are scattered and belong to small and marginal category. They generally sell their produce to local assemblers/ agents who sometimes provide inputs on credit. Another problem of marketing is distress sale by small and marginal farmers. This is also a cause of lower market price obtained by farmers. Majority of the farmers does not have the retention power due to financial constraints. These farmers do not have the access to the big markets. They have extremely limited understanding of the broader market, beyond their immediate market environment. Market information is generally not available to them. Their product suffers from mismatching with the specific market requirements, e.g. consistency of quantity/quality. Opportunities are also very limited for learning on marketing and entrepreneurship.

Lack of Processing Facilities in the Rain-fed Region

Organized potato processing industries have been established in the plain areas mostly in the vicinity of city/ town. There is a need to establish potato processing industries in the rain-fed areas and farmers can be a main player in the supply chain through contract farming. Improved technologies of potato production can enhance the efficiency of farmers. On the other hand cost of processing and processed products could be reduced by lower transportation cost due to lesser distance.

Lack of Adequate Export Opportunities

India produces 7.5 per cent of world and 21 per cent of Asian potato production, but it shares only 0.5 per cent of world exports. It did not export even 1 per cent of its production. Moreover the exports also inconsistent as exports are largely a crisis management tool. Though, in some years, India had favourable export competitiveness in terms of nominal protection coefficient it could not exports in a consistent manner. Shortage of potatoes with desired attributes, poor keeping quality, non adoption of international norms, lack of long term export policy, lack of market intelligence, lack of popularization of Indian varieties, high cost of inland transport, high charges of ocean freight, inadequate processing infrastructure, lack of quality assurance are some of the reasons behind poor export performances. India may be an important supplier of processed products like French fries to Mauritius, UAE, Sri Lanka, Malaysia, Nepal and Singapore, dried potato products to Sri Lanka, Maldives, South Africa and UK, non frozen potato to UAE and Sri Lanka, processing quality potato to Middle east specially Dubai. To deal with the situation of poor exports, it has been suggested to either the firm having long term interest in potato export should be encouraged to established big export houses or a "Potato Board" should be established that can help potato exporter during the time of high international prices (Chand, 2002 and Kumar *et al*., 2005).

Prospects for the Farmers

For sustainable production it is urgently necessary to have a modern vibrant market structure to ensure efficiency in marketing. Farmers, individually or collectively can do direct marketing. It enables the farmers to meet the specific demand of wholesalers, traders, consumers according to their preferences. This system encourages the farmers to undertake sorting, grading and quality marking at their farms. This model has been introduced in the name of Apni Mandi in Punjab, Rythu Bazars in Andhra Pradesh, Chitkari Bazar in Maharashtra and Uzavar Santhaigai in Tamil Nadu.

The Co-operative marketing is the system by which a group of farmers join together to carry on some or all the processes involved in bringing goods from producer to consumer. It is more printable than individual marketing, since farmers can reap the benefit of economy of scale arising out of increase in volume. The Potato Growers Co-operative Association in Gujarat, Farukhabad Co-operative Marketing Society in Uttar Pradesh etc. are successfully involved in co-operative marketing of potato. Farmers can be a member in the retail chains by way of co-operative marketing. Recently a number of companies like Reliance (Farm Fresh), ITC (ITC Chaupal), Bharti, Pentaloon Retail (Food Bazar), DCM Sriram Consolidated (Hariyali Kisan Bazar), Spencers Retail, Adani Group (Agri Fresh), Godrej Agrovet, Subhiksha come up with the retail chains.

Small and marginal farmers access to big markets could be enhanced by adopting improve technologies related to production and post-harvest practices, collective commercial quality supply, identify the distribution channels. Farmers can also resort to "contract farming" in which farmers can market their produce under a pre-agreed buy-back contract with an agency engaged in trading or processing. In this agreement, agency contributes input supply and renders technical guidance. In this system farmer's risk of price reduces and the agency reduces the risk of non-availability of raw material. In some contract farming system the company provides certain inputs and extension services like improved seed, credit, fertilizers, pesticides, farm machinery, technical guidance, etc. In the present context of globalized world small and marginal farmers can not access the global markets unless they adopt the latest technologies and improve the quality of the produce. Contract farming enables producers to adopt new technologies to ensure maximum value addition and access to new global markets. It also ensures efficient post harvest handling and meeting specific needs of customers.

In terms of price discovery and risk management, the forward and future markets have been identified as an important tool for price stabilization. Presently, forward and future market system is followed in certain agricultural commodities including potato. The forward market supports two economic functions namely price discovery and price

risk management which enables the traders and stockiest to protect against the risk of adverse fluctuation of prices. The future market facilitates the trading of potato for the purchase or sale of the commodity for future delivery where contracts are made on a future exchange on the basis of standard quality, quantity, delivery time, locations and the price. This makes the supply chain efficient and provide better price to the farmers. Potato farmers can take the full advantage of forward and future markets.

Farmers should be empowered with the market information. It is the market information, for want of which the farmers are left with the mercy of middlemen. Establishment of Kisan call centre (1551) is a welcome step. It should have one marketing expert also. Potato growers co-operative society may acquire market information for their members. Alternatively Government agencies or local public bodies also can supply the information. The use of Information Technologies should be encouraged. Computer with internet facilities may be provided at the community level. Information Kiosks may be set up in the markets or in farmer's co-operatives to provide information on demand of different products, products specifications with regard to quality, pack size, packaging material, quantity and time frame for supply, transport cost involved and the marketing charges, facilities available to the farmers/sellers in the market, rules and regulations of the destination market, legal provisions related to storage, transportation, phyto-sanitary requirements etc.

Rain-fed potato produced in some hilly pockets like Himachal Pradesh have some unique qualities and thus, has the possibly to be registered as seed potato as well as table potato under geographical indication. Potato grown on elevation of 2200 m MSL in H.P region produces high dry matter content, tasty, good cooking quality, low sugar content and longer duration crop because of specific climatic conditions prevailed in this region. The seed from this area are free from seed borne diseases which is also unique to this region as seed from other hilly area has one or the other seed borne diseases like Wart disease in Darjeeling hills, Golden cyst nematodes in Nilgiri hills, Bacterial wilt in North-Eastern hills and Uttarakhand region. Government should take initiative in this direction.

Government should formulate stable potato export policy. Knee jerk reaction to export won't serve the purpose. Creation of marketing infrastructure following international norms, export oriented units, market survey/studies in importing nations, popularization of Indian potato varieties, quality assurance, decreasing the cost of production by increasing productivity, export incentives such as transport subsidy, establishing potato processing units, encouraging big export houses in the potato export, establishment of "Potato Board" which can develop some mechanism to help the export in non-competitive years may help in sustainability in potato exports.

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Performance and Suitability of Growing Crops in Haryana : District-level Analysis

Dr. Ramphul*

Introduction

Haryana is predominantly an agriculture economy with preponderance of wheat, rice, bajra, mustard, sugarcane and cotton. In the recent years, commercial orientation of the state agriculture is more associated with mustard, vegetables, fruits etc. and the area under pluses has declined considerably. The annual compound growth rate of cereals production in the country for the period 1966-67 to 2010-11 has been estimated at 2 per cent. However for the same period, production of pluses increased at a much lower annual compound growth rate of 1 per cent. Among the cereals the annual compound growth rates for fine cereals, viz. wheat and rice are 3.7 per cent and 2.4 per cent while for coarse cereals, viz. bajra and jowar the growth rates are 1.4 per cent and -0.76 per cent for the same period respectively. These changes in cropping pattern have especially marked in the regions which have witnessed the advent of Green Revolution. For example, the pluses production in Haryana has declined alarmingly from 952.0 thousand tonnes in 1975-76 to 100 thousand tonnes in 2009-10. Contrary, during last four decades, wheat production in the state has increased about tenfold, from 1059 thousand tonnes in 1966-67 to 10500 thousand tonnes in 2009-10. Similarly the rice production has increased from 223 thousand tonnes to 3630 thousand tonnes during the same period, more than sixteen-fold. The indices of total cropped area and cropping intensity in the state have increased from 100.98 and 100.83 in 1975-76 to 121.02 and 133.53 in 2008-09 respectively. The decline in production of pulses, which are the main source of proteins for a large section of population in the state as well as in the country at large, is not only raising doubts about the nutritional security but also indicates structural transformation of the state agriculture.

A notable feature of changes in cropping pattern in Haryana is the enhanced share of the cereals, occupying two third of total cropped area. Sangwan (1985) reported that changes in the state cropping pattern resulted from increase in irrigation facilities to a large extent. Considering the diversity of soil, agro-climatic conditions and availability of canal irrigation and infrastructure services (e.g., roads and regulated markets) across the sub-regions, potentiality to cultivate varied types of crops exists in the state. The information at national or state level on aggregate growth land utilization pattern offers no sufficient clue for effective human efforts because the regions differ with respect to their needs and resource endowments. Since there has been a growing consensus about the need of district-level agricultural planning, it would be of interest to measure the level of agricultural activity at district level. A study at the district level will be useful to formulate district specific agricultural policies. It is also instructive to understand the changes in cropping pattern over the years. The seriousness of emerging acute regional imbalances has not yet received the public attention, it deserves. The main aim of the study is to gain insight into the magnitude of efforts needed to achieve balanced agricultural growth in Haryana. The specific objectives of our study are:

(i) To assess the specialization of various districts in different crops.

(ii) To examine the suitability of the different districts for growing various crops.

Methodology

The present study is based on secondary sources of data. The huge data on gross cropped area and area under various crops at state and district levels are obtained from Statistical Abstract of Haryana, Department of Economic and Statistical Analysis, Government of Haryana, Chandigarh. We consider 10 main crops grown in Haryana, namely rice, jowar, bajra, maize, wheat, barley, gram, mustard (including rapeseed), cotton (both American and Desi) and sugarcane. The crops included in the study account for 88 per cent of total cropped area in the state in 2008-09. Presently the state has 21 districts. Because of non-availability of data for newly created districts, we grouped these into 16 composite districts. The sample period is 1991-92 to 2008-09. It reflects the post-liberalization period and enables us to undertake a more disaggregated analysis. The data are annual. The data are analyzed for three different periods, viz. Period-I (1991-92 to 1999-2000), Period-II (2000-01 to 2008-09) and Period-III (1991-92 to 2008-09).

In market economies the motivation to use land in a particular way derives from the profit motives, and the optimal cropping pattern is that which returns the highest profit to the farmer. An initial profitable crop begins to dominant an area when demand for that product rise steadily in the national as well as overseas markets. The crop expands in the region by cultivators increasing

*Assistant Professor, Institute of Management Studies and Research, Maharshi Dyanand University, Rohtak-124001.

agglomeration economies for its production. Against this theoretical underpinning, to examine the cropping pattern and performance of different districts in growing different crops, we apply three standards measures, namely (i) location quotient, (ii) crop versatility index, and (iii) district versatility index. A brief introduction of the methods of analysis used in the study is in order.

Location Quotient

The location quotient is a simple and most wieldy used measure (e.g., Peters, 1987; Thakur and Jagalan, 2005; Guimaraes *et aI*., 2009; Ardeshna and Shiyani, 2011) of regional crop specialization. It is defined as the ratio of the share of acreage under a particular crop in the district to the share of that crop in the state total cropped acreage. This metric considers the relative position of a crop in a district with that of at the state level. The result reveals the degree of regional specialization in each crop. It is calculated as :

$$LQ_{ij} = \frac{A_{ij}/A_j}{A_i/A} \quad (1)$$

where

LQ_{ij} = Location quotient of i^{th} crop in j^{th} district

A_{ij} = Acreage of i^{th} crop in j^{th} district

A_j = Gross cropped acreage in j^{th} district

A_i = Acreage of i^{th} crop in j'h state

A = Gross cropped acreage in the state.

A value of location quotient equal to unity ($LQ_{ij} = 1$) indicates that the state and district proportions of a crop are equal, whereas a value below unity ($LQ_{ij} < 1$) means that the district is less specialized than the state. A value of quotient in excess of unity ($LQ_{ij} > 1$) indicates that the crop studied is more important or specialized in the district in relation of its importance at the state level. Larger the value of quotient indicates, higher the specialization of the district in the concerned crop. Also, observing location quotients over time show if a crop is becoming more or less specialized in the district. It is possible to increase the quotient even when the acreage under the crop in the district has shrink and vice-versa.

Crop Versatility Index

Crop versatility is one of the important characters which can be derived from the information on the cropping pattern prevailing in the state. It is helpful in knowing crop with respect to its spatial coverage in quantitative terms. The versatility index of a crop is inversely proportional to coefficient of variation among the district-wise acreages of the corresponding crop. A more versatility crop is one which grows in more number of districts. The crop versatility index is calculated as follows.

$$CV_i = \frac{\sigma A_{si}}{XA_{si}} \times 100 \quad (3)$$

where

CV_i = Coefficient of variation of i^{th} crop

σAs_i = Standard deviation of the district-wise acreage share of i^{th} crop

XAs_i = Mean of the district-wise acreage share of i^{th} crop.

A crop is considered to be more versatile if the coefficient of variation is less and conversely, the crop is considered to be more region-specific if the coefficient of variation is more.

District Versatility Index

It reflects the suitability of a given district for growing more number of crops. The most versatile district is one in which more number of crops are grown with same percentage allocation of acreage of gross cropped area. It is calculated as:

$$CV_j = \frac{\sigma A_{sj}}{XA_{sj}} \times 100 \quad (2)$$

where

CV_j = Coefficient of variation of j^{th} district

σAs_j = Standard deviation of the crop-wise acreage share in gross cropped area in j^{th} district

XAs_j = Mean of the crop-wise acreage share in gross cropped area in j^{th} district.

A district with smaller coefficient of variation may be regarded as more versatile in the sense of agro-climate conditions permitting a variety of crops being grown in the district.

Results and Discussion

Table 1 illustrates the district-wise location quotients (Eq. 1) of maize, wheat, rice, mustard and cotton for the Period-I (1991-92 to 1999-2000), Period-II (2000-01 to 2008-09) and Period-III (1991-92 to 2008-09). Columns three, four and five of Table I display that maize crop does its best in Ambala and Yamunanagar districts throughout the entire studied period. The district of Bhawani (1.15) remains specialized in maize during Period-l only. The highest specialization of the crop is observed in the district Ambala with the quotient value 20.08 during Period-II implying that the share of maize crop in gross cropped area of the district is more than twenty times than the share of the crop in gross cropped area of the state.

The cotton crop remains specialized in districts of Hisar,

Jind and Sirsa throughout the period under reference. The highest specialization of the crop is occurred in Hisar district during Period-I (4.04) and Period-III (3.38) while the Sirsa (3.08) district showed highest specialization during Period-II. Looking to the specialization of wheat, Ambala, Kurukshetra, Kathal, Karnal, Panipat, Sonipat, Faridabad, Jind and Hisar districts remain specialized throughout the whole period. The directorate of wheat research of the state is located at Karnal. The Yamunanagar district enjoys specialization in wheat crop during Period-I and III while Rohtak district has acquired specialization during Period-II and III. The specialization of Gurgaon district in wheat is observed during Period-II only. The highest specialization is observed in Hisar district during Period-I (2.25) while during Period-II (1.53), the position has captured by Faridabad district. During Period-III (1.58), both Hisar and Faridabad districts equally share the status of highest specialization in wheat.

Rice crop remains specialized throughout the entire period in Ambala, Yamunanagar, Kurukshetra, Kathal, Karnal, Panipat, Sonipat and Jind districts. The districts of Kurukshetra and Karnal, both having 100 per cent irrigated cropped areas, equally enjoy the status of highest specialization during Period-I (3.07) while Karnal continues at the top during Period- II (2.66) and Period-III (2.83) as well. The highest rice mills of the state are located in Karnal. As rice planting continued and diversified during the 1990s and 2000s, the value of location quotient for majority of districts has fallen steadily during the later period. Nonetheless, even though the value of location quotient has declined since 1991-92, northern region retains a significant concentration of rice.

TABLE 1—LOCATION QUOTIENT OF MAIZE, WHEAT, RICE, MUSTARD AND COTTON IN DIFFERENT DISTRICTS

District	Maize			Wheat			Rice			Mustard			Cotton		
	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III
Ambala	18.47	20.08	19.14	1.47	1.07	1.26	2.01	1.98	1.99	0.23	0.12	0.17	0.01	0.00	0.01
Yamunanagar	3.00	3.89	3.32	1.25	0.96	1.08	1.82	1.76	1.78	0.09	0.10	0.10	0.00	0.00	0.00
Kurukeshtra	0.73	0.12	0.44	1.54	1.14	1.33	3.07	2.62	2.82	0.16	0.02	0.09	0.12	0.00	0.06
Kathal	0.74	0.05	0.42	1.38	1.25	1.30	2.74	2.55	2.64	0.06	0.03	0.05	0.07	0.07	0.07
Karnal	0.72	0.21	0.54	1.02	1.19	1.11	3.07	2.66	2.83	0.03	0.02	0.02	0.01	0.00	0.00
Panipat	0.30	0.04	0.18	1.73	1.23	1.46	2.60	2.39	2.50	0.24	0.05	0.14	0.04	0.00	0.02
Sonipat	0.09	0.72	0.31	1.49	1.30	1.39	1.40	1.49	1.46	1.48	0.18	0.82	0.20	0.06	0.13
Rohtak	0.30	0.13	0.21	0.99	1.11	1.06	0.31	0.49	0.41	0.85	1.44	1.14	0.18	0.35	0.26
Faridabad	0.62	0.37	0.59	1.61	1.53	1.58	0.60	0.80	0.71	1.69	0.24	0.95	0.01	0.01	0.01
Gurgaon	0.00	0.00	0.00	0.79	1.04	0.92	0.12	0.15	0.14	1.83	1.74	1.77	0.00	0.01	0.00
Rewari	0.00	0.00	0.00	0.68	0.67	0.68	0.01	0.02	0.02	4.25	3.73	4.01	0.11	0.21	0.15
Mahendragarh	0.02	0.00	0.01	0.62	0.42	0.52	0.00	0.00	0.00	3.87	3.56	3.75	0.70	0.22	0.47
Bhiwani	1.15	0.01	0.63	0.18	0.49	0.35	0.02	0.10	0.06	0.69	2.26	1.49	0.39	0.87	0.61
Jind	0.18	0.15	0.15	1.52	1.21	1.35	1.18	1.22	1.22	1.19	0.21	0.69	3.16	1.14	2.22
Hisar	0.73	0.01	0.40	2.25	1.00	1.58	0.52	0.59	0.55	2.31	0.76	1.52	4.04	2.60	3.38
Sirsa	0.00	0.00	0.00	0.34	0.98	0.68	0.27	0.40	0.34	0.28	0.99	0.63	1.28	3.08	2.12

The districts of Rewari, Mahendragarh and Gurgaon remain specialized in mustard throughout the entire period. Besides these, Sonipat and Jind districts during Period-I, Bhawani and Rohtak during Period-ll and Period-III, Hisar during Period-III, remain specialized in mustard crop. The best position in the crop is attained only by Rewari and Mahendragarh throughout the entire period with the highest value of quotient ranging from 4.25 to 3.56. The districts of Rewari, Mahendragarh and Bhawani represent extreme arid to semi-arid climate, slight sloping to undulating plains and substantial rainfed cropland. These conditions necessitate for devoting higher acreages to low water consuming crops like mustard, bajra, barley and gram. The value of location quotient of mustard for Bhawani district increased from 0.69 during Period-I to 2.26 during Period-II mainly due to introduction of sprinkler irrigation system.

The location quotients of sugarcane, barley, jowar, bajra and gram are presented in Table 2. The results reveal that sugarcane not only specialized in Yamunanagar, but also remains at the top with quotient values of 6.35, 8.85 and 7.66 during Period-I, II and III respectively. This may partially be because of increase in irrigation facilities,

availability of large operational holdings, plain land and existence of numerous sugar mills at Yamunanagar. Other districts having specialization in sugarcane crops include Ambala, Kurukshetra, Panipat, Sonipat Rohtak and Faridabad. Hisar remains specialization in sugarcane during Period-I (1.14).

Faridabad, Hisar, Gurgaon, Rewari, Rohtak and Bhawani remain specialized in barley crop throughout the entire period. Among districts, Faridabad remains at the top during Period-I (3.44) and Period-III (2.50) while Sirsa remains at the top during Period-II in specialization of barley.

TABLE 2—LOCATION QUOTIENT OF SUGARCANE, BARLEY, JOWAR, BAJRA AND GRAM IN DIFFERENT DISTRICTS

District	Sugarcane			Barley			Jowar			Bajra			Gram		
	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III
Ambala	5.51	2.74	4.11	0.20	0.11	0.16	0.00	0.15	0.06	0.09	0.04	0.06	0.18	0.16	0.18
Yamunanagar	6.35	8.85	7.66	0.11	0.00	0.06	0.00	0.00	0.00	0.05	0.05	0.05	0.04	0.04	0.04
Kurukeshtra	1.77	2.50	2.15	0.10	0.00	0.06	0.06	0.00	0.04	0.16	0.00	0.08	0.04	0.03	0.04
Kathal	0.74	0.38	0.57	0.06	0.01	0.04	0.04	0.00	0.03	0.12	0.32	0.21	0.03	0.03	0.03
Karnal	0.92	1.36	1.13	0.06	0.07	0.07	0.11	0.01	0.06	0.03	0.04	0.04	0.02	0.03	0.03
Panipat	2.07	1.63	1.82	0.35	0.08	0.23	1.55	0.02	0.86	0.20	0.03	0.11	0.05	0.03	0.05
Sonipat	2.21	2.02	2.07	1.20	0.27	0.78	4.84	2.90	3.93	0.80	0.28	0.54	0.46	0.02	0.36
Rohtak	1.43	1.62	1.52	1.40	1.31	1.40	5.27	7.24	6.15	0.86	1.04	0.95	0.31	0.40	0.34
Faridabad	1.07	1.23	1.17	3.44	1.35	2.50	5.00	4.38	4.75	1.69	0.49	1.09	0.35	0.00	0.26
Gurgaon	0.10	0.05	0.07	1.81	1.62	1.73	1.99	2.50	2.27	1.76	1.74	1.77	0.37	0.19	0.32
Rewari	0.00	0.00	0.00	1.76	1.29	1.68	0.36	0.48	0.40	4.02	3.09	3.54	1.17	0.15	0.93
Mahendragarh	0.07	0.00	0.03	1.39	0.54	1.03	0.26	0.02	0.15	4.91	3.72	4.31	4.78	2.15	4.11
Bhiwani	0.53	0.11	0.32	1.33	1.70	1.44	0.32	0.39	0.34	1.02	2.68	1.87	1.26	5.12	2.25
Jind	0.65	0.62	0.64	1.50	0.40	1.02	0.23	0.07	0.16	1.40	1.09	1.23	2.23	0.07	1.70
Hisar	1.41	0.23	0.82	3.10	1.60	2.43	1.36	0.00	0.74	1.89	0.78	1.32	2.96	0.94	2.45
Sirsa	0.01	0.07	0.04	0.57	1.85	1.14	0.00	0.00	0.00	0.02	0.08	0.05	0.30	0.88	0.43

As far as the specialization of bajra is concerned, Mahendragarh (4.31) district top the list followed by Rewari (3.54), Bhawani (1.87), Gurgaon (1.77), Hisar (1.32) and Jind (1.23) during Period-III. The districts of Faridabad (1.69) remains specialized in bajra during Period-I. During Period-II, its cropping pattern has shifted towards sugarcane and rice.

The districts of Bhawani (5.12) and Mahendragarh (2.15) are the core of the gram cultivation region of the state during Period-II. Hisar (2.96), Jind (2.23) and Rewari (1.17) remain specialized in gram during Period-I. But during Period-II, the cropping pattern of Hisar and Jind districts has shifted towards rice and that of Rewari towards cotton. Gram crop is completely marginalised in the irrigated areas of the state. The district enjoying higher irrigation facilities tends to present low location quotient for gram. For example, for both Kurukshetra and Panipat districts, having high irrigation intensity, the value of location quotient is reported at 0.03 during Period-II.

The Rohtak (6.15) district remains at the top throughout the entire period in jowar specialization followed by Faridabad (4.75), Sonipat (3.93) and Gurgaon (2.27) districts. The quotient value of other districts is less than unity for jowar crop implying region specific characteristics of the crop to grow in specific area.

Fruits and vegetables remain specialized in Sonipat district (located in close proximity to Delhi) with value of location quotient 2.32 in 2008-09. It is followed by Ambala (1.99), Kathal (1.94), Panipat (1.60), Kurukshetra (1.34), Mahendragarh (1.33) and Yamunanagar (1.05) districts. In sum up, from the foregoing analysis the districts are classified on the basis of specialization in different crops and reported in Table 3. A glance at Column two of Table-3 makes it clear that out of the total 16 districts in the state, only two acquire specialization in maize and three in cotton and gram each. From our foregoing analysis it may be concluded that irrigation has led to specialization in fine cereals whereas urbanization and proximity to city encourages acreage towards high value crops like vegetables and fruits.

TABLE 3—SPECIALIZATION OF DISTRICTS IN DIFFERENT CROPS, 1991-92 TO 2008-09

District	Crops in descending order of magnitude of location quotient (LQ > 1)
Ambala	Maize, sugarcane, rice, wheat
Yamunanagar	Sugarcane, maize, rice, wheat
Kurukshetra	Rice, sugarcane, wheat
Kathal	Rice, wheat
Karnal	Rice, wheat, sugarcane
Panipat	Rice, sugarcane, wheat
Sonipat	Jowar, sugarcane, rice, wheat, mustard
Rohtak	Jowar, barley, sugarcane, mustard, wheat
Faridabad	Jowar, barley, wheat, sugarcane, mustard
Gurgaon	Jowar, mustard, barley, bajra
Rewari	Mustard, bajra, barley, gram
Mahendragarh	Bajra, gram, mustard, barley
Bhiwani	Gram, mustard, bajra, barley, maize
Jind	Cotton, wheat, rice, barley, bajra, gram
Hisar	Cotton, barley, gram, wheat, bajra
Sirsa	Cotton, barley

ABLE 3—SPECIALIZATION OF DISTRICTS IN DIFFERENT CROPS, 1991-92 TO 2008-09—*Contd.*

Table 4 contains the versatility indices (Eq. 2) for ten major crops grown in Haryana. It is observed from the table that rice (88.78) is more versatile followed by sugarcane (95.48) and wheat (108.49) crops during Period-I.

TABLE 4—CROP VERSATILITY DURING DIFFERENT PERIODS

Crop	Period-I	Period-II	Period-III
Rice	88.78	76.94	88.33
Jowar	142.20	205.25	160.78
Bajra	119.46	129.82	113.42
Maize	221.33	302.90	250.41
Wheat	108.49	56.40	78.99
Barley	141.50	130.79	129.49
Gram	171.13	230.79	160.38
Mustard	124.73	119.21	105.94
Cotton	229.22	201.25	210.08
Sugarcane	95.48	110.46	93.41

Cotton (229.22) and maize (221.33) are less versatile and grown in the specific parts of the state. More versatility of wheat (56.4) during Period-II implies that the crop has been grown in wider area of the state. Gram crop is also more region-specific which is reflected by its higher versatility index during Period-II (230.79). It is clear that the crops such as sugarcane, rice, wheat and mustard are more versatile than jowar, bajra, gram, barley etc.

Similar to the crop versatility, estimates are made for district versatility (Eq. 3) and results are presented in Table 5. A scrutiny of data presented in Column two of Table 5 reveals that Bhiwani district (106.79) is more versatile amongst all the districts which imply that more number of crops grown in the district while Karnal (200.7) is less versatile district implying fewer numbers of crops grown in the district during entire period under analysis. It suggests the imperative need for crop diversification in Karnal district.

TABLE 5—DISTRICT VERSATILITY DURING DIFFERENT PERIODS

District	Period-I	Period-II	Period-III
Ambala	157.44	168.18	161.04
Yamunanagar	170.82	159.10	163.46
Kurukshetra	189.07	194.53	191.26
Kathal	197.93	197.57	197.74

TABLE 5—DISTRICT VERSATILITY DURING DIFFERENT PERIODS—*Contd.*

District	Period-I	Period-II	Period-III
Karnal	201.34	200.02	200.07
Panipat	186.02	198.26	191.03
Sonipat	135.66	180.65	154.63
Rohtak	136.22	133.18	134.53
Faridabad	146.33	199.25	167.62
Gurgaon	137.08	158.99	148.15
Rewari	146.99	153.89	149.10
Mahendragarh	125.44	157.09	135.18
Bhiwani	92.44	115.04	106.79
Jind	117.58	160.88	130.60
Hisar	124.88	140.33	129.05
Sirsa	118.92	137.56	127.41

The versatility index for majority of districts, namely Ambala, Kurukeshtra, Panipat, Sonipat, Faridabad, Gurgaon, Rewari, Mahendragarh, Bhiwani, Jind, Hisar and Sirsa has increased. It implies that these districts are moving towards specialization.

Summary, Main Findings and Policy Implications

The cropping pattern and performance of different districts in growing different crops in Haryana are assessed using three standards measures, namely) (i) location quotient, (ii) cropversatility index, and (iii) district versatility index over the period 1991-92 to 2008-09. The specialization of maize in Ambala and Yamunanagar, cotton in Hisar, sugarcane in Yamunanagar and Ambala, mustard in Rewari and Mahendragarh, gram in Mahendragarh, bajra in Rewari are the highest during the study period with the value of location quotients to be more than two. The specialization of wheat in Panipat, Hisar and Fridabad, rice in Kurukshetra, Kathal and Karnal, jowar in Rohtak and Faridabad is highest during the period of study. The highest specialization of bajra is observed in Mahendragarh, Rewari and Gurgaon. The increase in value of versatility indices for majority of districts during 2000-01 to 2008-09 as compared to 1991-92 to 1999-2000 implies the move towards specialization. It is established that maize, gram and cotton are highly localized crops.

The policy implications of our findings are: (i) the knowledge of crop location quotient provides useful information to policy makers and planners for development of district-wise crop-potential map as envisioned in the Approach Paper to the 12th Five Year Plan, and (ii) the estimates of districts specialization are useful for decision makers, agricultural technology management agencies, district planning committees and researchers to focus on crop improvement and production management within the potential region for each crop.

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C. Agro-Economic Research

Impact of the National Horticulture Mission (NHM) Scheme in Haryana*

Introduction

In India, policy makers realized the potential of horticultural sector to diversify agriculture, efficient land use, optimum utilization of natural resources and creating employment opportunities for rural masses during the 1980s. As a result, planned investment for horticultural development increased significantly in the country. The fund allocation for horticultural sector increased from 24.2 crore in the Seventh Five Year Plan to Rs. 1453 crore in the Ninth and to Rs. 5650 crore in the Tenth Five Year Plan. During the Tenth Five Year Plan, centrally sponsored scheme on Technology Mission for Integrated development of horticulture in the North Eastern region was implemented and continued during the Eleventh Five Year Plan. This scheme was further extended to Jammu and Kashmir, Himachal Pradesh and Uttrakhand. The main objective of this Mission was to provide full support for horticultural development in these states. As a result, all India area under horticultural crops grew at the rate of 6.78 per cent per annum between 1991-92 and 2008-09. But, growth in production and productivity was below 2 per cent per year in this period (Table-1). Further, Maharashtra and Andhra Pradesh were leading states in case of fruits production while West Bengal, Uttar Pradesh and Bihar were the major vegetable growing states in India.

During this millennium, problems and constraints of unexploited potential of horticultural sector in the country were pointed out and therefore, National Horticulture Mission (NHM) was launched during 2005-06 covering research, production, post harvest management, processing and marketing of horticultural crops. The Mission envisaged two fold increase in horticulture production by 2011-12 reaching to 300 million tonnes with a growth rate of 6 per cent per annum. Under the Mission, eight North Eastern states, Jammu and Kashmir, Himachal Pradesh Uttrakhand are not covered since these states are receiving benefits under the Technology Mission for Integrated Development of Horticulture. The NHM aims to promote holistic growth of horticultural sector through area specific strategies to enhance production, nutritional security and to provide income support to farm households.

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Objectives

The NHM has completed initial phase of its implementation in the state of Haryana. Hence, its impact assessment in terms of out-comes and constraints would be useful for the policy makers. This study deals with some of these aspects and it is a departure from earlier literature in terms of its focus on issues related to horticultural crops at the macro as well as micro levels in the state of Haryana. The main objective of this research is to examine economics of selected horticultural crops vis-a-vis other crops grown by the farmers during the year 2008-09 and perceptions of farmers about the Mission. Further, it seeks to highlight the status of horticultural crops at the district and state levels. In addition, we have tried to assess the prospects of increasing employment through cultivation of horticultural crops.

Research Methodology

The study is based on both macro and micro level data. For the state and district level analysis, relevant information on important indicators was obtained from the Directorate of Horticulture, Ministry of Agriculture, Government of India, New Delhi. The data on main indicators related to agriculture such as GCA for the selected districts and the state were collected from various issues of the Statistical Abstract of Haryana. The micro level data were obtained by conducting a survey of the selected 150 beneficiary farm households growing kinnow, guava, aonla among fruit crops and garlic among vegetable crops. The sample is spread over three districts covered under the Misson namely, Rohtak, Hissar and Sirsa. Further, two villages, one nearby and another far off from the town were chosen for in-depth study. Thus, 25 beneficiary farm households engaged in cultivation of selected horticultural crops were selected from each of the village for detailed analysis. We have used appropriate statistical tools such as coefficient of variations, etc. in the data analysis. The reference year of the study is 2008-09.

IV. Main Findings

Status of Horticultural Crops in Haryana

Although, there has been surge in cultivation of fruits and vegetables in Haryana, an analysis of the status of horticultural crops in the state indicated that these crops covered only 1.4 per cent of GCA during 2009-10 (Table-3). The maximum share of GCA devoted to these crops was around 5 per cent in Ambala. In other districts, area allocated to horticultural crops was around 3 per cent in Kurukshetra and Sonipat. Thus, status of horticultural crops in terms of

*Agricultural Economics Research Centre, University of Delhi.

area devoted does not commensurate with availability of natural resource base.

Vegetables and fruits constituted 82.37 per cent and 11.38 per cent of area under horticultural crops respectively in Haryana. Other crops such as spices, floriculture, medicinal and aromatic plants together occupied around 6 per cent of area cultivated under these crops. Among fruits, mango, guava, citrus and ber were major crops while cucurbits, cauliflower, potato and tomato were main crops among vegetables in terms of area allocation at the state level. Further, Yamunanagar and Sirsa were leading districts in area allocation under fruit crops and together accounted for 37 per cent of the total cultivated area in the state. Cultivation of vegetables was found popular in Karnal, Sonipat, Gurgaon, Ambala and Yamunanagar and these districts together produced around 50 per cent of state's total output. The amount of change in area and production of fruits and vegetables in Haryana has been commendable during the recent years. Progress of fruits and vegetables production in Rohtak and Kurukshetra was appreciable.

Socio-economic Characteristics of Sampled Farmers

For better understanding of the NHM, we have looked into main indicators related to population and workers, educational status of the head of households, farm size, nature of land ownership, cropping pattern and sources of irrigation, area under HYV seeds, farm assets, credit availed by farm households and income of the farmers.

The efficiency and success of farming is influenced to a significant degree by the socio-economic background of the households. In addition, these characteristics influence adoption of improved technology. The average size of the family of selected farm households was 5.91 persons and there was no correlation between farm size and average size of family. The share of dependents in total population was 7.45 per cent at the overall level. Further, average number of workers per family ranged between 1.54 and 2.14 persons and most of them were engaged in agriculture. Also, literacy rate of the selected families was found to be impressive and large farm households indicated higher level of literacy.

The nature of land ownership influences crop pattern, adoption of technology and innovation. At the aggregate level, average land owned by the farmers was 16.35 acres. The practice of leasing-in land was common but none of them leased out land. Like the state, cropping intensity was found to be higher (224.26 per cent) on sampled farms. The main sources of irrigation were canal tubewell. In kharif season, bajra. paddy and vegetables were the main crops while rabi season was dominated by wheat and mustard. Adoption of HYV seeds is popular for wheat, paddy, mustard and horticultural crops. These farmers owned a variety of farm assets and value of farm assets was Rs. 3,59,030 per family. Tractors followed by milch animals were the major assets owned by these families. As expected, positive relationship emerged between farm size and value of farm assets. Availability of credit has played an important role in transforming traditional agriculture into modern agriculture in Haryana. The selected farmers availed credit of Rs. 2.10,000 per family and large farmers reaped higher benefits in comparison to other categories.

It was observed that sampled farm households earned income from crop cultivation, dairying, wage employment. salary and pensions, etc. The computed per household income was found to be Rs. 2,79,839 during the year 2008-09. Large variations in income have been observed across different classes of farmers. Large farm households earned the highest income due to their large resource base. Thus, farm size and income were found to be positively correlated.

Economics and Employment Generation through Horticultural Crops vis-a-vis other Crops

The impact of the National Horticulture Mission in Haryana on net returns per acre was assessed through comparison of selected horticultural crops with other crops grown by the farmers during 2008-09. Results of sampled survey pointed out that gross returns per acre from garlic cultivation were found higher than other selected horticultural crops during the reference year and this was true for net returns as well. Wide variations were observed when net returns were calculated at total cost after including fixed costs incurred by the growers of fruit crops. Among fruits crops, viz, kinnow, guava and aonla, net returns from latter were found higher than first two crops.

Farm size variations were common in gross returns and net returns per acre. In case of kinnow, an inverse relationship could be ascertained between farm size and returns. However, a mixed scenario emerged in case of remaining two horticultural crops. Therefore, any relationship between returns and farm size could not be ascertained.

A comparison of net returns from cultivation of selected horticultural crops with other crops during the kharif season has exhibited that flowers followed by sugarcane and cotton were found superior than paddy in terms of net returns per unit of land. The economics of moong, a minor pulse crop grown on sampled farms was also worked out and profitability was compared vis-a-vis other rainfed kharif crop such as bajra. This pulse crop provided higher net returns per acre in comparison to bajra. It was observed that vegetables and summer moong were superior crops than wheat, gram and mustard in terms of returns during rabi season.

An analysis of net returns from kharif, rabi and horticultural crops grown by the beneficiary farmers indicated that flowers followed by garlic, aonla and guava were superior crops in terms of profitability in' comparison to traditional crops like wheat and paddy on sampled farms in Haryana (Table 4.5).

Results show that selected horticultural crops generated higher employment in comparison to several traditional crops. In particular, garlic generated highest employment per acre in terms of labour days. Among various categories of farmers, marginal farmers used more than average number of labour days in growing these crops. Further, weeding and inter cultural operations were found most labour intensive and therefore, higher proportion of labour days was used for these activities.

Impact of NHM and Perceptions of Farmers on Important Issues

Response of farmers about area expansion under horticultural crops after adoption of the NHM was positive. But, they did not opt for rejuvenation due to low level of subsidy. Further, perceptions of farmers about employment generation and increase in household income through cultivation of kinnow, guava, aonla and garlic were positive. Overall, majority of the farmers reported increase in household income after implementation of the NHM, but the major beneficiaries of the Mission were large farmers. Hence, there is an urgent need for strong government intervention to help marginal farmers in raising household income through cultivation of horticultural crops.

Subsidy provision was listed as the most important positive factor by 94.67 per cent farmers. In each farm category, at least 90 per cent farmers gave positive response. Further, response of the farmers' regarding infrastructure and capacity building was found poor.

Performance of different categories of farmers varied in terms of yield rates for kinnow, guava, aonla and garlic. Although, several factors determine yield rates, extension through training plays an important role. Frequency of the training provided by the State Horticulture Department to beneficiaries of the NHM was 1.75 trainings during the year 2008-09. Respondents informed during the discussion that they were not satisfied with the training programmes organized by various institutions to impart knowledge about activities and package of practices for cultivation of horticultural crops under the Mission. Moreover, training was of very short duration and it was not sufficient to provide full details.

Growers of selected horticultural crops i.e. kinnow, guava, aonla and garlic received subsidy from the government for seedling, fertilizer, pesticides, drip irrigation and water tank. The highest percentage of farmers receiving subsidy was noticed for kinnow followed by guava.

There is no government intervention in the marketing process of horticultural crops in Haryana. Respondents during the survey reported that they sold garlic through commission agents. In case of fruit crops such as kinnow, guava and aonla, most of the farmers sold standing crops to pre-harvest contractors. These contractors were responsible for plucking, grading and marketing of the produce. Often, contractors make advance payment to the growers. Their collection centres operate within short distances. The produce harvested is collected here and sold to wholesalers when prices are found attractive.

None of the sampled farmers opted for processing of kinnow, guava and aonla despite understanding the benefits of processing and increase in profits after value addition. This brings out the importance of micro economic policies relating to public investment in processing. In the present circumstances, public policies that encourage private investment in processing can be useful in solving this problem.

Policy Implications

Horticultural crops offer an opportunity to enhance agricultural growth, employment and augment income of the farmers. In Haryana, these crops are getting popular among farmers due to government support under the National Horticulture Mission (NHM). But, full potential could not be tapped due to severe constraints in infrastructural and marketing facilities.

NHM has completed around five years of its implementation in Haryana but its impact on area, production and yield of selected horticultural crops was found limited due to low coverage of farmers and lack of holistic approach in practical. In order to make, Mission more effective, following policy measures are suggested. (i) to promote shorter gestation vegetable and fruit crops, medicinal and aromatic plants and commercial flower crops through research and development.(ii) timely availability of good quality planting material and pasteurized compost/ vermi-compost. (iii) motivating farmers to adopt latest technology for growing horticultural crops by arranging demonstrations and trainings at regular intervals to update their knowledge on modern technology. (iv) provision of post-harvest facilities through public private partnership in rural areas of the potential districts on priority basis and gradually extending to the entire state. (v) creation of storage and processing facilities at the village level. (vi) Identifying horticultural crops having export potential.

TABLE 1—AREA, PRODUCTION AND PRODUCTIVITY OF HORTICULTURAL CROPS IN INDIA (1991-92 TO 2008-09)

Year	Area (million ha)	Production (million mt)	Productivity (mt/ha)
1991-92	12.8	96.6	7.5
1992-93	12.9	107.4	8.3
1993-94	13.0	114.7	8.8
1994-95	13.1	118.4	9.0
1995-96	13.7	125.5	9.2
1996-97	14.4	128.5	8.9
1997 -98	14.8	128.6	8.7
1998-99	15.1	146.2	9.7
1999-00	15.3	149.2	9.8
2000-01	15.7	150.2	9.6
2001-02	16.6	145.8	8.8
2002-03	16.3	144.4	8.9
2003-04	19.2	153.3	8.0
2004-05	21.1	170.8	8.1
2005-06	18.7	182.8	9.8
2006-07	19.4	191.8	9.9
2007 -08	20.2	211.2	10.5
2008-09	20.7	214.7	10.4
Per annum Growth rate	6.78	1.09	1.60
Coefficient of Variation	17.74	22.85	9.12

NOTE: Crops = Fruits, vegetables, potato & tuber crops, mushrooms, flowers (loose) plantation crops (coconut, cashewnut, arecanut, and coca), spices and honey Source: NHB, 2009

TABLE 2—PERCENTAGE OF GCA UNDER HORTICULTURAL CROPS IN HARYANA

District	Percentage of GCA
Ambala	5.07
Panchkula	2.09
Yamunanagar	2.05
Kurukshetra	3..30
Kaithal	0.38
Karnal	1.15
Panipat	2.00
Sonipat	2.56
Rohtak	0.87
Jhajjar	0.42
Faridabad	2.00
Gurgaon	1.77
Rewari	0.33
Mahendragarh	0.59
Bhiwani	0.08
Jind	0.56
Hissar	0.71
Fatehabad	0.57
Sirsa	0.68
Haryana	1.11

Source : Ministry of Agriculture, Government of India, New Delhi

TABLE 3—DISTRICT WISE SHARE IN AREA UNDER HORTICULTURAL CROPS IN HARYANA

Sl. No.	District	Fruits and Vegetables
1.	Panchkula	2.74
2.	Ambala	7.72
3.	Yamunanagar	9.85
4.	Kurukshetra	5.77
5.	Kaithal	1.68
6.	Karnal	8.82
7.	Panipat	5.73
8.	Sonipat	8.68
9.	Rohtak	3.73
10.	Jhajjar	3.24
11.	Faridabad	2.97
12.	Narnaul	2.64
13.	Rewari	1.31
14.	Gurgaon	10.98
15.	Bhiwani	3.44
16.	Hissar	2.90
17.	Fatehabad	3.73
18.	Sirsa	4.53
19.	Jind	3.40
20.	Mewat	4.05
21.	Palwal	2.10
	State	100.00

Source: I bid

TABLE 4—NET RETURNS FROM HORTICULTURAL NON-HORTICULTURAL CROPS

(Rs. Per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0	12583	10852	12762	12499
Bajra	2750	4109	2649	3083	3063
Vegetable	9665	14267	8972	6631	7476
Cotton	0	15231	13288	14419	14383
Moong	0	0	14000	5303	5352
Flower	19000	0	62500	0	40750
Sugarcane	0	0	0	17250	17250
Rabi crops					
Wheat	7417	6455	7027	5377	5558
Mustard	6000	10075	7022	7068	7086
Vegetable	9250	23013	7141	7190	8011
Moong	0	0	8000	0	8000
Gram	0	0	0	6263	6263
Selected Horticultural crops					
Garlic	36350	29744	43261	41345	40612
Kinnow	0	16519	15367	14246	14327
Guava	34286	22837	27190	16147	19699
Aonla	0	0	10776	30545	29840

Source: Ibid

D. Commodity Reviews

(i) Foodgrains

During the month of March 2012 the Wholesale Prices of foodgrains displayed a rising trend. Wholesale Price Index (Base 2004-05=100) of foodgrains, pulses and Cereals rose by 1.04 per cent 0.72 per cent and 1.07 per cent respectively over the previous month.

ALL INDIA WHOLESALE PRICES INDEX (WPI) NUMBER

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of March 2012	WPI for the Month of February 2012	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	174.9	173.0	167.0	1.10	4.73
Wheat	1.116	171.9	169.7	173.1	1.30	–0.69
Jowar	0.096	238.0	250.8	206.2	–5.10	15.42
Bajra	0.115	204.4	199.9	178.3	2.25	14.64
Maize	0.217	219.3	213.8	191.9	2.57	14.28
Barley	0.017	200.6	188.8	184.3	6.25	8.84
Ragi	0.019	218.7	216.1	180.3	1.20	21.30
Cereals	3.373	179.9	178.0	172.3	1.07	4.41
Pulses	0.717	210.2	208.7	191.0	0.72	10.05
Foodgrains	4.09	185.3	183.4	175.6	1.04	5.52

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 March, 2012.

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

Procurement of Rice

3187 thousand tonnes of Rice (including paddy converted into rice) was procured during March 2012, as against 2284 thousand tonnes of Rice (including paddy converted into rice) procured during March 2011.The total procurement of Rice in the current marketing season i.e 2011-2012, upto 30-03-2012 stood at 29085 thousand tonnes, as against 25062 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 2011-12 (up to 30-03-12)		Corresponding Period of last Year (2010-11)		Marketing Year (October-September) 2010-11		2009-10	
	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	4640	15.95	4076	16.26	9610	28.10	7555	23.58
Chhatisgarh	4110	14.13	3497	13.95	3743	10.95	3357	10.48
Haryana	1981	6.81	1659	6.62	1687	4.93	1819	5.68
Maharashtra	142	0.49	161	0.64	308	0.90	229	0.71
Punjab	7731	26.58	8634	34.45	8635	25.25	9275	28.95
Tamil Nadu	1386	4.77	1101	4.39	1543	4.51	1241	3.87
Uttar Pradesh	3040	10.45	2150	8.58	2554	7.47	2901	9.06
Uttarakhand	308	1.06	323	1.29	422	1.23	375	1.17
Others	5747	19.76	3461	13.81	5695	16.65	5282	16.49
Total	**29085**	**100.00**	**25062**	**100.00**	**34197**	**100.00**	**32034**	**100.00**

Source: Department of Food and Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2011-2012 upto March, 2012 is 28335 thousand tonnes against a total of 22514 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 2011-12 (up to 30-03-2012)		Corresponding Period of last Year (2010-11)		Marketing Year (April-March) 2010-11		2009-10	
	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	6928	24.45	6347	28.19	6347	28.19	5237	23.08
Madhya Pradesh	4965	17.52	3539	15.72	3539	15.72	2410	10.62
Punjab	10958	38.67	10209	45.35	10209	45.35	9941	43.81
Rajasthan	1303	4.60	476	2.11	476	2.11	935	4.12
Uttar Pradesh	3461	12.21	1645	7.31	1645	7.31	3137	13.83
Others	720	2.54	298	1.32	298	1.32	1029	4.54
Total	**28335**	**100.00**	**22514**	**100.00**	**22514**	**100.00**	**22689**	**100.00**

Source : Department of Food and Public Distribution.

(ii) Commercial Crops

Oil Seeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 170.3 in March, 2012 showing a rise of 3.7 per cent and 12.8 per cent over the previous month and over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed an increasing trend. The WPI of Groundnut seed (5.9 per cent), Rape & Mustard (0.4 per cent), Cottonseed (0.2 per cent), Copra (3.3 per cent), Gingelly seed (3.1 per cent), Niger Seed (4.0 per cent), Safflower seed(1.3 per cent), Sunflower seed (4.4 per cent) and Soyabean (6.8 per cent) increased over the previous month. The Wholesale Price Index (WPI) of Edible Oils as a group stood at 141.4 in March, 2012 showing a rise of 1.5 per cent and 9.8 per cent over the previous month and over the previous year. The WPI of Groundnut Oil (4.3 per cent), Cottonseed Oil (1.1 per cent), Mustard Oil (1.9 per cent), Soyabean Oil (1.8 per cent), Copra oil (1.5 per cent), Sunflower Oil (0.8 per cent) and Gingelly Oil (0.1 per cent) increased compared to the previous month.

Fruits and Vegetable

The Wholesale Price Index (WPI) of Fruits and Vegetable as a group stood at 181.1 in March, 2012 showing a rise of 9.1 per cent and 9.2 per cent over the previous month and over the previous year.

Potato

The Wholesale Price Index (WPI) of Potato stood at 119.3 in March, 2012 showing a rise of 12.7 per cent and 11.6 per cent over the previous month and over the previous year.

Onion

The Wholesale Price Index (WPI) of Onion stood 135.7 in March, 2012 showing an increase of 1.4 per cent over the previous month. However, it decreased by 24.2 per cent over the previous year.

Condiments and Spices

The Wholesale Price Index (WPI) of Condiments and Spices (Group) stood at 214.0 in March, 2012 showing a fall of 0.2 per cent and 13.3 per cent over the previous month and year respectively. The Wholesale Price Index of Black Pepper increased by 12.6 per cent over the previous month. However, the WPI of Chillies (Dry) and Turmeric decreased by 1.0 per cent and 4.7 per cent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 196.1 in March, 2012 showing a fall of 1.6 per cent and 35.2 per cent over the previous month and over the previous year respectively.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 225.8 in March, 2012 showing an increase of 1.2 per cent over the previous month. However, it decreased by 5.9 per cent over the previous year.

Wholesale Price Index of Commercial Crops

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over	
	Mar., 2012	Feb., 2012	Mar., 2011	Month	Year
Oil Seeds	170.3	164.3	151.0	3.7	12.8
Groundnut Seed	226.6	214.0	171.3	5.9	32.3
Rape and Mustard Seed	163.3	162.7	134.8	0.4	21.1
Cotton Seed	142.4	142.1	136.1	0.2	4.6
Copra (Coconut)	100.3	97.1	116.1	3.3	–13.6
Gingelly Seed (Sesamum)	237.5	230.3	240.3	3.1	–1.2
Niger Seed	174.4	167.7	146.2	4.0	19.3
Safflower (Kardi Seed)	132.6	130.9	144.8	1.3	–8.4
Sunflower	167.7	160.7	164.3	4.4	2.1
Soyabean	161.2	150.9	140.2	6.8	15.0
Edible Oils	141.4	139.3	128.8	1.5	9.8
Groundnut Oil	180.9	173.4	142.6	4.3	26.9
Cotton Seed Oil	151.1	149.5	143.2	1.1	5.5
Mustard and Rapeseed Oil	147.6	144.9	121.2	1.9	21.8
Soyabean Oil	154.2	151.4	140.1	1.8	10.1
Copra Oil	120.4	118.6	114.9	1.5	4.8
Sunflower Oil	133.2	132.1	125.9	0.8	5.8
Gingelly Oil	151.7	151.5	141.7	0.1	7.1
Fruits and Vegetables	181.1	166.0	165.9	9.1	9.2
Potato	119.3	105.9	106.9	12.7	11.6
Onion	135.7	133.8	179.1	1.4	–24.2
Condiments and Spices	214.0	214.4	246.8	–0.2	–13.3
Black Pepper	480.6	426.8	303.3	12.6	58.5
Chillies (Dry)	249.0	251.4	292.6	–1.0	–14.9
Turmeric	157.4	165.1	360.3	–4.7	–56.3
Raw Cotton	196.1	199.2	302.5	–1.6	–35.2
Raw Jute	225.8	223.2	240.0	1.2	–5.9

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	—	250.00	130.00	—	—	—	—	—	—	—
Guntur	Tadikonda	Dec., 2011	8	200.00	175.00	110.00	200.00	160.00	110.00	160.00	—	—	—	—	—
Rangareddy	Arutla	Dec., 2011	8	200.00	120.00	—	150.00	120.00	—	150.00	120.00	—	220.00	200.00	—
Karnataka															
Bangalore	Harisandra	July to Sep., 2011	8	200.00	150.00	—	200.00	150.00	—	250.00	180.00	—	300.00	300.00	—
Tumkur	Gedlahali	July to Sep., 2011	8	150.00	150.00	—	140.00	145.00	—	150.00	—	—	150.00	150.00	—
Maharashtra															
Nagpur	Mauda	Dec., 2009	8	100.00	80.00	—	—	—	—	—	—	—	—	—	—
Ahmednagar	Akole	June, 2009	8	80.00	70.00	—	—	—	—	—	—	—	83.5	85.00	85.00
Jharkhand															
Ranchi	Gaintalsood	May, 2011 & June, 2011	8	100.00	100.00	—	90.00	90.00	—	58.00	58.00	—	170.00	150.00	—

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

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working	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	Feb.,11	M	8	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
			W	8	—	—	120.00	120.00	120.00	—	—	—	—
Bihar													
Muzaffarpur	Bhalui Rasul*	Feb. &, March, 2010	M	8	104.00	104.00	104.00	104.00	104.00	—	150.00	150.00	150.00
			W	8		104.00	104.00	104.00	104.00	—	—	—	—
Shekhpura	Kutaut	May & June, 2010	M	8	150.00	—	—	—	150.00	—	220.00	—	—
			W	8									
Chhattisgarh													
Dhamtari	Sihaba	Jan., 2012	M	8	300.00	100.00	—	120.00	80.00	80.00	150.00	80.00	70.00
			W	8	—	—	—	80.00	70.00	—	—	—	—
Gujarat													
Rajkot	Rajkot	April., 2011	M	8	187.00	195.00	130.00	155.00	140.00	133.00	308.00	273.00	200.00
			W	8	—	152.00	130.00	147.00	140.00	140.00	—	—	—
Dahod	Dahod	April, 2011	M	8	71.00	71.00	71.00	71.00	71.00	—	143.00	150.00	150.00
			W	8	—	71.00	71.00	71.00	71.00	—	—	—	—
Haryana													
Panipat	Ugarakheri	May to June, 2011	M	8	180.00	180.00	180.00	200.00	180.00	—	—	—	—
			W	8	—	150.00	150.00	180.00	150.00	—	—	—	—

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

(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	Skilled Labour: Blacksmith	Skilled Labour: Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Himachal Pradesh													
Mandi	Mandi	July, 2010	M	8	300.00	110.00	110.00	110.00	110.00	110.00	200.00	200.00	—
			W	8	—	110.00	110.00	110.00	110.00	110.00	—	—	—
Kerala													
Kozhikode	Koduvally	Nov., 2011	M	4 to 8	670.00	450.00	—	450.00	560.00	—	500.00	—	—
			W	4 to 8	—	—	350.00	350.00	400.00	—	—	—	—
Palakkad	Elappally	Nov., 2011	M	4 to 8	400.00	300.00	—	275.00	356.3	—	400.00	—	—
			W	4 to 8	—	—	150.00	200.00	155.00	—	—	—	—
Madhya Pradesh													
Hoshangabad	Sangakherakalan	Aug., 2011	M	8	100.00	100.00	100.00	—	100.00	100.00	275.00	275.00	—
			W	8	—	100.00	100.00	—	100.00	100.00	—	—	—
Satna	Kotar	Aug., 2011	M	8	120.00	—	120.00	—	120.00	120.00	180.00	180.00	180.00
			W	8	—	—	120.00	—	120.00	120.00	—	—	—
Shyopur Kala	Vijaypur	Aug., 2011	M	8	N. R.								
			W	8	N. R.								
Orissa													
Bhadrak	Chandbali	June, 2011	M	8	150.00	130.00	—	—	145.00	120.00	200.00	—	—
			W	8	—	—	—	—	120.00	100.00	—	—	—
Ganjam	Aska	June, 2011	M	8	160.00	90.00	90.00	90.00	101.7	90.00	160.00	160.00	160.00
			W	8	—	60.00	60.00	60.00	60.00	60.00	—	—	—
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	—	—	90.00	95.00	—	99.44	—	—	—
Rajasthan													
Barmer	Vishala	Aug., 2011	M	8	N. A.								
			W	8	N. A.								
Jalore	Panwa	Aug., 2011	M	8	—	—	—	—	—	150.00	100.00	150.00	—
			W	8	—	—	—	—	—	—	—	—	—
Tamil Nadu													
Thanjavur	Pulvarnatham	Jan., 2012	M	6	—	N. R.							
			W	5	—	N. R.							
Tirunelveli	Malayakulam (Kurvikulam)	Jan., 2012	M	8	—	N. A.							
			W	8	—	—	—	100.00	—	—	—	—	—
Tripura													
Agartala	Govt. Agri. Farm				N. R.								
*Uttar Pradesh**													
Meerut	Ganeshpur	April, 2011	M+W	8	159.00	175.00	156.00	156.00	157.00	—	250.00	—	—
Chandbali	Dhanpur	April, 2011			N. R.								
Chanduli	Chanduli	April, 2011	M+W	8	—	—	120.00	124.3	120.00	—	172.9	—	—

M-Man, W-Women, N. A. —Not Available N. R. —Not Reported

*District avarage data, there is no bifurcation between Man and Women.

B. PRICES

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Mar.-12	Feb.-12	Mar.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1240	1300	NA
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1120	1110	NA
Wheat	—	Quintal	Madhya Pradesh	Sagar	1400	1400	NA
Jowar	—	Quintal	Maharashtra	Mumbai	2300	2250	1995
Gram	—	Quintal	Punjab	Abohar	NA	NA	NA
Maize	Yellow	Quintal	Uttar Pradesh	Bahraich	1040	1045	995
Gram Split	—	Quintal	Maharashtra	Mumbai	4350	4400	3300
Gram Split	—	Quintal	Bihar	Patna	4950	4700	3300
Arhar Split	—	Quintal	NCT of Delhi	Delhi	5600	5700	5900
Arhar Split	—	Quintal	Maharashtra	Mumbai	5300	5200	6350
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	5500	5700	5200
Arhar Split	—	Quintal	Bihar	Patna	6200	6200	6200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2350	2225	1950
Gur	Sort II	Quintal	Tamil Nadu	Chennai	2900	2900	2500
Gur	—	Quintal	Maharashtra	Mumbai	3250	3100	2600
Mustard seed	Rai UP	Quintal	West Bengal	Kolkata	4000	3550	3000
Mustard Seed	Raira	Quintal	West Bengal	Kolkata	NA	NA	NA
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	2870	2860	2425
Linseed	—	Quintal	Maharashtra	Nagpur	3900	3650	NA
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	3480	3460	2720
Cotton Seed	Superior	Quintal	Maharashtra	Jalgaon	NA	NA	NA
Castor Seed	—	Quintal	Andhra Pradesh	Badepalli	NA	NA	NA
Sesamum Seed	Black	Quintal	Tamil Nadu	Chennai	4500	4500	4570
Cotton Seed	—	Quintal	Maharashtra	Mumbai	NA	NA	NA
Copra	FAQ	Quintal	Kerala	Alleppey	5000	4400	6000
Groundnut	—	Quintal	Maharashtra	Mumbai	5900	5900	5320
Groundnut	TMV 7	Quintal	Tamil Nadu	Chennai	4280	4280	4060
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1475	1350	1020
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1119	1118	935
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1800	1575	1110
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1650	1575	1005
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1329	NA	870
Castor Oil	—	15 Kg.	Uttar Pradesh	Kanpur	NA	NA	NA
Sesamum Oil	Agmark	15 Kg.	Tamil Nadu	Chennai	2040	2040	1875
Sesamum Oil	—	15 Kg.	Maharashtra	Mumbai	NA	NA	1163
Coconut Oil	—	15 Kg.	Kerala	Cochin	960	975	1335
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1150	1150	1100
Groundnut Cake	—	Quintal	Uttar Pradesh	Kanpur	NA	NA	NA
Cotton/Kapas	F414	Quintal	Punjab	Abohar	NA	NA	NA
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Thiruppur	NA	NA	NA
Wool	Fine	Quintal	Madhya Pradesh	Dabra	NA	NA	NA
Jute Raw	TD5	Quintal	West Bengal	Kolkata	2475	2440	3100

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

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Mar.-12	Feb.-12	Mar.-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jute Raw	W5	Quintal	West Bengal	Kolkata	2475	2440	3320
Oranges	—	100 No.	Maharashtra	Mumbai	NA	NA	1991
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	NA	NA	NA
Oranges	Big	100 No.	Tamil Nadu	Chennai	540	540	390
Banana	Basarai	100 No.	Maharashtra	Jalgaon	320	400	860
Banana	Singapore	100 No.	West Bengal	Kolkata	NA	NA	NA
Cashewnuts	—	Quintal	Maharashtra	Mumbai	40000	42500	48000
Almonds	—	Quintal	Maharashtra	Mumbai	40000	40000	37000
Walnuts	—	Quintal	Maharashtra	Mumbai	47083	32500	60500
Kishmish	—	Quintal	Maharashtra	Mumbai	12000	12000	13750
Peas Green	—	Quintal	Tamil Nadu	Chennai	4200	1800	2400
Tomatoes	—	Quintal	Tamil Nadu	Chennai	2150	1400	700
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	3400	3000	1280
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1200	1200	1200
Potatoes	Red	Quintal	Bihar	Patna	600	500	750
Potatoes	Desi	Quintal	West Bengal	Kolkata	900	480	475
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	NA	1056	974
Onions	Bombay	Quintal	West Bengal	Kolkata	NA	NA	NA
Turmeric	Erode	Quintal	West Bengal	Kolkata	NA	NA	NA
Turmeric	Nadan	Quintal	Kerala	Cochin	7500	6700	15000
Chillies	—	Quintal	Bihar	Patna	8350	8500	7500
Black Pepper	Palai	Quintal	Kerala	Alleppey	NT	NT	NT
Ginger	Dry	Quintal	Kerala	Cochin	8500	7600	16000
Cardamom	Big	Quintal	West Bengal	Kolkata	95000	95000	125000
Cardamom	Small	Quintal	West Bengal	Kolkata	70000	70000	140000
Milk	Cow	100	NCT of Delhi	Delhi	3300	3300	NA
Milk	Buffalo	100	West Bengal	Kolkata	3200	3200	2600
Ghee Deshi	Agmark	Quintal	West Bengal	Kolkata	NA	NA	NA
Ghee Deshi	—	Quintal	Uttar Pradesh	Khurja	NA	NA	NA
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	26583	27000	23500
Fish	Rohu	Quintal	West Bengal	Kolkata	NA	NA	NA
Fish	Sea Prawns	Quintal	Tamil Nadu	Chennai	20000	20000	22000
Eggs	Madras	1000 No.	West Bengal	Kolkata	3200	3250	2250
Tea	Medium	Quintal	Assam	Guwahati	NA	NA	NA
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	13000	13000	14000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	30000	30000	25000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	12400	12400	12000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2300	2325	2600
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2215	2215	2500
Tobacco	Bidi	Quintal	West Bengal	Kolkata	3500	3400	3250
Rubber	—	Quintal	Kerala	Kottayam	19350	18200	22000
Arecanut	Rashi	Quintal	Tamil Nadu	Chennai	30000	30000	24000

NA :—Not Available

NT :—Not Transaction

C. Crop Production

3. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING MAY, 2012

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

(K)—Kharif. (R)—Rabi.

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