Agricultural Situation in India

February, 2015

सत्यमेव जयते

Publication Division
Directorate of Economics and Statistics
Department of Agriculture and Cooperation
Ministry of Agriculture, Government of India

AGRICULTURAL SITUATION IN INDIA

February, 2015

PUBLICATION DIVISION
DIRECTORATE OF ECONOMICS and STATISTICS
DEPARTMENT OF AGRICULTURE and CO-OPERATION
MINISTRY OF AGRICULTURE
GOVERNMENT OF INDIA

Serv.3/e/Agriculture 2015/5264Agri\5264Agri(1-3)(Prelims)

Publication Division

DIRECTORATE OF ECONOMICS AND STATISTICS
DEPARTMENT OF AGRICULTURE AND CO-OPERATION
MINISTRY OF AGRICULTURE

GOVERNMENT OF INDIA
C-1, HUTMENTS, DALHOUSIE ROAD,
NEW DELHI-110011
PHONE : 23012669

Subscription

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

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

Agricultural Situation in India

VOL. LXXI February, 2015 No. 11

CONTENTS

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

NOTE TO CONTRIBUTORS

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

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

An honorarium of Rs. 2000 per article of atleast 2000 words for the regular issue and Rs. 2500 per article of at least 2500 words for the Special/Annual issue is paid by the Directorate of Economics & Statistics to the authors of the articles accepted for the Journal.

STATISTICAL TABLES

Abbreviations used

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

Plus (+) indicates surplus or increase.
Minus (–) indicates deficit or decrease.

GENERAL SURVEY OF AGRICULTURE

(i) Trends in Foodgrain Prices

During the month of December, 2014 the All India Index Number of Wholesale Price (2004-05=100) of Foodgrains declined by 0.42 percent from 235.8 in Nov., 2014 to 234.8 in Dec., 2014.

The Wholesale Price Index (WPI) Number of Cereals declined by 0.72 percent from 234.8 to 233.1 and WPI of Pulses increased by 1.00 percent from 240.5 to 242.9 during the same period.

The Wholesale Price Index Number of Wheat increased by 1.32 percent from 211.7 to 214.5 while that of Rice declined by 2.08 percent from 245.4 to 240.3 during the same period.

(ii) Wheather, Rainfall and Reservoir Situation during January, 2015

Cumulative Winter (January to February) Rainfall for the country as a whole during the period 01st January to 28th January, 2015 is 6% lower than LPA. Rainfall in the four broad geographical divisions of the country during the above period was lower than LPA by (-) 32% in North West India, (-) 38% in East & North East India, (-) 9% in South Penisula and higher than LPA by 37% in Central India.

Out of a total of 36 meterological sub-divisons, 25 sub-divisions received excess/normal rainfall and 11 sub-divisions received deficient/scanty rainfall.

Central Water Commission monitors 85 major reservoirs in the country which have a total live capacity of 155.05 BCM at Full Reservoir Level (FRL). Central live storage in these reservoirs as on 29th January, 2015 was 77.36 BCM as against 92.66 BCM on 29.01.2014 (last year) and 76.79 BCM of normal storage (average storage of the last 10 years). Current year's storage in 83% of the last year's and 101% of the normal storage.

As per lastest information available on sowing of crops, around 97.1% of the normal area under Rabi crops have been sown upto 30.01.2015. Area sown under all Rabi crops taken together has been reported to be 596.24 lakh hectares at All India level as compared to 636.04 lakh hectares in the corresponding period of last year.

Area reported was higher by 9.6 lakh ha. under Wheat, 1.9 lakh ha. under Maize, 2.1 lakh ha. under Urad and 1.2 lakh ha. under Moong. Area coverage was lower by 6.0 lakh ha. under Jowar, 6.4 lakh ha. under Gram, 2.9 lakh ha. Under Rapeseed & Mustard, 2.4 lakh ha, under Sunflower, 1.3 lakh ha. under Groundnut and 1.1 lakh ha. in Safflower.

(iii) Price Movement of Onion, Potato and Tomato druing January, 2015

The All India average wholesale price of onion during January 2015 was Rs. 1968/qtl compared to Rs. 2022/qtl in December, 2014, showing a marginal decline of 2.67% over the last month. The average wholesale price during January, 2015 was in the range of Rs. 929/qtl in Indore to Rs. 3811/qtl in Kozhikode. At the retail level, Al India average price of onion in January, 2015 was Rs. 23/kg as compared to Rs. 26/-kg in December, 2014. The average retail price ranged from Rs. 11/kg in Indore to Rs. 44/kg in Eranakulam. Total arrivals of onion during January (29/12/2014-28/01/2015) was 10,04,975 tonnes which was about 27.4% higher than the previous month's arrival and 1.7% lower than the previous year.

In case of potato, the All India average wholesale price during January, 2015 was Rs. 1432 qtl. compared to Rs. 1929/qtl in December, 2014 showing a decrease of 26% over the last month. The average wholesale price during January, 2015 was in the range of Rs. 476/qtl in Agra to Rs. 3284/qtl in Thiruvananthapuram. At the retail level, All India average retail price of potato in January, 2015 was Rs. 18/kg as compared to Rs. 20/kg in December, 2014. The average retial price was in the range of Rs. 7/kg in Bhagalpur to Rs. 33/kg in Thiruvananthapuram. Total arrivals of potato during January (29/12/2014-28/01/2015) was 14,75,792 tonnes which was about 10.8% higher than the previous month's arrival and 9.6% higher than the previous year.

In respect of tomato, the All India average wholesale price during January, 2015 was Rs. 1739/qtl compared to Rs. 1742/qtl in December, 2014 registering a marginal decline of 0.17% over the previous month. The average wholesale price during January, 2015 was in the range of Rs. 640/lqtl in Ranchi to Rs. 3147/qtl in Ludhiana. At the retail level, All India average price of tomato in Janaury, 2015 was Rs. 21/kg compared to Rs. 23/kg in December, 2014. The average retail price ranged between Rs. 10/kg in Ranchi to Rs. 40/kg in Ludhiana. Total arrivals of tomato during January (29/12/2014-28/01/2015) was 4,17,555 tonnes which was about 38.3% lower than the previous month's arrival and 10.7% higher than the previous year.

Economic Growth

The Central Statistics Office (CSO) has recently undertaken a revision in National Accounts aggregates by Shifting to the new base of 2011-12 from the earlier base of 2004-05. As per the revised base year 2011-12, the growth rate of Gross Domestic Product (GDP) at constant (2011-12) market prices is estimated at 7.4 percent in 2014-15 (advance estimates). The growth rate of Gross Value Added (GVA) at constant (2011-12) basic prices for agriculture & allied sectors, industry Value Added (GVA) at constant (2011-12) basic prices for agriculture & allied sectors, industry sector and services sector are estimated to be at 1.1 per cent, 5.9 per cent and 10.6 per cent respectively, in 2014-15 compared to 3.7 per cent, 4.4 per cent and 9.1 per cent respectively in 2013-14. The growth rate of GVA at constant basic prices for the first, second and third quarters of 2014-15 is estimated at 7.0 per cent, 7.8 per cent and 7.5 per cent respectively, compared to 7.2 per cent, 7.5 per cent and 6.6 per cent respectively during the corresponding quarters of previous year.

TABLE 1: GROWTH OF GVA AT BASIC PRICES BY ECONOMIC ACITIVITY (AT 2011-12 PRICES) (IN PER CENT)

Sector	Growth			Share in GVA		
	2012-13	2013-14	2014-15*	2012-13	2013-14	2014-15*
Agriculture, forestry & fishing	**1.2**	**3.7**	**1.1**	**17.7**	**17.2**	**16.2**
Industry	**2.4**	**4.5**	**5.9**	**32.3**	**31.7**	**31.2**
Mining & quarrying	-0.2	5.4	2.3	3	3	2.9
Manufacturing	6.2	5.3	6.8	18.3	18.1	18
Electericity, gas, water supply & other utility services	4.0	4.8	9.6	2.4	2.3	2.4
Construction	-4.3	2.5	4.5	8.6	8.3	8
Services	**8.0**	**9.1**	**10.6**	**50**	**51.1**	**52.6**
Trade, hotels, transport, communication and services related to broadcasting	9.6	11.1	8.4	18	18.8	18.9
Financial, real estate & professional services	8.8	7.9	13.7	19.5	19.7	20.9
Public administration, defence and other services	4.7	7.9	9	12.5	12.6	12.8
GVA at basic prices	**4.9**	**6.6**	**7.5**	**100.0**	**100.0**	**100.0**
GDP at market prices	**5.1**	**6.9**	**7.4**	**----**	**---**	**---**

Source: CSO.*: Advance Estimates.

TABLE 2: QUARTER-WISE GROWTH OF GVA AT CONSTANT (2011-12) BASIC PRICES (IN PER CENT)

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

Source:CSO.

FARM SECTOR NEWS RELEASES

Area Coverage Under Rabi Crops

As per Rabi Crops data released by Directorate of Economic and Statistics, Ministry of Agriculture, total area coverage as on today under Rabi crops moves to 552.82 lakh hectares while last year's sowing area was at 579.63 lakh hectare. Wheat's sowing area is at 293.16 lakh hectares as compared to last year's 294.30 lakh hectares. The area under sowing of total Coarse cereals is at 51.17 lakh hectares as compared to last year's 56.18 lakh hectares. The area under sowing of Gram is at 79.65 lakh hectares this year while the last year's figure was 95.03 lakh hectares. Area coverage under Total Pulses is at 129.99 lakh hectares while the last year's sowing area coverage was 144.79 lakh hectares. Similarly sowing area under total oilseeds is at 75.43 lakh hectares as compared to 80.93 lakh hectares last year.

Union Agriculture Minister Emphasises on the Potential of 'Neem' Coated Urea

Union Agriculture Minister Shri Radha Mohan Singh while addressing farmers in a function at the launching of 'Neem' coated urea organised by KRIBHCO, Hebbal, Bengaluru today, emphasised on the maximum use of neem coated urea for increase of production and reduction in production cost. He further said that 'neem coated urea is helpful in reducing the pollution of water, soil and air. Shri Singh said that India have to import about 70 lakh ton of urea every year, which affects the foreign exchange. He further said that plants cannot absorb nitrogen found in urea to its maximum extent as a result a large component of it goes waste. By increasing the utility factor of nitrogen (through 'neem' coated urea), the consumption of urea can be reduced, he added.

India has been using neem over the centuries in one way or the other. 'Neem' is a true friend of farmers from ancient times. KRIBHCO has developed neem coated urea, by mixing 'neem' oil in urea, which is being used by various farmers across the country and they are benefited by it. Shri Singh further said that by using neem coated urea the utility capacity of nitrogen can be increased by 10 to 15%. By balanced used of fertilizers, the health of soil can be sustained over a long period, he said.

Union Agriculture Minister Calls Upon the Farmers to use Modern Techniques and Machinery

Union Agriculture Minister Shri Radha Mohan Singh called upon the horticulture farmers to use modern techniques and machinery as per international standards to produce horticultural products. He spoke about showcasing imported modern equipments and machinery and promoting their use by providing subsidy for this purpose. He was speaking during a function titled 'Horticulture Sangam' jointly organised by National Horticulture Board and Horticulture Department of Government of Karnataka at Lalbagh, Bengaluru today.

Shri Singh said that organisation of such events gives inspiration to horticulture fraternity to work together and facilitates the availability of horticulture products of various states at single place. The ethos behind organising this event is in consonance with Integral part of Indian culture *i.e.*, 'Vasudhaiva Kutumbakam'. Attributing, horticultural production at 275 million tonnes during 2014-15 (as per initial estimates) to the efforts of farmers, Shri Singh said that Government has intergrated all horticulture programme into Mission for Integrated Development of Horticulture (MIDH), so that farmers and entrepreneurs are benefited. Indian horticulture products, such as Mango, Lichi, Grapes, Saffron have their distinct identity in Global Market. By exporting horticulture products farmers have contributed in increasing the country's foreign exchange, he added.

Shri Singh said that Government is facilitating the use of advanced horticulture techniques through its Horticulture Central Programmes so that farmers can achieve high productivity with quality and efficiency in cultivation of horticulture products. Government is also promoting chain of cold storage across the country so as to avoid wastage of horticulture products. In this 'Horticulture Sangam' business groups such as Mother Dairy, Reliance, Walmart, Big Bazaar, Spencer are participating so that farmers can directly sell their products to them, he said.

The programme was inaugurated by Union Minister of Fertilisers and Chemicals, Shri Ananth Kumar. Diginitaries present on this occasion included State Government Ministers, MLAs, MD (National Horticulture Board, Ministry of Agriculture) and Senior officials of State Government.

Union Agriculture Minister Emphasises that Proper Marketing is Essential for Ensuring Increase in the Income of the Farmers

Shri Radha Mohan Singh, Union Minister for Agriculture, stressed the need for strengthening the marketing of the agricultural produce on priority to ensure that agriculture becomes beneficial for the farmers of the country. In his valedicatory address at 4th India International Potato Expo

2015 today at Chandigarh the Minister said that allied sectors of the agriculture like horticulture, diary, and fisheries be promoted and diversification of the crops especially their proper marketing is essential to ensure to increase the income of the farmers. He said that Haryana Horticulture University will be opened soon in consultation with the State Government.

He informed the gathering that the final draft of Irrigation Policy has been prepared and the same will be implemented in all the states. This policy will be able to provide water to every district and work for everybody.

Speaking on the occasion, Shri Om Prakash Dhankar, Minister of Agricultural & Horticulture Development, Government of Haryana mentioned that Excellency Centres in every districts for horticulture in Haryana will be opened to provide better marketing.

Dr. Sanjeev Chopra, Joint Secretary, Union Ministry of Agriculture said that market linkage is the only solution for the potato farmers in India. Hence, effort should be made to develop better market for the farmers domestically and internationally.

Government officials, scientists and industry experts deliberated on the problems being faced by potato industry including lower potential yield, early harvesting, uneconomic landholdings, requirement of capital that is mostly unavailable with farmers, shortage of farm labour, wrong dose of fertilizer, inadequate and inefficient transport infrastructure, enhanced pest resistance, global warming, and inefficient cold storage facility. It was felt that the selection of seed, water and pesticides are very important to generate good quality potato. This will help the farmers to get better market domestically and internationally.

The 4th India International Potato Expo 2015 was supported by Ministry of Food Processing Industry, Central Potato Research Institute (CPRI), Indian Council of Agriculture Research (ICAR), Ministry of Agriculture, NABARD, Food and Agriculture Organization, Department of Horticulture, Government of Haryana, Government of Bihar, Government of Madhya Pradesh, Government of Uttrakhand, Government of Meghalaya and National Horticulture Board.

Union Agriculture Minister, Shri Radha Mohan Singh says that Cooperative Leadership and Training are Essential for Stable Economy and Inclusive Development

Union Agriculture Minister, Shri Radha Mohan Singh said that cooperative leadership and training are essential for stable economy and inclusive development in the present age of globalisation when the Indian economy is passing through an era of competitiveness. He was speaking at a function organised in New Delhi today, titled 'National Conference on Strengthening of Cooperative Education and Training'. Efficient management of human resources is the bedrocks for the development of cooperatives. For this, the training programmes of cooperatives have to be dove-tailed to the hour of the day, he said.

Government have received proposals for opening cooperative management institutes from North Eastern Region like Sikkim, Mizoram, Tripura and states of Chattisgarh and Jharkhand, he said. Union Agriculture Minister mentioned that Government is keen to strenthen cooperative education and training in these states and all efforts will he made to provide sufficient funds and other resources in this regard.

Shri Singh said that in North East region, Government is implementing cooperative programme through NCUI. NCUI have established 8 field projects is North Eastern region which include Aizawl (Mizoram), Thoubal and Imphal (Manipur), Magalbara (Sikkim, Shillong (Meghalaya), Kohima (Nagaland), Morigaon and Jorhat (Assam).

Shri Singh said that National Cooperative Development Corporation (NCDC) provides encouragement and financial assistance to cooperatives from primary level to national level and also provides them with technical guidance including computerisation skills. So far, NCDC have sanctioned Rs 269.15 cr to 352 cooperative committees/banks and have released Rs. 202.15 cr. He said that NCDC implements ICDP (Integrated Cooperative Development Projects) in selected districts. NCDC released Rs 405.70 cr. for 19 projects in Arunachal Pradesh, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, Uttar Pradesh and Haryana. NCDC have released a total amount of Rs. 3126.23 cr. to least developed states as against sanctioned amount of Rs 5535.05 cr.

Shri Singh said that NABARD is playing an important role as an advisor to provide core banking solution to cooperative banks. NABARD also gives technical/ technological infrasture and Human Resources training to state and district level cooperative banks. Recently, Government have decided to provide Rs 23.75 cr. as special package to 23 district cooperative banks (16 from Uttar Pradesh) to revive them.

Mentioning Cooperative movement of India as World's largest one, Shri Singh said that there are about 5.89 lakh cooperative committees spread across from village to national level. These Committees have a membership of 25 crore people covering 97% villages and 71% total rural families. Agriculture cooperative credit contributes 16.9% fertiliser production 29%, weaver cooperatives 54% and sugar production 40% towards the Indian economy.

Mentioning Dairy cooperatives, Shri Singh complimented Amul model of Gujarat and said that it has played an important role.

Minister for Agriculture, Fisheries & Forests, Fiji Calls on Shri Radha Mohan Singh Today

A delegation from Fiji led by, Mr. Inia Seruiratu Minister for Agriculture, Fisheries & Forests Minister for Rural & Maritime Development and National Disaster Management called on Union Agriculture Minister, Sh. Radha Mohan Singh in Krishi Bhawan, New Delhi today.

Fiji has proposed to enter into MoUs in the follwing generic areas:

1. Development of the Animal Husbandry Industry.
2. Cooperation in areas of Fisheries and Aqua-culture.
3. Horticulture Industry Development.
4. Revamping of the Rice Industry.
5. Cooperation i Root Crop Diversification.

It may be mentioned that MoU on Development Cooperation was signed with Fiji by Minister of External Affairs in 2006 which included Agriculture, Fisheries and Forests sectors as an item.

Shri Radha Mohan Singh assured the delegation that Agriculture Ministry will look into the points mentioned by them. Shri Radha Mohan Singh said that India looks forward to strengthening the bilateral relation to a new height.

Shri Radha Mohan Singh also showed keen interest on the point of an training of Agriculture student of Fiji at ICAR Institutes.

No Shortage of Seeds in Kharif Season 2015

A Zonal Conference of all the State Departments of Agriculture was held on 20th-21st January, 2015 at NASC Complex, Pusa Campus, New Delhi. The meeting held to review agriculture seeds availability, plan of the states for next kharif season and future seed rolling plan of the states. An assessment of availability of agriculture seeds in various states has been made and is satisfactory. In kharif 2015 approximately 137.27 lakh qtl. seed is required against which 140.69 lakh qtl. seed is available. There is no shortage of seeds except soyabean seeds. All the states were requested to take maximum benefit of central assistance under "submission on seed and planting material" and send the Annual Action Plan of 2015-16 by mid March positively.

A book on all the varieties of crops released in 2012 and its package and practices were released in the zonal conference and a copy of it was presented to all the states for operationalising it into the field. The states were requested and stress were given to adhere to quality and certified seeds to increase the productivity of agriculture in their respective areas.

NOTE TO CONTRIBUTORS

Articles on the state of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture & Cooperation monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. Good articles in Hard Copy, in MS Word, not exceeding five thousand words, and Soft Copy (email ID: agri.situation@gmail.com.), may be sent in duplicate, typed in double space on one side of Foolscap paper in Times New Roman font size 12, addressed to the Editor, Publication Division, Dte. of Economics and Statistics, M/o Agriculture, C-1, Hutments, Dalhousie Road, New Delhi 110011, along with a declaration by the author(s) that the article has neither been published nor submitted for publication elsewhere. The author(s) should furnish their e-mail address, Phone No. and their permanent address only on the forwarding letter so as to maintain anonymity of the author while seeking comments of the referees on the suitability of the article for publication.

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

An honorarium of Rs. 2000/- per article of at least 2000 words for the regular issue and Rs. 2500/- per article of at least 2500 words for the Special/Annual issue is paid by the Directorate of Economics & Statistics to the authors of the articles accepted for the Journal.

ARTICLES

Bajra Price Forecasting in Chomu Market of Jaipur District: An Application of SARIMA Model

HEMANT SHARMA* AND S.S. BURARK**

Abstract

The price behaviour of a commodity plays crucial role in farm level crop production planning. In this paper, an attempt has been made to forecast bajra price using statistical time-series modelling techniques-Seasonal Autoregressive Integrated Moving Average (SARIMA) Models. The forecasting performance of these models has been evaluated and compared by using common criteria such as: mean square error, mean absolute percentage error and Akaike Information Criteria (AIC) and Schwarz's Bayesian Information criterion (SBC). The data used in this study include monthly wholesale price of bajra from January 2002 to December 2013. A seasonal ARIMA (0,1,1) (0,1,1) model is constructed based on autocorrelation and partial autocorrealation. Finally, forecasts were made based on the model developed. On validation of the forecasts from these models, Seasonal ARIMA (0,1,1) (0,1,1) model performed better than the others for bajra in Chomu market. The validation percentage ranged between 85.6 per cent in December 2013 to 93.5 per cent in November 2013. Thus, SARIMA model can be used to predict the future price of bajra in Chomu market of Rajasthan state.

Introduction

Bajra (Pearl millet) is considered as the fifth important cereal crop, and most important millet (constitutes more than 55% of global millet production) and is grown in over 40 countries, predominantly in Africa and the Indian subcontinent. India produced 9.18 million tonnes of bajra in 2013-14 (Directorate of economics and Statistics). The major producing states in India are Rajasthan, Uttar Pradesh, Maharashtra and Gujrat. The major producing countries are Senegal, Mali, niger, Nigeria, Sudan and India. Bajra (Pennsetum typhoides L.) is one of the major coarse grain crops is also one of the most drought resistant crop among cereals and millets. It is higher than sorghum in nutritive value but less inferior in feeding value. Bajra grain contains about 12.4% moisture, 11.6% protein, 5% fat, 67% carbohydrates and about 2.7% minerals, Pearl millet production in India was characterized by subsistence cultivation during 1970s with a small marketable surplus. But in recent years, it is being geared to a more market oriented crop owing to the change in utilization from mainly food use to many other alternative uses such as animal feed, potable alcohol, processed food, etc.

Rajasthan has the highest area under pearl millet with the highest production in the country. The state occupies nearly 44.34 lakh ha. area with average production of about 41.55 lakh tonnes and productivity of 1067 kg/ha in 2013-14 (Deptt. of Agriculture, Govt. of Rajasthan). The crop is grown as a sole crop as well as mixed crop or inter-cropped with legumes or sesame in the state. Considering the fact that pearl millet continues to be an important food grains crop for India and its productivity has shown upward trend, it is an ideal food crop to expand the food basket of the country which is being eroded due to rise in population and growing demand of food security. Certain policy measures are immediately required, such as inclusion of pearl millet in PDS, promotion of pearl millet in breweries, linked with suitable incentives to growers and its promotion as poultry and animal feed. Also there is need to develop a strong market support system through market intelligence. The returns to the producer farmer are not only governed by production but prices at which the produce is marketed.

The prices of bajra fluctuate to a great extent mainly because of its supply side and increasing demand at domestic and global level. Thus, the price forecast may help to producers in acreage allocation and time of sale. Sowing time of bajra is in between start of June to end of July in Rajasthan. The peak time for arrival is November but it starts in small quantity by October. However, arrivals continue all over the year gradually.

Naturally forecasting is one of the main aspects of time series analysis having the art of saying that what will happen in the future rather than why. There are various forecasting models is use now a days. Forecaster can choose his own method of forecasting based on his knowledge and available external information. As the process goes on, this procedure can be modified to meet the conditions and to satisfy the current situation. Different

*Assistant Professor, Agro-Economic Research Centre, SPUVVN, Anand, Gujarat

** Professor, Deptt. of Agril. Economics and Management, MPUAT, Udaipur

forecasting models may be fitted more or less equally well to the data, but they forecasts different future values. Thus, the present study was an attempt to identify the best suited model of price forecasting for bajra in Chomu (Jaipur) market of Rajasthan.

Material and Methods

Chomu Market in Jaipur region was purposively selected for the price forecasting study of bajra (Pearl millet) on the basis of highest bajra arrivals from the producer-farmers in the state. The various price forecasting Seasonal Autoregressive Integrated Moving Average (SARIMA) models were tried to identify the most suitable model which suits to actual market price of bajra. The secondary data of monthly wholesale bajra prices were collected for the study from the Chomu (Jaipur) market. The data of bajra price in Chomu regulated market for the period from January 2002 to June 2013 was utilized for model fitting and data for subsequent priod i.e. from July 2013 to December 2013 was used for validation.

The details of various price forecasting Seasonal ARIMA models are as follows:

Box-Jenkins Models

Box-Jenkins (ARIMA) model (1976) was used to measure the relationship existing among the observations within the series. In its general form, the seasonal ARIMA model is characterized by a notation as ARIMA (p,d,q) (P,D,Q)s is given by

=(1-ϕB) (1-ΦBS)(1-B)(1—BS)y1=(1-φqBS) (1-φQBS)e1

where, B is the backshift operator (By1-yt-1, B2yt-yt-2 and so on), 's'the seasonal lag and 'e' and 't' a sequence of independent normal error variables with mean 0 and variance σ2. Φs and Φs are the seasonal and non-seasonal autoregressive parameters, respectively. φs and φs are seasonal and moving average parameters, non-sesonalrespectively. P and q are orders of non-seasonal autoregressive and moving average parameters respectively, whereas, P and Q are that of the seasonal auto regression and moving average parameters, respectively. Also 'd' and 'D' denote non-seasonal and seasonal differences, respectively.

The Main Stages in Fiting Box-Jenkins Seasonal ARIMA Model are i) Identification, ii) Estimation of parameters, iii) Diagnostic checking, and iv) Forecasting.

Identification of Models: The foremost step in the process of modelling is to check for the stationarity of the series, as the estimation procedures are available only for stationary series. There are two kinds of stationarity, viz., stationarity in 'means'and stationarity in 'variance'. A cursory look at the graph of the data and structure of autocorrelation and partial correlation coefficients may provide clues for the presence of stationarity. Another way of checking for stationarity is to fit a first order autoregressive model for the raw data and test whether the coefficient '1 ϕ ' is less than one. If the model is found to be non-stationary, stationarity could be achieved mostly by differencing the series or go for a Dickey Fuller test. Stationarity in variance could be achieved by some modes for transformation, say, log transformation.

The next step in the identification process is to find the initial values for the order of seasonal and non-seasonal parameters, p, q, and P, Q. They could be obtained by looking for significant autocorrelation and partial autocorrelation coefficients. Say, if the second order auto correlation coefficient is significant, then an AR (2), or MA (2) or ARMA model could be tried to start with. This is not a hard and fast rule, as sample autocorrelation coefficients are poor estimates of population autocorrelation coefficients. Still they can be used as initial values while the final models are achieved after going through the stages repeatedly. Yet another application of the autocorrelation function is to determine whether the data contains a strong seasonal component.

Estimation of Parameters

At the identification stage one or more models are tentatively chosen that seem to provide statistically adequate representations of the available data. Then we attempt to obtain precise estimates of parameters of the model by least squares as advocated by Box and Jenkins. Standard computer packages like SPSS 7.5 are available for finding the estimates of relevant parameters using iterative procedures.

Diagnostic Checking of the Model

After having estimated the parameters of a tentatively identified ARIMA model, it is necessary to do diagnostic checking to verify that the model is adequate. Examining Autocorrelation Function (ACF) and Partial ACF (PACF) of residuals may show up an adequacy or inadequacy of the model. If it shows random residuals, then it indicates that the tentatively identified model was adequate. The residuals of ACF and PACF considered random, when all their ACF were within the limits of

$$\pm 1.96\sqrt{\frac{1}{(n - 12)}}$$

The minimum Akaike's Information Co-efficient (AIC) can be used to determine both the differencing order (d, D) required to attain stationary and the appropriate number of AR (p) and MA(q) parameters. It can be computed as follows

$$AIC = n(1 + \log(2\pi)) + n \log \sigma^2 + 2m$$

where, σ2 is the estimated MSE, 'n' is the number of observations being used and 'm' is the number of parameters (p+q+P+Q) to be estimated.

Measurement of Forecast Accuracy

Forecast accuracy is a significant factor when deciding among forecasting alternatives. Accuracy is based on the historical error performance of a forecast. Three commonly used measures for summarizing historical errors are the **MAD, MSE** and **MAPE**. MAD is the average absolute error, MSE is the average of squared errors, and MAPE is the average absolute percent error.

The formulas used to compute MAD, MSE, and MAPE are as follows:

$$MAD = \frac{\Sigma \left| \text{Actual}_t - \text{Forecast}_t \right|}{n}$$

$$MSE = \frac{\Sigma (\text{Actual}_t - \text{Forecast}_t)^2}{n-1}$$

$$MAPE = \frac{\Sigma \left| \frac{\text{Actual}_t - \text{Forecast}_t}{\text{Actual}} \right| \times 100}{n}$$

Results and Discussion

Seasonal ARIMA (p,d,q) is the general form of Seasonal Autoregressive Integrated Moving Average models. Here p stands for the order of the autoregressive process, d presents the degree of differencing involved, and q is the order of the moving average process. Using SPSS package for different value of p, d and q(0, l or 2), various Seasonal ARIMA models were fitted and appropriate model was chosen corresponding to minimum value of the selection criterion *i.e*. Akaike Information Criteria (AIC) and Schwarz's Bayesian Information criterion (SBC). The monthly wholesale prices data of bajra from Chomu (Jaipur district) market were used in the SARIMA analysis (Appendix.-1).

The results of SARIMA model are presented in Table 1 and 2 and figure 1 to 2. It can be seen from the Table 1 that autocorrelation function (ACF) declined very slowly and as many ACF's were significantly different from 0 and fell outside the 95 per cent confidence interval, the price of Bajra was non-stationary for Chomu market. It can be observed that the partial autocorrelation function (PACF) declined rapidly after the first lag period, which also indicated the non stationerity of the price series. It was corrected through appropriate differencing of the data. The best model was chosen from the following SARIMA models viz., SARIMA (1,1,0), (1,1,0) SARIMA (1,1,1), SARIMA (0,1,1), (1,1,1), (0,1,1) SARIMA (2,1,1) (2,1,1) SARIMA (1,1,2) (1,1,2) and SARIMA (0,1,2) (0,1,2) on the basis of the least Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC). The above SARIMA models were estimated through SPSS 7.5 version of SPSS package. The SARIMA model (0,1,1) (0,1,1) observed least AIC and SBC values. The MAPE for SARIMA (0,1,1) (0,1,1) was also lowest. Thus, SARIMA model (0,1,1) (0,1,1) was the most representative model for the price forecast of bajra in Chomu market.

Table 1: Autocorrelation Coefficient and Bajra Price

(Rs.)

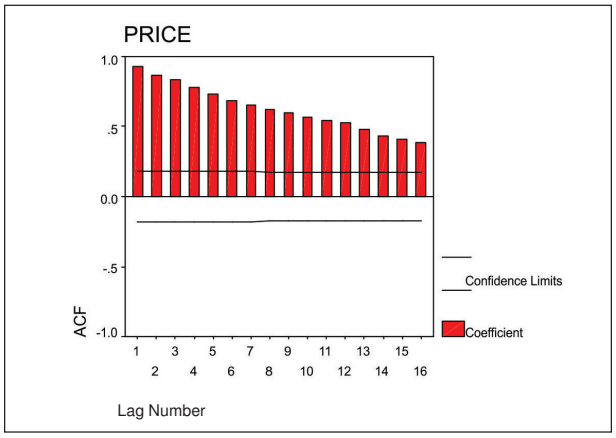
Lag	Auto-Corr.	Stand. Err.	-1 -.75 -.5 -.25 0 .25 .5 .75 1	Box-Ljung	Prob.
1.	.928	. 091	I***.**********	103.351	.000
2.	.869	.091	I***.**********	194.673	.000
3.	.832	.090	I***.**********	279.287	.000
4.	.783	.090	I***.**********	354.860	.000
5.	.730	.090	I***.**********	421.171	.000
6.	.688	.089	I***.**********	480.572	.000
7.	.650	.089	I***.*********	534.112	.000
8.	.624	.088	I***.********	583.927	.000
9.	.597	.088	I***.********	629.882	.000
10.	.567	.088	I***.********	671.778	.000
11.	.545	.087	I***.********	710.730	.000
12.	.530	.087	I**.********	748.025	.000
13.	.484	.086	I**.********	779.352	.000
14.	.437	.086	I**.********	805.146	.000
15.	.411	.086	I**.********	828.204	.000
16.	.390	.085	I**.********	849.130	.000

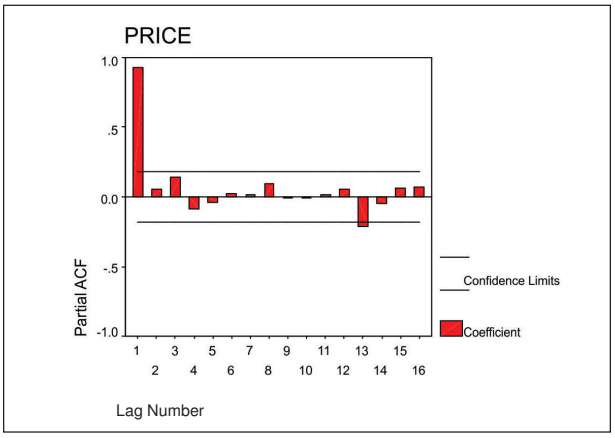
TABLE 2: PARTIAL AUTOCORRELATION COEFFICIENT AND BAJRA PRICE

(Rs.)

Lag	Pr-Aut-Com.	Stand. Err.	-1 -.75 -.5 -.25 0 .25 .5 .75 1
			+----+----+----+----+----+----+----+----+
1.	.928	.092	. I*** .**********
2.	.053	.092	. I* .
3.	.144	.092	. I*** .
4.	-.086	.092	. . ** I .
5.	-.040	.092	. . * I .
6.	.020	.092	. . * .
7.	.017	.092	. . * .
8.	.094	.092	. . I** .
9.	-.009	.092	. . * .
10.	-.011	.092	. . * .
11.	.017	.092	. . * .
12.	.055	.092	. . I* .
13.	-.215	.092	. .****I .
14.	-.046	.092	. . * I .
15	.062	.092	. . I* .
16.	.069	.092	. . I* .

Figure 1 & 2: Autocorrelation and Partial Autocorrelation Coefficient and Price





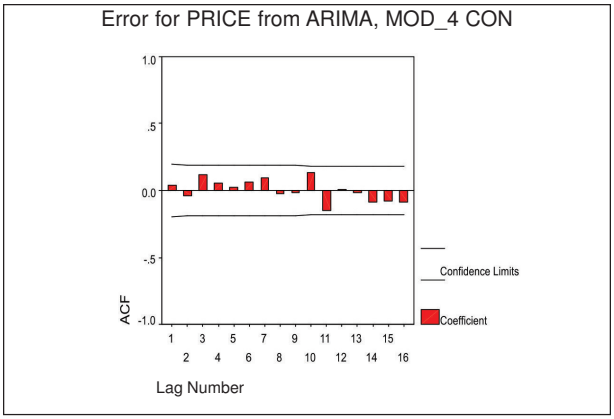
Comparative Performance of Different Price Forecasting Seasonal ARIMA Models

Residual analysis was carried out to check the adequacy of the models. The residuals of ACF and PACF were obtained from the tentatively identified model. The adequacy of the model was judged based on the value of AIC and SBC. The values of the statistics are shown in Table 3. The model (0,1,1) (0,1,1) was found to be the best model for prices in Chomu market, since it had the lowest statistic for AIC and SBC.

TABLE.3 COMPARATIVE PERFORMANCE OF DIFFERENT PRICE FORECASTING SEASONAL ARIMA MODELS

Model (p,d,q) (P,D,Q)	AIC	SBC
(1,1,0) (1,1,0)	1164.53	1172.46
(0,1,1) (0,1,1)	**1145.81**	**1153.75**
(1,1,1) (1,1,1)	1152.88	1166.10
(2,1,1) (2,1,1)	1151.83	1170.34
(1,1,2) (1,1,2)	1152.35	1170.87
(0,1,2) (0,1,2)	1149.88	1163.10

The autocorrelation and partial autocorrelation of various orders of the residuals of Seasonal ARIMA (0,1,1) (0,1,1) upto 16 lags were computed and shown in Figure 3 and 4, respectively. The figures depicted the absence of autocorrelation as the autocorrelation and partial autocorrelation functions at various lags fall within the 95 per cent confidence interval. This proved that the selected Seasonal ARINA model was most appropriate for forecasting the price of barja during the period under study.



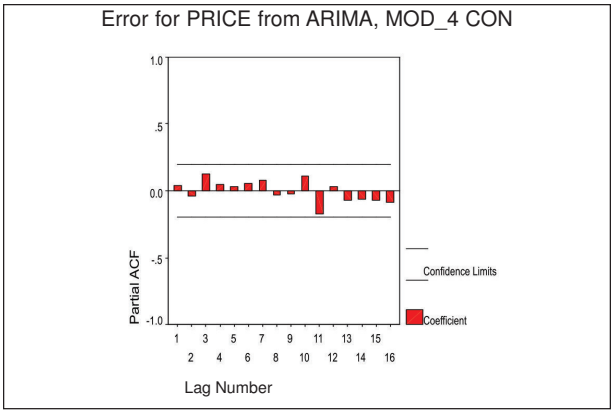


Figure 3 and 4: ACF and PACF diagnostic checking of SARIMA (0,1,1) (0,1,1)

Error for PRICE from ARIMA, MOD-CON Error for PRICE from ARIMA, MOD_4 CON

Autocorrelation Partial Autocorrelation

The performance of the seasonal ARIMA forecast was measured in terms of Mean Absolute Deviation (MAD), Mean Standard Error (MSE) And Mean Absolute Percentage Error (MAPE). The comparative performances of different seasonal ARIMA models are presented in Table 4.

TABLE 4: EXTENT OF ACCURACY THROUGH DIFFERENT CRITERION

Criteria	(1,1,0) (1,1,0)	**(0,1,1) (0,1,1)**	(1,1,1) (1,1,1)	(2,1,1) (2,1,1)	(1,1,2) (1,1,2)	(0,1,2) (0,1,2)
MAD	77.75	52.91	72.85	60.50	60.88	78.54
MSE	14224.71	6962.86	12476.37	8729.93	8769.02	14583.97
MAPE	6.80	4.61	6.37	5.29	5.32	6.88

From the Table 4, it can be inferred that the (0,1,1) (0,1,1) SARIMA model is the preferred model for forecasting bajra price due to the minimum value of MAD (52.91), MSE (6962.86) and MAPE (4.61) when compared to the other models. The actual prices of bajra in Chomu market and the predicted values for these months through seasonal ARIMA models are presented in Table 5. In order to check the validity of these forecasted values, they were compared with the actual values of price of bajra during the post sample forecast period i.e. from July-2013 to December-2013 (Six months) which is shown in Table 5. The accuracy percentages vary from 82.1 per cent to 93.5 per cent. It was observed that the accuracy percentage out of different SARIMA models the prevailing market price of bajra and based on seasonal ARIMA (0,1,1) (0,1,1) model was very close to actual value as compared to other predicted model prices. This proved that the seasonal ARIMA (0,1,1,) (0,1,1) model was the best fit model for forecasting the price of bajra for Chomu market during the period under study.

TABLE 5: FORECAST PRICE OF BAJRA BY DIFFERENT SEASONAL ARIMA MODELS (RS./QUINTAL)

Month	Actual Price	Predicted Price (1,1,0) (1,1,0)	**(0,1,1) (0,1,1)**	(1,1,1) (1,1,1)	(2,1,1) (2,1,1)	(1,1,2) (1,1,2)	(0,1,2) (0,1,2)
Jul-13	1116	1031.97 (92.5)	1041.56 (93.3)	1030.45 (92.3)	1044.17 (93.6)	1037.79 (93.0)	1034.6 (92.7)
Aug-13	1195	1010.91 (84.6)	1042.68 (87.3)	1022.05 (85.5)	1038.37 (86.9)	1037.53 (86.8)	1032.09 (86.4)
Sep-13	1156	950.5 (82.2)	1070.89 (92.6)	966.35 (83.6)	1052.76 (91.1)	1037.77 (89.8)	949.1 (82.1)
Oct-13	1097	930.96 (84.9)	1013.85 (92.4)	952.99 (86.9)	977.42 (89.1)	982.13 (89.5)	918.36 (83.7)
Nov-13	1081	971.2 (89.8)	1010.55 (93.5)	981.93 (90.8)	986.24 (91.2)	995.52 (92.1)	967.51 (89.5)
Dec-13	1175	991.52 (84.4)	1005.51 (85.6)	992 84.4)	995 (84.7)	998.75 (85.0)	975.86 (83.1)

Note - Figures in parentheses are percentage of accuracy.

Conclusion

In the present investigation, different forecasting models of seasonal ARIMA (Box-Jenkins) were considered to produce forecast and to measure the forecast accuracy among selected different models. Price forecast based on various time series forecasting methods were produced and compared with the actual price. The best model was chosen on the basis of least values of Akaike Information Criteria (AIC), Schwarz Bayesian Criteria (SBC) and MAD (average absolute error), MSE (average of squared errors), and Mean Absolute Percentage Error (MAPE). From the various forms of Seasonal ARIMA models *viz.*

SARIMA (1,1,0) (1,1,0) SARIMA (1,1,1) (1,1,1), SARIMA (0,1,1) (0,1,1), (2,1,1) SARIMA (2,1,1) (1,1,2) and SARIMA (0,1,2) (0,1,2); On comparing the alternative models, it was observed that AIC (1145.83), SBC (1153.75), MAD (52.91), MSE (6962.86) and MAPE (4.61) were least for SARINA (0,1,1) model . It come out to be the most representative model for the price of bajra in Chomu market of Rajasthan. The model can be used for reaching dependable price forecast for many agricultural produce that have immense policy implications.

REFERENCES:

Box, G.E.P. and Jenkins, G.M. 1976. Time series analysis: Forecasting and control, Second Edition, Holden Day.

Burark, S.S., Pant, D.C.Sharma Hemant, Bheel S.K. 2011, "Price Forecast of Coriander-A Case Study of Kota Market of Rajasthan" *Indian Journal of Agricultural Marketing, 25(3): 72-82.*

Burark, S.S. Sharma Hemant 2011, ''Price forecasting of Coriander: Methodological Issue'' 20th Annual Conference on Agriculture Inputs and Services Delivery System for Accelerating Growth and Improving Farm Income held at New Delhi from 9th to 11th October, 2012 *Agricultural Economics Research Association, Vol (25): 350.*

Martin, R.V. Washington, R. Downing, T.E. 2000 Seasonal maize forecasting for South Africa and Zimbabwe derived from an agro-climatologically model, *Journal of Applied Meteorology, 2000.* ***(39.9),*** 1473-1479.37 ref.

Karim, M.R. Awal, M.A. Akter, M. 2010 Forecasting of wheat production in Bangladesh. *Bangladesh Journal of Agricultural Research. 2010.* **(35:1),** 17-28.19.

www.krishi.rajasthan.gov.in

APPENDIX-1

Wholesale Price of Bajra, Chomu (Jaipur District) Market

(in Rs./qtl)

Month	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Jan	370	625	365	560	700	675	610	749	950	808	927	1010
Feb	450	665	385	580	685	665	620	825	950	788	928	1000
March	455	635	395	570	625	675	645	887	923	814	972	990
April	465	685	375	625	675	670	615	925	952	885	1037	980
May	450	620	375	600	715	650	670	965	953	912	998	990
June	500	560	375	630	700	625	655	875	929	940	930	1025
July	550	470	525	725	700	640	689	1000	960	960	1016	1116
August	650	460	425	675	700	620	744	1100	981	902	996	1195
Sept.	600	430	475	615	600	540	670	821	937	790	1016	1156
Oct.	600	340	450	600	650	570	640	800	772	750	1010	1097
Nov.	625	450	500	600	685	590	650	950	789	812	1000	1081
Dec.	**600**	**400**	**515**	**625**	**677**	**605**	**700**	**950**	**794**	**847**	**1011**	**1175**

Input Utlization, Returns and Profitability of Major Food grains Crops of Himachal Pradesh

Dr. Sandeep Kumar*

Abstract

As an economy develop and diversify, the primary agriculture sector loses weights in terms of GDP but develop strong backward and farward linkages with other sectors of the economy and the success story of its progress largely depends upon profitability and returns from this sector. The present study is also an attempt to evaluate primarily returns and profitability of extensively grown crops of Himachal Pradesh along with land use, holding size, cropping pattern and input use structure. The study indicated that there is limited scope to increase net sown area and curb marginalization of holding due to fragmentation, scattered and uneconomic nature of farm. Again, area under fruits and vegetables is increasing and the input use pattern shows human labour, machine labour, fertilizer and manure as the main items. In terms of net returns and profitability, only paddy and potato crops are bearing positive returns and wheat crop can be added in this list in case of profitability. However, farmers are quite rational in terms of using their own resources but there are other impediments outside the crop enterprise to raise agricultural production. Quality rural education, introduction of supplementary vocations, creation of private enterprise environment and effective implementation of rural bottom up policy are required to increase employment avenue outside the agriculture and rain harvesting, quality extension services, emphasis on horticulture development, policy for live stocks are urgently needed to upgrade farm productivity and adding non-farm productivity for overall well being of farm families.

I. Statement of the Problem

Development of agriculture is logical and unavoidable for the general economic development of our country because it has a crucial role to provide food, livelihood and employment to a large chunk of population besides a source of raw material to expanding the industries. It provides direct employment to about 48.9 per cent of the working population and contributing about 13.9 per cent of the Gross Domestic Product of the country (Economic Survey 2013-14). Agriculture has also a lion's share in the occupation of the people of Himachal Pradesh as 70 per cent of the working population is directly or indirectly depends upon it and about 14.42 per cent of the total gross state domestic product comes from this sector (Economic Survey of H.P., 2013-14) and its performance affects the overall operation of the economy. The preponderance of agriculture in the state economy is also discernible from the fact that about 90 per cent population of the state resides in rural areas (highest in country in terms of percentages) and there is greater scope for the development of this sector comprising of cultivation, horticulture, animal husbandry and fishery.

The economy of the state is predominantly agricultural Wheat, Paddy, Maize and barley are principal crops, while potato and ginger are the main cash crops. The success of field crops, by and large, depends upon rain which is often erratic and not well spread. Soil erosion is rampant. Agricultural productivity is much low as compared to the adjoining states of Punjab, Haryana, and Western Uttar Pradesh due to the hilly terrain, Peculiar agro climatic conditions, inadequate irrigation and infrastructural facilities, terraced and fragmented holdings or steep slopes, poor soil, low input use and severity of the climate. Several studies {C.S. Nadda and Ranveer Singh (1981), H.R. Kalia (1983), Thakur et al. (1985), Sharma et al. (1989) and (1992), Moorti et al. (1991), Mitra and Jena (1991), Oberai and Raina (1991), R. Swaroop and B.K. Sikka (1992), Chandel and Sharma (1992), Vaidya (1993), Thakur et al. (1994), Kumar et al. (2002), Ranveer Singh and S.P. Sarswat (2004), Ranveer Singh and B.K. Sikka (2004), Sikander Kumar and Sandeep Kumar (2004), H.R. Sharma (2005), B. Bala and S.D. Sharma (2005), D.V. Singh and J.P. Bhatti (2006) and Kumar et al. (2012)} have been undertaken to examine the agricultural development and related issues over the years in the state of Himachal Pradesh. Many of these studies have pointed out that there is a large scope for its further development by judicious mix of resources, delivering critical inputs at the right time and place, development of irrigation facilities, introduction of HYV programs etc. However, hilly terrain, peculiar agro climatic conditions, fragmented holdings, growing marginalization of holding etc. institute major factors limiting adoption of modern agricultural practices in full. Despite all these barring factors, the farmers of Himachal Pradesh are making all possible efforts to exploit the agricultural potential fully so as to become self reliant in agricultural production. Over the years, state government has launched a series of programs for the development of agriculture e.g. high yielding variety programs, multiple cropping, soil testing programs, kisan credit card scheme, plant protection programs,

*Assistant Professor, Department of Economics, H.P.U. Regional Centre Khanyara (Dharmshala), Email: sandeep75358@gmail.com

bringing more are under HYV cultivation, approach to watershed development, demonstration and effective dissemination of improved farm technology national agricultural technology project, crop insurance scheme, seed certification program, seed village program, agriculture education and training program, computerization of land records etc. in order to increase the foodgrain production thereby boosting the income of farm families.

Therefore keeping in view, the dominance of agriculture in occupation and overall performance of the economy of the state, the present study is also an attempt to investigate whether producing foodgrain is viable from farmers' point of view. Whether there is a change in cropping pattern over the years? What are the main problems in agricultural development of the state? More specifically, the objectives of present study are:

1. To study the input use and cropping pattern in the production of principal food grain crops of Himachal Pradesh;
2. To examine the net returns and profitability of selected crops grown extensively in the state and
3. To identify the major problems of agricultural development in the state and to seek appropriate solutions to improve the livelihood of farm families.

II. Data Source and Method

The study is purely based on secondary data compiled from various publications and records of government departments. The data have been used for the agricultural year 2011-12 to work out the profitability and net returns of principal crops, whereas to study the land use, holding size and cropping pattern, the data pertaining to different agricultural years have been used. The profitability and net returns of crops have been calculated with the help of different farm management cost concepts like A1, A2, B and C have been used for the present investigation. In addition to this, percentage and proportion are also used to analyse the data.

III. Results and Discussion

In this section, an attempt has been made to meet out the objectives of present study, but before going into the analysis of profitability of farm enterprise, resource use pattern, agricultural problems, cropping pattern etc., it would be appropriate to have an idea of the agricultural economy of the region. Himachal Pradesh is nestled in western Himalayas with a varying altitude from 350 meters to 6975 meters above the mean sea level and is famous throughout the country for its salubrious climate and scenic beauty. The state has comparative advantage in production of many location specific crops of high value due to different agro climatic zones as shown in Table 1. An overview of different agro climatic zones, its ecology, area, rainfall, altitude etc. can be seen from Table 1. Different agro climatic zones are also presented in Figure 1 on the basis of altitude mean above sea level (MASL).

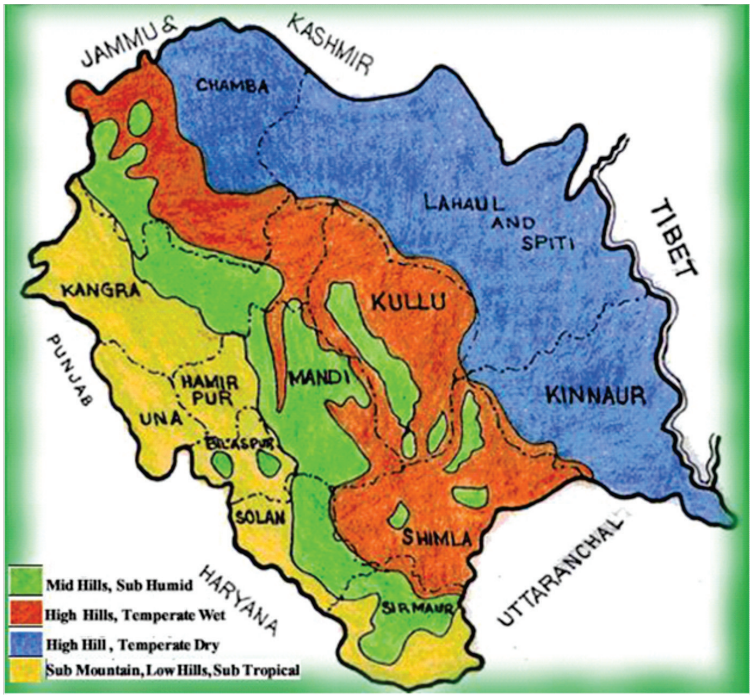
3.1 Land Use Patters

Land is the most predominant factor in an agricultural economy and a proper study of land use profile help the planners in evolving a suitable and scientific policy for its full utilization. Till 1950, land in India was broadly classified into five categories. *viz.* area under forests, area not available for cultivation, uncultivated land including current fallows, area under current fallows and net sown area. However, a new reclassification was adopted in March, 1950 and under it, land is now classified into nine different categories at national level as well as in the state as visualized in Table 2 (serial number 2 to 10) under land classification. The geographical area reported by professional survey (Surveyor General of India) and village papers indicate a large difference. The reason for this difference is that the entire land of the state has not yet been covered by the revenue settlement. Approximately 18 per cent of the geographical area of the state was not brought under settlement till 2009-10.

Table 1. Characteristics of Agro Climatic Zones of Himachal Pradesh

Particular	Zone 1	Zone II	Zone III	Zone IV
Ecology	Low Hill Sub Tropical (Shivalik)	Mid Hill sub Tropical	High Hill Temperate Wet	High Hill Temperate Dry
Geographical Area (% of Total Area)	35	32	25	08
% of Total Cultivated	40	37	21	02
Irrigated Area (%)	17	18	08	05
Altitude (MASL) (meters)	350 to 650	651 to 1800	1801 to 2200	Above 2200
Average Rainfall (cm)	100-150	150-300	100-200	20-50
Area (Districts)	Una, Bilaspur, Hamirpur and Parts of Kangra, Solan and Sirmaur district	Palampur and Kangra tehsil of Kangra district, Rampur tehsil of Shimla district and parts of Mandi, Solan, Kullu, Sirmaur, Chamba and Bilaspur districts.	North West Himalyan Region *i.e.* Shimla, Kullu and parts of Mandi and Chamba district	Lahaul and Spiti, Kinnaur and Pangi Tehsil of Chamba

Agro climatic Zones in Himachal Pradesh



Source: Computed from Department of Agriculture, Government of Himachal Pradesh.

TABLE 2. CHANGES IN LAND USE PATTERN IN HIMACHAL PRADESH FROM 1966-67 TO 2009-10

(Area in hectares)

Land use Classification	1966-67	1994-95	1999-00	2003-04	2009-10
1. Total Area:					
By Professional Survey	5567300	5567300	5567300	5567300	5567300
By Village Papers	2906336	3402429	4531828	4544100	4559010
2. Forests	636096	1049039	1094209	1099110	1105997
	(21.88)	(30.83)	(24.14)	(24.18)	(24.25)
3. Barren & unculturable waste	109383	149388	856911	672500	783404
	(3.76)	(4.39)	(18.90)	14.79)	(17.18)
4. Land put to non agricultural uses	117483	198669	302190	453500	348649
	(4.04)	(5.83)	(6.66)	(9.97)	(7.64)
5. Permanent Pastures & other Grazing Land	1163402	1193602	1471536	1515000	1503833
	(40.02)	(35.08)	(32.47)	(33.33)	(32.98)
6. Land use to Misc. tree crops and groves (not included in net sown areas)	39716	48634	64161	62500	68391
	(1.36)	(1.42)	(1.41)	(1.37)	(1.50)
7. Culturable Waste	176760	118126	119413	128400	128224
	(6.08)	(3.47)	(2.63)	2.82)	(2.81)
8. Other Fallow Land	62630	20695	15714	16500	22109
	(2.15)	(0.60)	(0.34)	(0.36)	(0.48)
9. Current Fallow	65759	55938	56233	56100	59991
	(2.26)	(1.64)	(1.24)	(1.23)	(1.31)
10. Net Sown Area	535107	568338	551457	540500	538412
	(18.41)	(16.70)	(12.16)	(11.89)	(11.80)

Note: Figure in parenthesis denote percentage to the area by village paper.

Soruce: Directorate of Land Records, Government of Himachal Pradesh (various issues)

The net sown area is only 11.8 per cent of the total reproting area that was 18.41 per cent in 1966-67. The area under nonagricultural uses has increased from 4.04 per cent in 1966-68 to 7.64 per cent in 2009-10 and barron & unculturable land has also increased manifold from 3.76 per cent to 17.18 per cent during this period. It is due to the fact that as the settlement process is progressing in the state, information about land use on new areas especially Lahaul-spiti, Kinnaur and Kullu brought under settlement and this area is being added to geographic area as per village papers. The area under culturable waste, other fallow land and current fallow land has declined during this period. Permanent pastures & other grazing land form the largest chunk of the reporting area *i.e.* 33 per cent followed by forests *i.e.* 24 per cent in 2009-10. The culturable waste, other fallow and current fallow land account for 4.6 per cent of total reporting area which indicate that there is scope to increase the net sown area by at least 5 per cent through improving this category of land.

3.2 Structure of Landholdings

Between 1990-91 and 2005-06, the pattern of holding structure has undergone perceptible changes. There were 833,793 operational holding in1990-91 and covered area of 1,009,766 ha which increased to 933,383 with covered area of 968,345 ha indicated that number of operational holding has increased by about 99,590 units but the area covered by them has decreased during this period. It implies that the size of operational holding has decreased from 1.21 ha to 1.03 ha as revealed by Table 3. The size of operational holdings by and large is same during this period except large farm size category. Table further reveals that the number of marginal and small farm size categories and the area under such holdings has increased over the years while the number of semi medium, medium and large holdings has decreased but the area belonging to them has increased. It is indicative of the fact that inequality in the distribution of land among the cultivators has increased which is further fuelled by uneconomic, scattered and fragmented holding size. It also leads to inefficient supervision and causes undue strain in the conduct of various farm operations with tremendous loss of time in movement. The extent of growing marginalization of holding size has also serious implications in terms of profitability and net returns for the farmers as can be seen from the fact that about 87 per cent of the cultivators (marginal & small) have 52 per cent of land as against to 48 per cent of land which is owned by just 17 per cent of the farmers. The marginal holdings are increasing more than the population growth rate on account of division of land due to law of in heritance process which is further intensified by decline in joint family system. Another factor behind the growth in number of marginal holdings seems to be allotment of new areas brought under settlement operation to landless persons in the state and due to the purchases of land or orchards & establishment of new orchards especially in apple belt by the people who previously did not have landholding there. The overall picture regarding distribution of land holdings is also clear from Figure 2(a), 2(b), and 2(c).

Table 3. The Percentage Distribution of Operaitonal Holdings by Size Class, 1990-91 to 2005-06

1) Share in Number of Holding (In Percentage)

Category	1990-91	1995-96	2000-01	2005-06
Marginal	63.82	64.39	67.28	68.20
Small	19.95	20.10	19.06	18.81
Semi medium	11.26	11.01	9.83	9.47
Medium	4.29	3.94	3.38	3.12
Large	0.66	0.54	0.43	0.37
(II) Share in Operated Area (in Percentage)				
Marginal	21.26	23.02	25.72	26.66
Small	23.28	24.08	25.0	25.27
Semi medium	23.80	25.63	24.85	24.82
Medium	16.42	19.41	17.96	17.03
Large	5.97	7.83	6.45	6.19
(III) Average Size of Holding (in ha)				
Marginal	0.40	0.41	0.40	0.40
Small	1.41	1.38	1.40	1.39
Semi medium	2.74	2.69	2.70	2.71
Medium	5.73	5.70	5.69	5.66
Large	17.58	16.54	15.90	16.99
Overall	**1.21**	**1.15**	**1.07**	**1.03**

Note: Marginal: 0 to 1ha; Small: 1 to 2 ha; Semio medium: 2 to 4 ha; Medium 4 to 10 ha and Large: 10 & above ha.
Source: Computed from Agricultural Census 2005-06, Directorate of Land Record,Government of Himachal Pradesh.

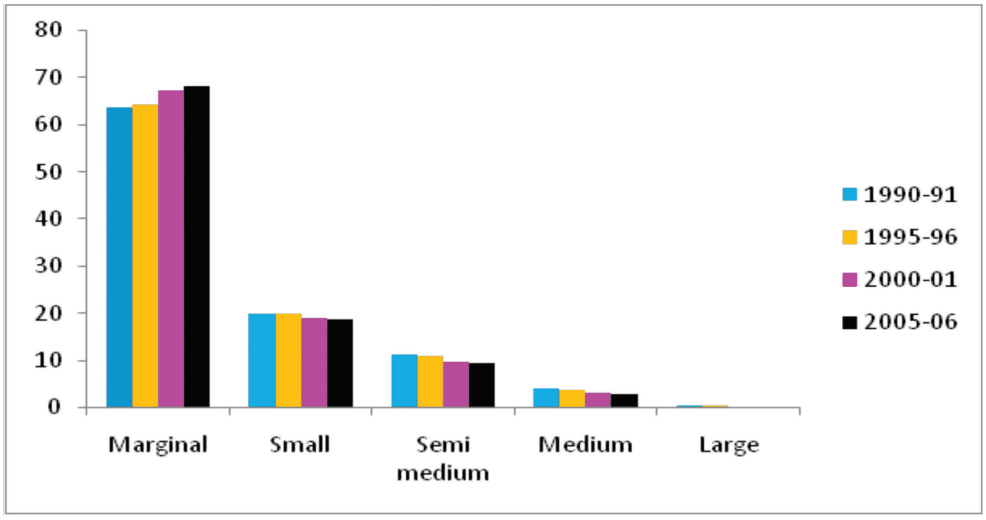


Figure 2(a) Share in Number of Holdings (in Percentage)

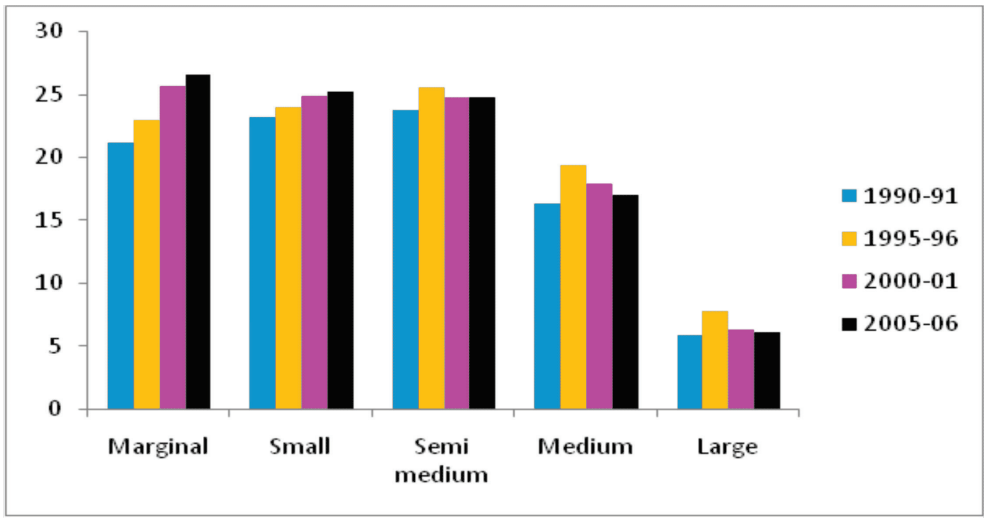


Figure 2(b) Share in Operated Area (in Percentage)

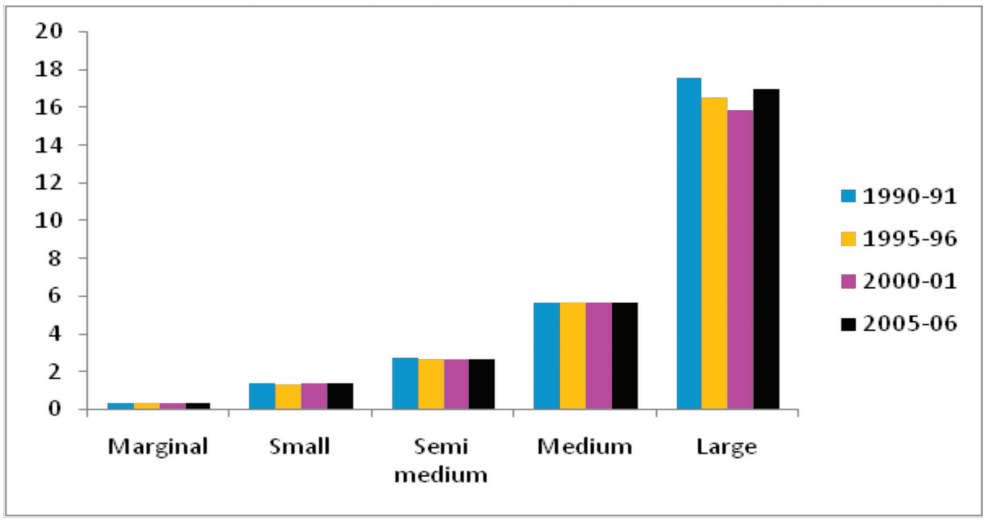


Figure 2(c) Average Size of Holding (in Ha)

3.3 Changes in Cropping Pattern

The study of cropping pattern is of paramount importance for planning rational and balanced programs of crop growing in such a manner that the people of a country get adequate food and raw material for agro based industries. The cropping pattern changes in response to change in economic, technological and institutional factors. It deals with the nature of crop and percentage of area under each crop. Table 4 protrays that the economy of the state is predominantly agricultural based as 81.6 per cent of the area is covered by food grain crops in 2007-08 however, it has come down since 1980-81. Major food crops (i.e. maize, paddy & wheat) predominate the agricultural scenario, account for about 78 per cent of total cropped area, however the area under rice is showing declining trend whereas in case of maize and wheat, it is more or less constant. The area under pulses mainly gram and other cereals comprising of barley, ragee, millet such as mandua, kangani, cheena etc. is decreasing whereas, the area under orchards especially of apple and vegetables like tomato, potato, ladyfinger, cauliflower, cabbage etc. is increasing over the years. Main cereals like maize and wheat has replaced inferior cereals such as barley, ragee, millet etc. due to technological changes occurred in recent pass in the state and changes in taste of farmers due to increase in income and interaction with the rest of the world. The area under pulses especially of gram has also decreased due to more requirement of labour on account of tedious intercultural operations, frequent weather changes in recent past, violent fluctuation in prices of pulses and traditional variety of pulses has also became susceptible to insects and pests over time. Moreover, with the improvement in infrastructural facilities like road network, increased commercialization and development of trade, crop pattern got adjusted because of advantages of trade in commodities. Earlier, a family used to grow most of the crops it required for its self use because of trade with other region was so weak.

TABLE 4: TEMPORAL CHANGES IN CROPPING PATTERN IN HIMACHAL PRADESH: 1980-81 TO 2007-08

(Per Cent)

Sr. No.	Crop & Crop Groups	1980-81	1990-91	2001-20	207-08
1	Rice	9.8	9.46	8.4	8.2
2	Maize	30.2	31.72	31.5	31.4
3	Wheat	37.0	38.06	38.3	38.4
4	Barley	3.9	3.07	2.6	2.5
5	Other cereals	3.7	2.51	1.5	1.1
6	Total Cereals	84.6	84.83	82.3	81.6
6	Total Pulses	5.9	4.29	3.1	3.3
7	Total Food grains	90.5	89.12	85.4	84.9
8	Total Fruits	2.7	4.23	6.5	7.1
8	Total Vegetables	2.6	2.69	3.8	3.7
9	Other Food Crops	0.6	0.68	0.9	1.1
10	Total Food Crops	96.4	96.72	96.7	96.9
11	Total Non Food Crops	3.6	3.28	3.3	3.1
12	Total Food & Non Food Crops	100.0	100.0	100.0	100.0

Source: Computed from Annual Season and Crop Report (Various Issues) Directorate of Land records, Shimla, Government of Himachal Pradesh.

It being so, the area under many of the traditional crops and pulses has declined over the years. There are two nodal agencies to supply the information on area under fruits i.e. Department of Horticulture and Land Records. However, there is inconsistency in their record as far as area under fruit is concerned e.g. the date reported by horticulture Department is almost four time higher than the data provided by Land records. After a careful examination, it is concluded that the area under fruits supplied by Land Records is more reliable authentic and useful to study crop pattern because it is based on field to field enumeration done by village revenue officials and also follows standard methodology to apportion area under fruits, trees & other crops when intercropping is done, Again, the area under various crops and uses is tallied with total land area of each village i.e. increase in area under one crop or use must involve decrease elsewhere. Such type of enumeration is absent in the Department of Horticulture and the data furnished by them is mostly depend upon number of nursery plants sold, export of fruits

outside state etc. It is also pertinent to note that a small shift in crop pattern to a suitable crop can lead to tremendous increase in output and income of the farm families. Apple, citrus, and offseason vegetables like tomato, peas, cauliflower, cabbage, potato etc. are important examples of such success stories due to favorable climatic and topographical conditions of the state. Apple with only 5.0 per cent share in total cropped area, has made the state to be known as "Apple State". Fruits and Vegetables (potato having 1.7 per cent in 2007-08) despite of their low share in area as approximately 7.1 per cent, make significant contribution towards total output because of their manifold higher output value as compared to cereals, pulses and oilseeds. Keeping in view, the peculiar physical and agro climatic conditions of the state, the scope to bring more area under cultivation is severely limited and available land is exhaustively used for raising cereal crops for the purpose of self subsistence of the rural masses however, the trend of area apportion to fruits and vegetables is quite considerable in some recent years due to the growing awareness of high value crops among the farming communities.

3.4 Structure of Costs and Input Use

In order to study the profitability ad returns of crop enterprises, It is pre requisite to examine the input structure and cost of cultivation and have an idea about the share of various factors in total cost. The Table 5 portrays the information regarding cost and input structure per hectare of Maize, Paddy, Wheat and Potato on which data is available. Taking first of all the overall position, it can be seen from the table that average cost of production per hectare is worked out to be Rs. 48768 for potato crop enterprise followed by Wheat (R 21772), Paddy (R 20986) and Maize Crop (R 20948). When we compare paid out costs *i.e.* Cost A_1 total cost C, the lion's share of cost is incurred on potato crop *i.e.* roughly fifty per cent of the total cost C, whereas it is minimum on paddy crop to the extent of just 26 per cent. It is due to the fact that potato seed ar very costly which account for 24.52 per cent share in paid out costs after rental value of land. The other major items of expenditure are fertilizer and manures in all crop enterprises whereas, machine labor also on wheat and paddy crop i.e. about 13 per cent and 9 per cent in paid out cost i.e. cost A_1.

In respect of imputed value of factor inputs, it is human labor and imputed value of owned land which account for largest chunk of cost i.e. about three-fourth on paddy crop followed by maize (55.42 per cent) , potato (46.53 per cent) and wheat crop (44 per cent) in total cost C. it is mainly due to that maize and paddy are season bound crop and have more labor intensive crop operations in respect of land preparation, weeding/hoeing, sowing, transportation, winnowing, harvesting etc. Therefore farmers and obliged to use more of family as well as hired labour to complete various crop operations well in time without caring much of their marginal contribution.

TABLE 5: INPUT USE PATTERN OF PRINCIPAL CROPS IN HIMACHAL PRADESH (2011-12)

(R/ha)

Sr. No.	Input/Cost	Maize	Paddy	Wheat	Potato
1.	Human Labour (Hired in)	543.72(2.59)	313.67 (1.49)	780.24(3.58)	4524.93(9.27)
2.	Animal Labour Hired in Owned	635.19(3.03)	67.75(0.32)	357.05(1.63)	1509.00(3.09)
		144.29 (0.68)	635.55(3.02)	196.67(9.03)	168.84(0.34)
	Total	779.48(3.72)	703.30(3.33)	553.72(2.54)	1677.84(3.44)
3.	Machine Labour Hired in Owned	1330.43(6.35)	1801.63(8.58)	2822.50(12.96)	0.00
		7.03(0.03)	13.31(0.06)	51.81(0.23)	151.31(0.31)
	Total	1337.46(6.38)	1814.94(8.64)	2874.31(13.2)	151.31(0.30)
4.	Seed	759.36(3.62)	1315.49(6.26)	1472.42(6.76)	11959.60(24.52)
5.	Fertilizer & Manure Fertilizer Manure	572.61(2.73)	308.24(1.46)	769.69(3.53)	1536.73(3.15)
		2322.26(11.08)	156.58(0.74)	1369.41(6.28)	2884.51(5.91)
	Total	2894.87(13.81)	464.82(2.21)	2139.10(9.82)	4421.24(9.06)
6.	Insecticides & Pesticides	79.89(0.38)	157.15(0.74)	26.56(0.12)	100.20(0.20)
7.	Irrigation Charges	82.35 (0.39)	55.13(0.26	111.89(0.51)	51.08(0.1)
8.	Interest on working capital	202.41(0.96)	150.77(0.71)	248.69(1.14)	715.19(1.46)
9.	Depreciation of Farm Buildings and Implements	521.53(2.48)	449.86(2.14)	708.40(3.25)	569.84(1.16)
10.	Land Revenue, Taxes & Cesses	7.08 (0.03)	12.48(0.05)	13.18(0.06)	9.56(0.01)
11.	Miscellaneous	0.00	0.00	0.00	0.00
	Cost A1	7208.15(34.40)	5437.61(25.91)	8928.51(41.0)	24180.79(49.58)
12.	Rent paid for	30.85	127.36	30.09	0.00
	Leased in Land	(0.14)	(0.60)	(0.13)	
	Cost A2	7239.00(34.55)	5564.97(26.51)	8958.60(41.14	24180.79(49.58)

Sr. No.	Input/Cost	Maize	Paddy	Wheat	Potato
13.	Rental Value of owned Land	4183.60(19.97)	5337.10(25.43)	4705.13(21.61)	14419.80(29.56)
14.	Interest on Fixed Capital	2099.33(10.02)	1717.32(8.18)	3244.34(14.90)	1891.04(3.87)
	Cost B	13521.93(64.54)	12619.39(60.13)	16908.07(77.65)	40491.63(83.02)
15.	Imputed Value of Family Labour	7426.16(35.45)	8366.94(39.86)	4864.07(22.34)	8276.75(16.97)
	Cost C	20948.09 (100.0)	20986.33 (100.0)	21772.14 (100.0)	48768.38 (100.0)

Note: Figure in the parentheses denotes percentage to respective column.

Source: Directorate of Economics, Ministry of Agriculture, Government of India.

3.5 Returns and Profitability

Gross revenue in juxta-position with per hectare cost gives a rough estimate of profitability and returns of a crop enterprise. However, it is no substitute for rigorous production function analysis which serves a better tool to indicate efficiency in resource use but a study of this kind throws a useful light on the analysis of efficiency. It has been suggested that output per unit of paid out cost is a preferable criterion in view of the difficulties arising due to imputation of various factor inputs in order to work out Net Returns (NR). Moreover, cultivators are not interested in minimizing imputed costs but they always wish to maximize net gross output (output from which paid out costs have been deducted) i.e. Farm Business Income (FBI). It is therefore, FBI is more relevant variable in farm level decision making process. A comprehensive analysis of costs, returns and profitability for selected crop enterprises have been provided in Table 6. It is evident from the table that gross returns are of course higher in potato crop (being a cash crop) to the tone of approximately Rs. 59350 followed by paddy (Rs. 33312), wheat (Rs. 20936 and maize crop (Rs. 19025). Gross Revenue (GR) is much lower on maize and wheat crop enterprises due to lack of remunerative prices, lack of irrigation facilities, low crop productivity as compared to adjoining states, poor soil fertility, lack of improved variety of seeds, poor agricultural extension services at right time and place etc.

It can be further seen from the table that per hectare cost of maize cultivation is less than its counterpart's *viz.* wheat and paddy. However, in respect of cost A1, which comprises of all cash and kind expenses, cost of paddy cultivation is less than all other crops *i.e.* about ₹ 5438. The cost of production per quintal is recorded minimum for paddy crop (₹ 662) as against to the highest for wheat crop (₹ 1219) *i.e.* almost slightly less than double of paddy crop production. The per hectare cultivation of Potato crop gives FBI, RFLM and NR to the tone of about ₹ 35169, ₹ 18858 and ₹ 10581 respectively. FBI and RFLM are positive in respect of each crop but when NR are taken into account, only paddy and potato crop bears positive returns to the tone of just ₹ 12326 and ₹ 10581 respectively. The negative returns on maize and wheat crop may be due to low crop yield and lack of remunerative prices whereas, all the factor inputs used in cultivation have equivalent costs as incurred on other crops.

Similarly, when net profit per quintal over cost C is taken into account, it is negative for maize crop (₹ -103) whereas, it is highest for paddy crop (₹ 448) followed by potato (₹ 223) and wheat (₹ 131) crop enterprise. Loss in maize crop may be due to low value of crop. Thus it can be safely concluded that production of these crops are not much remunerative occupation.

TABLE 6: GROSS RETURNS AND PROFITABILITY OF SOME SELECTED CROPS OF HIMACHAL PRADESH (2011-12)

Sr. No.	Items	Maize Crop	Paddy Crop	Wheat Crop	Potato (cash crop)
1.	**Gross Returns (₹/ha)**	**19025.56**	**33312.06**	**20935.96**	**59349.48**
	(a) Value of Main Product	13710.41	22472.15	14728.30	59349.48
	(b) Value of By Product	5315.15	10839.91	6207.66	0.00
2.	**Cost of Cultivation (₹/ha)**				
	Cost A_1	7208.15	5437.61	8928.51	24180.79
	Cost A_2	7239.00	5564.97	8958.60	24180.79
	Cost B	13521.93	12619.39	16908.07	40491.63
	Cost C	20948.09	20986.33	21772.14	48768.38

Sr. No.	Items	Maize Crop	Paddy Crop	Wheat Crop	Potato (cash crop)
3.	**Cost of Cultivation (₹/ha)**				
	Cost A_1	367.50	170.73	495.60	338.61
	Cost A_2	368.98	174.70	497.05	338.61
	Cost B	693.72	397.94	930.49	568.65
	Cost C	1082.86	662.32	1218.91	677.46
4.	**Net Returns (₹/ha)**				
	Over Cost A_1	11817.41	27874.45	12007.45	35168.69
	Over Cost A_2	11756.56	27749.09	11977.66	35168.69
	Over Cost B**	5503.63	20682.67	4027.89	18857.85
	Over Cost C***	(-)1922.53	12325.73	(-)836.18	10581.10
5.	**Net Profit (₹ /Quintal)**				
	Over Cost A_1	612.50	939.27	854.40	561.39
	Over Cost A_2	611.02	935.30	852.95	561.39
	Over Cost B	286.28	712.06	419.51	331.35
	Over Cost C	(-102.86)	447.58	131.09	222.54

Source: Calculated from report of cost of cultication 2011-12, Directorate of Economics, Ministry of Agriculture, India.

Note: Minimum Support Price of Maize, Paddy and Wheat crop for the respective Year was taken as ₹ 980, ₹ 1110 & ₹ 1350 per quintal respectively. Potato price was determined on prevailling wholesale Market price *i.e.* ₹ 900 per quintal.

- Cost A_1 include all cash and kind expenses out pocket actually incurred. It pertains to the paid out cost of expenses incurred in cash and king on material inputs, hired human labour, bullock and machine labour (both hired in and owned) seed, insecticides & pesticides etc.
- Cost A_2 include Cost A_1 +rent paid for Leased in land.
- Cost B include Cost A_2+rental value of owned land and interest on fixed capital.
- Cost C include Cost B and Imputed value of family Labour.
- *It is also known as Farm Business Income (FBI)
- **It is also known as Returns to Family Labour Management (RFLM)
- ***It is Known as Net Return (NR)

3.6 Rates of Returns

The ratios of gross returns to total cost C serve as a crude index of profitability. It gives an idea of relationship between output and input. In Table 7, the ratios of gross returns to total cost, human labour, fertilizer & Manure and ratios of FBI & RFLM to NR are presented in order to know roughly the profitability and efficiency of use of family labour and owned capital resources in different crop enterprises.The low ratios of FBI to NR and RFLM to NR indicated the rational use of both family labour & owned fixed capital (land) and owned fixed capital respectively. It is clear from above table that cultivators are making relatively more productive use of owned factor inputs on maize and wheat crop as against to paddy and potato crop. The productivity unit of expenditure on factor inputs is more than unity on paddy and potato crop indicating increasing returns from these crops whereas, decreasing returns are observed on maize and wheat crop. Maximum returns are found on paddy crop from per rupee of expenditure on inputs *i.e.*₹ 1.58. Similarly, productivity per rupee of fertilizer & manure is also highest on paddy crop followed by potato. However labour productivity per rupee of expenditure is higher on potato crop followed by paddy crop enterprise.

TABLE 7: RATIOS OF GROSS RETURNS TO COST AND FBI & RFLM TO NR

Sr.No.	Particulars	Maize Crop	Paddy Crop	Wheat Crop	Potato (cash crop)
1. Rates of Gross					
Returns					
Over Cost A_1		2.63	6.12	2.34	2.45
Over Cost A_2		2.62	5.98	2.33	2.45
Over Cost B		1.40	2.63	1.23	1.46
Over Cost C		0.90	1.58	0.96	1.21
2. Ratios of FBI to NR		0.86	2.25	0.93	3.32

Sr. No. Particular	Maize Crop	Paddy Crop	Wheat Crop	Potato (cash crop)
3. Ratios of RFLM to NR	0.74	1.67	0.82	1.78
4. Rates of Returns to Human Labour	2.38	3.83	3.70	4.63
5. Rates of Returns to Fertilizer and Manures	6.57	71.66	9.78	13.42

Source: Calculated from gross revenue and different cost concepts.

V. Policy Implications and Suggestions

As an economy develop and diversify, the primary agricultural sector loses weight in terms of GDP but develop strong backward and forward linkages with other sectors of the economy and the success story of its progress largely depends upon profitability and returns from this sector. In this process, the present study is also an attempt to evaluate primarily return and profitability of extensively grown crops of Himachal Pradesh along with land use, holding size, cropping pattern and input use structure. The various cost concepts as developed by Farm Management *viz.,* A_1, A_2, B and C are used to analyze returns and profitability of crop enterprise. The study indicate that there is narrow scope of enhancing net sown area under cultivation being a hilly area and predominance of marginal & small holdings mingled with fragmentation, scattered, uneconomic holdings and lack of irrigation facilities also put severe constraints for the expansion of area thereby causing hindrance to the development of mountainous agriculture. The area under rice, barley, pulses, oilseeds and other cereals declining continuously over the past three and half decades and it is shifting in favour of high value horticultural fruits (apple, almound, citrus fruits) potato, other vegetables (cabbage, tomato, cauliflower, ladyfinger etc.) and major cereals (maize and wheat) in the state. The study also highlights that family labour has predominant role in the accomplishment of various crop operations whereas the role of animal labour almost displacing with the introduction of machine labour in rigorous farm activities in the cultivation of all crops especially land preparation, sowing, threshing, winnowing and even transporting. Animal labour is kept only in remote hilly areas where tractor is not accessible to carry on primarily land preparation activity due to one or more reasons. As far as net returns and profitability is concerned, only paddy and potato crops are bearing positive returns over cost C and in terms of net profit per quintal, we can add wheat crop to the list however, profit is too low. Maize and Wheat crops in terms of net returns giving a good amount of loss due to lack of remunerative prices and above all, low agricultural productivity on account of subsistence nature of farming, lack of motivation, overwhelming traditional practices, poor resource base, lack of basic and optimum holding size, rain fed agriculture and inadequate knowledge. However, the farmers are quite rational in optimizing their own resources like family labour, owned land and fixed capital etc., as indicated by low ratios of FBI to NR and RFLM to NR on maize and wheat crop enterprise, but despite of this the production of these crops is not viable at least from farmers' point of view.

After evaluating the results, this study has made some important points:

- Although the study indicated that there is little scope of increasing net sown areas as shown by Revenue Record of the state but if we calculated meticulously the changes in pattern of land use in recent years on account of menace of wild animals (monkeys, wild boars, blue bulls etc.), stray animals, birds and rogues mainly Ageratum (Neela phulnu) & parthenium hystorophorus (congress grass), Lanatana etc. (which fuelling the process of rendering culturable land unusable because the farmers are being compelled to abandon their primary source of livelihood in many parts of the state), the net sown area might further go down even from the present level. Further, a good quality of agricultural land is putting to non agricultural uses especially on real estate business, industrial area establishment etc. also leading to reduction in net sown area.
- The gross value of agricultural (crop+fruits+ animal husbandry) output was ₹ 5167 cr. for the year 2011-12 and about 6.176 million people live in rural areas (population census report, 2011) which gave an estimate of approximately ₹ 697.16 per capita/month income. This income was further compared against planning commission norms (Expert Group headed by Dr. C. Rangarajan, June; 1012) of state specific poverty lines for rural areas of Himachal Pradesh (₹ 1066.60) which indicate that about 89.9 per cent of population i.e. entire rural population would be under the unbrella of poverty line as against to planning commission estimates of 11.1 per cent if they do not have an opportunity to earn income outside the agriculture. Therefore, it can be safely concluded that nine-tenth of the population cannot meet their livelihood from farm income alone at the present level of farm productivity. Rural income and livelihood can be improved by two ways; firstly, an increase in holding size which is possible only if a sizeable

portion of small sized cultivators moved out of farming which is impossible keeping in view the growing marginalization of holding and secondly, provision of employment opportunities to farmers in and around their habitation to supplement their farm income. Therefore, serious steps must be taken to create employment avenues for at least smallholder cultivators outside the farms so that they can partly work on the fields and partly outside farms. These steps may include improvement in rural education up to urban standard and must be accessible & affordable to all, creation of private business environment, establishment of small scale enterprises (preferably rural manufacturing), provision of all weather roads and bus service at peak hours to work outside farms, introduction of supplementary avocation as poultry keeping, bee keeping, mushroom cultivation, medicinal cultivation, wool processing & weaving, aromatic plants and last but not the least, implementation of bottom-up rural policy i.e. put the rural development agenda in local hands and create a much stronger link between decisions and consequences. All rural inhabitants should play a critical role in deciding future priorities and strategies, not just those residents with the most economic and political influence.

- There are many hurdless however, to upgrade the farm productivity from the present level like irrigation constraints, poor soil fertility due soil erosion, sharp increase in fragmented; scattered & marginal land holdings, farmers' ignorance towards institutional credit, improved variety of crop seeds & fruits, lack of suitable agro techniques & farm implements at affordable rates,acute shortage of fodder especially in winter, poor extension services, narrowing down of crop base {some earlier crops such as Eleusine Coracana (Marua & Mandal), Setaro italica (kangni), and particum miliaceum (cheena) have almost disappeared from the farmers fields and gram, black gram, grain amaranth, grain chenopods, buckwheat, barley (hulled & hull less), kinnauri peas, kulth etc. are under severe threat to survive.}, indiscriminate use of chemical fertilizer biased towards nitrogenous i.e. urea, emergence of nuclear families resulting reduction in working hands at least at peak hours, high cost of energy inputs primarily tractor services, problems of stray & wild animals etc. In order to reduce the degree of these impediments, a multidimensional approach comprising of consolidation of holdings, effective crop insurance scheme, introduction of vegetable & fruit processing small scale industry at least a block level, regular social forestry programs to check soil erosion, feasible and affordable rain water harvesting techniques, implementation of woman oriented schemes in agriculture, increasing adoption of HYV & hybrid seeds, efforts to revive traditional organic farming, laying more emphasis on fruit & vegetable production, long term planning to raise investment in agriculture as well as in R & D activities, regular exhibition camps regarding improved farm technology at block level, adoption of eco friendly practices, emphasis on mixed cropping or farming, saving biodiversity character in crops, introduction of new crop plant species, strategy to get rid of wild & stray animal menace and in last, coordinated approach on the part of all departments dealing in agricultural issues. However, Government leaving no stone unturned to raise crop income and well being of farm families but these suggestions also need careful attention if the state has to forge ahead in agricultural development as a strong viable economy. The action and will power of the government must be seen in the eyes of common people to earn credibility.

REFERENCES

Bala B. and Sharma, S.D. (2005): Effects on Income and Employment of Diversification and Commercialization of Agriculture in Kullu District of Himachal Pradesh-*Agricultural Economics Research Review,* vol 18, No. 2, New Delhi, 261—269.

Chand, Ramesh (1996): Agricultural Diversification and Development of Mountain Regions with special Reference to Himachal Pradesh-*MD. Publication Private Limited,* New Delhi-110048.

Government of India (2013): Agricultural Statistics at a Glance (2013)—Directorate of Economic and Statistics, Ministry of Agriculture, India.

Government of Himahcal Pradesh (2014): Economic Survey of Himachal Pradesh—*Directorate of Economic and Statistics,* Shimla.

Government of Himahcal Pradesh: Annual Season and Crop Report (Various Issues)—*Directorate of Land Records,* Shimla.

Govt. of Himahcal Pradesh (2013): Statistical Outline of Himachal Pradesh (2012-13)—*Directorate of Economic and Statistics,* Himahcal Pradesh, Shimla.

Kalia, H.R. (1983): Diversification of Agriculture in Himahcal Pradesh—*Agricultural Situation in India,* August, 1983, New Delhi, 305—309.

Kumar Ashok, Sharma, S.K. and Washist, G.D. (2012): Profitability, Risk and Diversification in Mountain

Agriculture: Some Policy Issue for slow Growth crops—*Indian Journal of Agricultural Economics,* Vol. 57, No. 3, Mumbai, 356-365

Kumar Sikander and Kumar Sandeep, (2004): Resource Use Efficiency and Returns from Selected Food grain Crops of Himachal Pradesh: A Study of Low Hill Zone—*Indian Journal of Economics,* Vol. LXXXV, No. 339, Allahabad, 549—568.

Kumar S. Barik, K. and Prasher D. (2012): Cropping and Land use Pattern in Himachal Pradesh: A Case of Solan District—International Journal of Current Research and Review, Vol. 4, No., 3, 19—25.

Mitra, A.K. and Jena S. (1991): Growth Rates of Groundnut Production in Orissa: A Decomposition Analysis—*Agricultural Situation in India,* Vol. 5, New Delhi, 19—25.

Moorti, T.V. Sharma, K.D. and Thakur, D.R. (1991): Trend in production in pulses and oilseed in Himachal Pradesh—*Agricultural Situation in India,* Vol. 8, New Delhi, 303—308.

Oberai, R.C. and Raina, K.K. (1991): Growth and Diversification of Food grains in Himachal Pradesh *Economic Affairs*, Vol. 36, and No. 3,155—160.

Sharma, A.K., Moorti, T.V. and Oberoi, R.C. (1992): Economics of Vegetable Farming in Mid Hills of Himachal Pradesh—*Agricultural Situation in India,* Vol. XLVII, No. 1 New Delhi, 11—14.

Sharma, A.K., Oberoi, R.C. and Moorti, T.V. (1989): An Economics Analysis of Ginger Farming in Kangra District of Himachal Pradesh—*Agricultural Situation in India,* Vol. XLI, No. 8 New Delhi, 633—636.

Sharma, H.R. (2005): Agricultural Development and Crop Diversificaton in Himachal Pradesh: Understanding the pattern, processes, determinant and lessons—*Indian Journal of Agricultural Economics,* Vol. 60, No. 1, Bombay, 71—93.

Sharma, H.R. (2011): Crop Diversificaton in Himachal Pradesh: Pattern, Determinant and Challenges—*Indian Journal of Agricultural Economics,* Vol. 66, No. 13, Mumbai, 97—114.

Sharma, H.R. and Chauhan S.K. (2013): Agricultural Transformation in Trans Himalyan Region of Himachal Pradesh: Cropping pattern, Technology Adoption and Emerging Challenges—*Agricultural Economics* Research Review, vol. 26, (conference No. 2013), New Delhi, 173—179.

Singh, D.V. and Bhati, J.P. (1996): Pattern of Energy Consumption in Farming Household of Himachal Pradesh—*Agricultural Situation in India,* Vol. LIII, No. 7, New Delhi, 629—634.

Singh, R. Bishnoi D.K. & Singh A. (2010): Cost Benefit Analysis and Marketing of Mushroom in Haryana—*Agricultural Economics Research Review,* Vol. 23, No. 1, New Delhi, 165—171.

Singh Ranveer and Sikka B.K. (2004): Cropping Pattern Himachal Pradesh—*Agro Economic Research Centre,* Himachal Pradesh University, Shimla, 27—40.

Thakur, D.S. Kapila and Moorti, T.V. (1985): Vegetable Production for Diversification of Farm Economy—*Indian Journal of Agricultural Economics,* Vol. 61, No. 3, Mumbai, 330.

www.weathers shimla.com.got.in

Assessment of Marketable and Marketed Surplus of Major Foodgrains in Punjab*

In the liberalized era, improving productivity, competitiveness and increasing marketed surplus are important goals of agriculture sector. The generation of marketed surplus and its transfer from agricultural sector to non agricultural sector is crucial for achievement of self sustaining economic growth. In a growing economy the rate of growth of urban industrial sector depends on the availability of food from the rural agricultural sector. Thus, understanding the behavious of marketed supply of food crops grown partly for home consumption is of prime importance. Understanding the behavious of marketed surplus and the variables affecting it can be of great importance in the development of sound policies with respect of agricultural marketing and prices, imports and exports, national reserves and overall rural and national development objectives of the country. At present the Indian government through its agencies is actively involved in marketing of staple food products especially the food-grains. Huge and increasing amount of money in food security and agricultural development assistance schemes depicts the urgency of meeting the basic needs of the people. Implications of National Food Security Bill may be enormous in the form of requirement of foodgrains and government involvement in foodgrain trade. In order to make correct estimates of food supplies for human consumption, the scientific estimation of seed and feed requirement along with the post-production foodgrain losses during storage, transportation and marketing is of utmost importance. An understanding of marketed surplus behavious is also important in determining the size, placement and rules for release of reserve stocks. Thus, understanding of foodgrain marketed surplus and its determinants is an essential element of effective planning and program design.

Wheat and rice contributes significantly in maintaining adequate Buffer Stock of country to meet emergencies like weather vulnerability as well as for domestic market stabilization measures. With increase incomes and urbanization the people substitute wheat and rice products for other staples particularly the coarse grain, thus leading to the increased demand for these. To meet this increasing demand of the foodgrains,country is heavily dependent on the availability of adequate local supplies particularly from the Punjab state. In Punjab, wheat and rice are the most dominating crop enterprises and this tiny state with only 1.54 percent of the total geographical area of the country contributed the largest share of rice and wheat towards the central pool of foodgrains for last two decades, although in post decentralization period (1997-98 onwards) its share has declined consistently. Share of state in central pool for rice which was about from 46 per cent in 1980-81 had been declined to nearly 25 per cent in 2010-11. Similarly, for wheat also the contribution declined from about 61 per cent to 45 per cent during the same period. Despite decline in share, still Punjab is the larget contributor of wheat to the central pool while it ranks second after Andhra Pradesh for contribution of paddy. Looking at the role of Punjab in Indian food security, it is important to estimate marketable and marketed surplus of wheat and rice in the state. Equally important is to know the proportion of farm and family requirement and post harvest losses of these important foodgrains. This study is very much relevant and important in providing the authentic estimates on marketable and marketed surplus as well as post harvesting losses of major foodgrains and thus availability of foodgrains for human consumption in the state and country.

Objectives of Study

The present study has been taken with the following specific objectives:

1. To estimate marketed and marketable surplus of wheat and rice
2. To estimate the retention of wheat and rice for consumption, seed, feed, wages and other payments in kind
3. To examine the role of various factors such as institutional, infrastrcutural, socio-economic, etc. in influencing household marketed surplus.

Methodology

To meet the specific obejctives of the study, at first stage of sampling three major wheat and paddy growing districts (14 per cent of the total number of district) *viz.* Gurdaspur, Sangrur and ferozepur were selected. These districts besides being major producers of the study crops also represent three agro ecological regions of the state. The selected sample districts accounts for 26 per cent of the area as well as production of study crops in Punjab state.

*Agro-Economic Research Centre Department of Economics and Sociology, Punjab Agricultural University Ludhiana.

At second stage, two major wheat and paddy producing blocks from each of the selected district were selected. Thus overall six blocks from the sample districts were selected. At next stage of sampling a total of twelve villages *i.e.* two villages each from the selected blocks were selected randomly for the farm household survey. Finally from each of the selected village, 25 representative cultivators growing both wheat and paddy, in proportion to their respective proportionate share in different categories as per standard national level definition of operational holdings *viz.,* marginal (< 1 ha), small (1.01 to 2 ha), medium (20.01 to 4 ha) and large (> 4 ha) were selected randomly. Thus, overall from state total sample of 300 farmer households producing both wheat and paddy, comprising 36 marginal, 60 small, 96 medium and 108 large farmers forms the basis for the present enquiry.

In order to accomplish the objectives of the study, the required information pertaining to the production, on farm requirements, marketed surplus and losses at various stage of handling of wheat and paddy output along with other socio-economic aspects was collected from the sample farmers through the interview method using the specially designed scheduled for the purpose. The comprehensive survey was conducted in the sample villages at end of crop year 2011-12 (Reference year). In addition to the primary data collected from the farmers, relevant secondary data were collected from various published sources such as Statistical Abstracts and Economics Surveys of Punjab. Tabular analysis and simple statistical tools such as averages and percentages were used for the interpretation of the results. The regression analysis was also carried out to know the role of different non-price factors *viz.* socio-economic, infrastructural, institutional and technological factors in determination of the marketed surplus of paddy and wheat in state.

Structural Transformation of State Economy: Changing Sectoral Shares of the Economy

Percentage share of primary sector in GSDP in Punjab which was 45.68 per cent during TE 1980-81 declined significantly to 31.35 per cent in TE 2010-11 (Table 1). Over this period the share of secondary sector in GSDP gone up from 20.87 per cent of 26.61 per cent. Major increase was observed in the contribution from the teritary sector and its contribution in GSDP went up from 28.69 per cent in TE. 1980-81 to 42.04 per cent in TE 2010-11. Thus, while the contribution of primary sector consisting of agriculture and allied fields in state income decreased overtime in a major way, the contribution from teritary sector had been observed to be increased tremendously.

TABLE 1: PERCENTAGE DISTRIBUTION OF GROSS STATE DOMESTIC PRODUCT AT FACTOR COST BY SECTORS IN PUNJAB AT CURRENT PRICES

Sector	TE 1980-81	TE 1990-91	TE 2000-01	TE 2010-11
Agriculture and livestock	45.45	44.00	38.99	29.03
Agricutlure	33.60	32.46	26.61	20.56
Livestock	11.85	11.54	12.38	8.47
Forestry and Logging	0.18	0.40	0.28	2.06
Fishing	0.04	0.10	0.27	0.23
Agricutlure & allied	45.67	44.49	65.40	31.33
Mining and quarrying	0.01	0.02	0.01	0.02
Sub-total (Primary)	45.68	44.49	39.56	31.35
Manufacturing	12.86	15.00	14.84	17.11
Registered	6.85	8.60	9.62	9.77
Un-registered	6.01	6.40	5.22	7.34
Construction	5.53	5.29	4.39	7.49
Electricity, Gas & water supply	2.48	3.23	4.46	2.00
Sub-total (Secondary)	20.87	23.48	23.69	26.61
Total industry	20.88	23.50	23.70	26.63
Transport, storage & communication	4.23	3.53	4.48	5.78
Railways	—	—	—	0.90
Transport & other means	—	—	—	3.29
Storage	—	—	—	0.25
Communication	—	—	—	1.34
Trade, Hotel & restaurants	17.07	13.92	11.60	11.57
Banking & insurance	2.22	3.25	4.32	4.74

TABLE 1: PERCENTAGE DISTRIBUTION OF GROSS STATE DOMESTIC PRODUCT AT FACTOR COST BY SECTORS IN PUNJAB AT CURRENT PRICES—*CONTD.*

Sector	TE 1980-81	TE 1990-91	TE 2000-01	TE 2010-11
Real estate, ownership of dwelling & business services	1.97	2.83	4.07	5.54
Public administration	2.09	3.33	4.98	4.63
Other services	5.89	5.28	7.31	9.77
Sub-total (Terriary)	28.69	32.15	36.75	42.01
Gross state domestic product	100.00	100.00	100.00	100.00

Source: Statistical Abstract, Punjab, TE is terinennium ending.

Changing Structure of State Agricutlure

In the wake of new technology, Punjab agricutlure made rapid progress since mid sixties. The progress was spectacular in early phase due to rising agricultural producivity and expasion in gross corpped area. The agrarian structure of state witnessed significant changes in last four decades.

Since 1970-71, land holding distribution of Punjab has witnessed significant changes. From 1980-81 to 2010-2011, the proportion of marginal, small and large holding declined from about 19.21, 19.41 and 7.20 per cent to about 15.50, 18.20 and 6.61 per cent, respectively. During the same time period, the proportionate share of semi-medium and medium holdings in total operational holdings in state increased from about 27.98 and 26.20 per cent to 30.90 and 28.45 percent, respectively. Overtime, the proportion of area operated by marginal, small and large size category farmers in total operational area of state declined from 3.02, 6.98 and 29.75 per cent in 1980-81 to 2.53, 6.76 and 25.90 per cent, respectively in 2010-11. Over the same period, the proportion of area operated by semi-medium and medium farmers increased from 20.16 and 40.09 per cent to 21.57 and 43.24 per cent respectively.

In TE 1970-71, about 39.65 per cent of the gross cropped area in state was under wheat crop which increased to 43.44 per cent in TE 1990-91, and then rose further to 44.60 per cent during TE 2010-11. Rice, which occupied around 6.64 per cent of the gross cropped area in TE 1970-71, increased to 25.59 per cent in TE 1990-91, and then rose further to 35.33 per cent in TE 2010-11. The increased in wheat cultivation has been at the cost of gram, rapeseed and mustard, while that of rice has been obtained by shifting the area from maize, groundnut and cotton. It can be concluded that imbalance in favour of two main cereals viz. rice and wheat in the cropping pattern has further sharpened despite all efforts on diversification of state agriculture. This happened because of better relative profitability of these crops within minimum production and marketing risk as compared to other crops.

The collective per cent share of agriculture and livestock sub-sector in GSDP from primary sector, which was 99.50 percent in TE 1980-81 declined to 92.61 percent during TE 2010-11. During this period while the contribution of agriculture inprimary sector decreased from 73.56 per cent to 65.58 percent, the contribution of livestock increased marginally from 25.94 per cent to about 27 per cent. Over this period, the respective contribution of forestry and fishing sub-sectors in overall primary sector of state went up from 0.39 per cent to 6.58 per cent and 0.08 per cent to 0.75 per cent. Thus, while from TE 1980-81 to TE 2010-11, the contribution of primary sector (Agriculture and allied activities) in GSDP went down significantly from 45.68 per cent to 31.35 per cent, the composition of agriculture sector with regard to respective share of differenet components had witnessed only samll changes during this time period.

Trends in Area, Production and Productivity of Wheat and Rice

The trends in Area, Production and Productivity of wheat in state and country are provided in Table 2 and Table 3.

TABLE 2: AREA, PRODUCTION AND YIELD OF WHEAT CROP IN PUNJAB AND INDIA, 1970-71 TO 2010-11.

Particulars	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**
		Punjab			
Area (Million Ha)	2.30	2.81	3.27	3.41	3.51
Production (Million tonnes)	5.15	7.68	12.16	15.55	16.47
Yield (Kg/ha)	2238	2730	3715	4563	4693

TABLE 2: AREA, PRODUCTION AND YIELD OF WHEAT CROP IN PUNJAB AND INDIA, 1970-71 TO 2010-11—*CONTD.*

Particulars	1970-71	1980-81	1990-91	2000-01	2010-11
			India		
Area (Million Ha)	18.24	22.28	24.17	25.73	29.25
Production (Million tonnes)	23.83	36.31	55.14	69.68	80.80
Yield (Kg/ha)	1307	1630	2281	2708	2938

TABLE 3: COMPOUND ANNUAL GROWTH RATES OF AREA, PRODUCTION AND YIELD OF WHEAT CROP IN PUNJAB AND INDIA.

(Percent per annuam)

Particulars	1970 to 1980	1980-1990	1990-2000	2000-2010	1970-2010
			Punjab		
Area	2.33***	1.25***	0.26ns	0.42***	1.05***
Production	4.70***	4.29***	2.24***	0.25ns	3.01***
Yield	2.31***	3.00***	1.98***	-0.17ns	1.94***
			India		
Area	2.39***	0.46ns	1.72***	1.29***	1.01***
Production	4.31***	3.58***	3.57***	2.16***	3.31***
Yield	1.87**	3.10***	1.82***	0.86**	2.28**

*** and ** indicate significance at one and five percent level of probability, respectively.

In Punjab,the production of wheat increased by almost three times from 5.15 million tonnes in 1970-71 to16.47 million tonnes in year 2010-11.The wheat productivity during this time period more than doubled from 2238 kg/ha to 4693/ha.During first three decades (1970-2000), the area, production and yield of wheat in Punjab state incresed with a falling compound annual growth rates and ultimately become almost stagnant since the last decade with some variations. On an average during 1970-71 to2010-11 the area, production and productivity of wheat in the state increase with a growth rate of 1.05, 3.01 and 1.94 per cent, respectively. During this period the production of wheat in country recorded a CAGR of 3.31 per annum. In this, the contribution of increase in yield was significantly more (2.28 per cent per annum) as compared to that of increase in area (1.01 per cent per annum).

The trends in area, production and productivity of rice in state and country are provided in Table 4 and Table 5. In Punjab, the production of rice increased tremendously from only 0.56 million tonnes in 1970-71 to 10.82 million tonnes in year 2010-11. During the same time period the rice productivity increased from 1540kg/ha to 3828kg/ha.

TABLE 4: AREA, PRODUCTION AND YIELD OF RICE CROP IN PUNJAB AND INDIA, 1970-71 TO 2010-11.

Particulars	1970-71	1980-81	1990-91	2000-01	2010-11
			Punjab		
Area (Million Ha)	0.37	1.18	2.02	2.61	2.83
Production (Million tonnes)	0.56	3.23	6.51	9.16	10.82
Yield (Kg/ha)	1540	2733	3229	3506	3828
			India		
Area (Million Ha)	37.59	40.15	42.69	44.71	42.56
Production (Million tonnes)	42.22	53.63	74.29	84.98	95.33
Yield (Kg/ha)	1123	1336	1740	1901	2240

Table 5: Compound Annual Growth Rates of Area, Production and Yield of Rice Crop in Punjab and India.

(Percent per annuam)

Particulars	1970 to 1980	1980-1990	1990-2000	2000-2010	1970-2010
		Punjab			
Area	12.69***	5.34***	2.52***	0.89***	4.66***
Production	18.66***	6.70***	2.54***	2.67***	6.25***
Yield	5.29***	1.30ns	0.17ns	1.76***	1.52***
		India			
Area	0.88***	0.41ns	0.67***	-0.10ns	0.39***
Production	1.90ns	3.62***	2.02***	1.51ns	2.35***
Yield	1.01ns	3.19***	1.34***	1.62***	1.95***

*** and ** indicate significance at one and five percent level of probability, respectively.

On an average, during 1970-71 to 2010-11 the area, production and productivity of rice in the state increased with CAGR of 4.66, 6.25 and 1.52 per cent, respectively. In country the production of rice showed a consistent increase from 42.22 million tonnes in 1970-71 to 95.35 million tonnes in year 2010-11. The rice productivity in country which was only 1123 kg/ha during 1970-71 doubled to 2240 kg/ha in 2010-11. The area, production and productivity of rice in country over this period increased at CAGR of 0.39, 2.35 and 1.95 per cent, respecitively.

Main Features of Sample Districts

The study districts *viz*. Gurdaspur, Sangrur and Ferozepur constituted about 9, 6 and 7 per cent of the total state population, respectively. All the selected districts were found to be dominated by the rural population as about 70 to 75 per cent of total population of these districts residesed in the rural areas. The cropping intensity in Sangrur was found to be relatively high at 198.08 per cent. In Ferozepur and Gurdaspur districts in was recorded at 187.74 per cent and 175.87 per cent, respectively. Use of fertilizer, the most important agricultural input was found out to be relatively high at 527 kg per net sown ha in Sangrur district as compared to that of 410 kg per ha in Ferozepur district and 395 kg per ha in Gurdaspur district. Similarly the number of tractors for every thousand hectare of net sown area was higher in case of Sangrur district (171) as compared to Ferozepur district (22) and Gurdaspur district (51). Productivity per gross cropped ha of foodgrains, was found to be much higher in Sangrur district (4731 kg/ha) followed by Ferozepur district (3988 kg/ha) and Gurdaspur district (3732 kg/ha). The cropping pattern of the study districts was dominated by the food-grains mainly wheat and paddy. In all of the study districts 100 per cent villages were electrified and linked with the roads.

Socio-economic Profile of Sample Farmers

All of the sample farm households were having male as the family head and the average age of head of the family in over all sample farm households was about 48 years. Overall 97 per cent farmers reported agriculture as their main occupation, the highest by large category farmers (99.07 per cent) and the lowest by marginal farmers (88.89 per cent). Average years of schooling of households on the sample farms in state was found to be 7.39 years with highest (8.05 years) in case of large farmers and the least (5.98 years) in case of small farmers. The average size of family on sample farm households in state was 6.47 consisting of 3.46 males and 3.01 females. Largest average family size of 7.27 members was recorded on large category farm households and the least in case of marginal category (4.97). Overall 96.33 per cent of sample farmers belonged to the general category, and other 1.67 and 2 per cent belonged to schedule casts (SC) and other backward casts (OBC), respectively.

Overall average operational farm size on sample farms was 4.22 ha comprising 3.23 ha of owned land and 0.99 ha of leased in land. The average area on marginal, small, medium and large category farms was 0.77, 1.61, 3.09 and 7.82 ha, respectively. Overall 34.33 per cent of the sample farm house holds leased in the land accounting for the 23.40 per cent of the operation area on an average. The incidence of leasing in land to increase the farm size was found to be directly and positively related to the farm size. There was adequate availability of irrigation water as entire operational area on the sample farms was under assured irrigation. Number of sources of irrigation increased with the increase in farm size and was found to be highest on large size category farms.

The average investment on machinery on the sample farms was worked out to be Rs. 58321 per ha. Overall, the largest investment per ha was on the tractors and implements (Rs 48417) followed by tubewells (Rs 7331) and combine harvesters (Rs 2437). The respective per ha investment on marginal, small, medium and large farms was found to be Rs 23220, Rs 43885, Rs 71720 and Rs 56419, respectively. Overall on sample farms the total

number of livestock units per farm was found to be 5.65 comprising of 1.10 cattle, 2.70 buffalo and 1.85 others. Category wise number of livestock units per farm increased with the farm size.

Production and Availability of Paddy and Wheat on the Sample Farms

Paddy and wheat were major crops on all the farm size categories and on average accounted for 40.38 and 45.66 per cent of the gross cropped area on the sample farms in state. Other important crop on sample farms was the fodder followed by basmati and sugarcane. The average production of paddy on sample farms was 233.33 q/farm, which along with carry over stock of previous year, lead to the net average availability at 233.41 q/farm. The production of paddy during the reference year on marginal, small, medium and large farms was 34.01, 87.83, 172.40 and 434.77 q/farm, respectively. The net average availability of paddy on the respective categories was 34.02, 87.86, 172.44 and 434.94 q/farm (Table 6).

Table 6: Availability of Paddy on Various Farm Size Categories of Farm Households (q/farm)

Farm Size	Average Beginning Stock	Average Production	Net Average Availability
	(1)	(2)	(1+2)
Marginal	0.01	34.01	34.02
Small	0.03	87.83	87.86
Medium	0.04	172.40	172.44
Large	0.17	434.77	434.94
All farms	0.08	233.33	233.41

The production of wheat during the reference year on marginal, small, medium and large farms was 34.12, 72.74, 147.61 and 381.05 q/farm, respectively. The average availability of wheat on the respective categories was 34.94, 73.58, 149.54 and 384.36 q/farm. The overall average production and availability of wheat on sample farms was worked out at 203 q/farm and 205.13 q/farm, respectively (Table 7).

Table 7: Availability of Wheat on Various Farm Size Categories of Farm Households (Q/farm)

Farm Size	Average Beginning Stock	Average Production	Net Average Availability
	(1)	(2)	(1+2)
Marginal	0.82	34.12	34.94
Small	1.11	72.47	73.58
Medium	1.93	147.61	149.54
Large	3.31	381.05	384.36
All farms	2.13	203.00	205.13

In case of paddy crop, overall average productivity on sample farms was recorded at 6945 kg per ha and it varied from the lowest (6458 kg/ha) on marginal farms to the highest (7012 kg/ha) on the large farms. Wheat average productivity was found to varying from the highest (5420 kg/ha) on the large farms to the lowest (5104 kg/ha) on small farms. Overall the average productivity of wheat on sample farms was 5342 kg per ha. With some variations the crop productivity was relatively more on the large size farms.

Crop Losses at Different Stages

Total losses at different stages for paddy are provided in Table 8. Overall, in total post harvest losses of paddy (5.75 q/farm), the losses during harvesting alone accounted for 93.21 per cent, followed by the transportation losses (6.09%) and 0.70 per cent by storage losses. Proportionate share of losses during harvesting was lowest on marginal farms. However, relative share of transportation and storage losses in total losses was the highest on the marginal farms as compared to the other farm size categories. Total losses at various stages of handling as percentage of production of paddy are provided in Table 9. On an average, total losses of paddy at various stages accounted for 2.47 per cent of paddy production on sample farms. Out of this, losses during harvesting alone accounted for 2.30 per cent of production followed by 0.15 per cent in transportation and a negligible during the farm level storage. Category-wise, total losses accounted for 1.74, 2.43, 2.48 and 2.47 per cent of paddy production on marginal, small, medium and large farms, respectively.

Table 8: Losses at Different Stage of Handling: Paddy

(q/farm)

	Marginal		Small		Medium		Large		Average	
Stages	Qty	Percent	Qty	Percent	Qty	Percent	Qty	Percent	Qty	Percen
Harvesting	0.51	86.44	1.98	92.53	4.00	93.68	10.06	93.32	5.36	93.21
Transportation	0.07	11.86	0.13	6.07	0.24	5.62	0.67	6.22	0.35	6.09
Storage	0.01	1.70	0.03	1.40	0.03	0.70	0.05	0.46	0.04	0.70
Total	0.59	100.00	2.14	100.00	4.27	100.00	10.78	100.00	5.75	100.00

Table 9: Percent Share of Losses to the Total Production of Paddy

Farm size	Production (q/farm)	Harvesting	Transportation	Storage	Total
Marginal	34.01	1.50	0.21	0.03	1.74
Small	87.83	2.25	0.15	0.03	2.43
Medium	172.04	2.32	0.14	0.02	2.48
Large	434.77	2.31	0.15	0.01	2.47
Overall	233.33	2.30	0.15	0.02	2.47

Total losses at different stages for wheat are provided in Table 10. Overall, in total losses of wheat (4.38 q/farm) at different stages, the losses during harvesting alone accounted for 91.10 per cent, followed by the transportation losses (6.16%) and during storage (2.74 %). Proportionate share of losses during harvesting in total losses was lowest on marginal farms to the tune of 74.20 per cent as compared to 86.67, 91.18 and 92.13 per cent on small, medium and large farms, respectively. However, relative share of transporation losses in total losses was highest on the marginal farms (12.90% and decreased with the increase in farm size being lowest on the large farms (5.87%). Similarly, relative share of storage losses in total losses was highest on the marginal farms (12.90%) and decreased with the increase in farm size being lowest on the large farms (2.00%). Total loss at various stages of handling as percentage of production of wheat is provided in Table 11. Overall on an average, total loss of wheat at various stages accounted for 2.16 per cent of wheat produced on sample farms. Out of this, losses during harvesting alone accounted for 1.97 per cent of production followed by 0.13 per cent in transportation and a negligible 0.06 per cent during the farm level stoarage. Category-wise, total losses accounted for 1.81, 2.28, 2.31 and 2.10 per cent of wheat production on marginal, small, medium and large farms, respectively.

Table 10: Losses at Different Stages of Handling: Wheat

(q/farm)

	Marginal		Small		Medium		Large		Average	
Stages	Qty	Percent	Qty	Percent	Qty	Percent	Qty	Percent	Qty	Percent
Harvesting	0.46	74.20	1.43	86.67	3.10	91.18	7.38	92.13	3.99	91.10
Transportation	0.08	12.90	0.12	7.27	0.20	5.88	0.47	5.87	0.27	6.16
Storage	0.08	12.90	0.10	6.06	0.10	2.94	0.16	2.00	0.12	2.74
Total	0.62	100.00	1.65	100.00	3.40	100.00	8.01	100.00	4.38	100.00

Table 11: Percent Share of Losses to the Total Production of Wheat

Farm size	Production (q/farm)	Harvesting	Transportation	Storage	Total
Marginal	34.12	1.35	0.23	0.23	1.81
Small	72.47	1.97	0.17	0.14	2.28
Medium	147.61	2.10	0.14	0.07	2.31
Large	381.05	1.94	0.12	0.04	2.10
Overall	203	1.97	0.13	0.06	2.16

Crop Retention Pattern

On farm requirements of foodgrains for different purposes *viz.* home consumption, requirements for seed, feed and kind payments determine the total quantity to be retained by the farmers. Purpose-wise retention of paddy production on the sample farms are given in Table 12. Overall on average the total retention of paddy per farm was 1.48 quintals, out of which 37.16 per cent was retained for self consumption followed by for payments in kind (35.14%), feed (14.19%) and as seed (12.16%). On

marginal, small, medium and large farms the quantity of paddy retained was worked out to be 0.77, 1.09, 1.19 and 2.16 q/farm, respectively. Out or the respective quantity retained on various farm size categories the major proportion was retained for self consumption followed by kind payments. Significant proportion of total retention was also kept for seed and feed uses on all the categories of farms.

TABLE 12: PURPOSE-WISE RETENTION OF PADDY BY THE FARMERS (Q/FARM)

Farm Size	Self-consumption (1)			Seed (2)	Feed (3)	Others (4)	Payments in kind (5)	Total retention (1+2+3+4+5)
	Retention (1)	Purchased Qty	Price					
Marginal	0.41	-	-	0.02	0.17	0.01	0.16	0.77
	(53.25)			(2.60)	(22.08)	(1.30)	(20.77)	(100.00)
Small	0.46	-	-	0.10	0.15	0.01	0.37	1.09
	(42.20)			(9.18)	(13.76)	(0.92)	(33.94)	(100.00)
Medium	0.66	-	-	0.09	0.08	0.01	0.35	1.19
	(55.46)			(7.56)	(6.72)	(0.84)	(29.42)	(100.00)
Large				0.35	0.34	0.05	0.87	2.16
	0.55	-	-	(16.20)	(15.74)	(2.31)	(40.28)	(100.00)
	(25.47)							
All farms	0.55	-	-	0.18	0.21	0.02	0.52	1.48
	(37.16)			(12.16)	(14.19)	(1.35)	(35.14)	(100.00)

Note:- Figures in parentheses indicate the per cent of total retention.

TABLE 13: PURPOSE-WISE IN PROPORTIONATE SHARE OF RETENTION OF PADDY TO THE TOTAL PRODUCTION

(per cent)

Farm Size	Self-consumption (1)	Seed (2)	Feed (3)	Others (4)	Payments in kind (5)	Total retention (1+2+3+4+5)
Marginal	1.21	0.06	0.50	0.02	0.50	2.29
Small	0.52	0.11	0.17	0.01	0.42	1.23
Medium	0.38	0.05	0.05	0.00	0.20	0.68
Large	0.13	0.08	0.08	0.01	0.20	0.50
All farms	0.24	0.08	0.09	0.01	0.22	0.64

Total retention of paddy on sample farms on an average accounted for 0.64 per cent of farm production (Table 13). Purpose-wise the home consumption, payment in kind, feed and seed accounted for 0.24, 0.22, 0.09 and 0.08 per cent of paddy production, respectively. Percentage share of total as well as purpose-wise retention of paddy in total farm production declined with the increase in farm size.

Purpose-wise retentions of wheat production on the sample farms is given in Table 14. Overall on average the total retention of wheat per farm was 20.17 quintals, out of which 12.70, 3.26 and 3.08 quintals constituting 62.96, 16.17 and 15.27 per cent of the total retained quantity was retained for self consumption, feed and seed purpose, respectively. About 1.39 per cent of total quantity retained was used for kind payments and the rest 4.21 per cent for other miscellaneous purposes. On marginal, small, medium and large farms the quantity of wheat retained was worked out to be 11.04, 15.11, 18.54 and 27.49 q/farm, respectively.

TABLE 14: PURPOSE-WISE RETENTION OF WHEAT BY THE FARMERS (Q/FARM)

Farm Size	Self-consumption (1)			Seed (2)	Feed (3)	Others (4)	Payments in kind (5)	Total retention (1+2+3+4+5)
	Retention (1)	Purchased Qty	Price					
Marginal	8.89	-	-	0.62	1.01	0.41	0.11	11.04
	(80.52)			(5.62)	(9.15)	(3.71)	(1.00)	(100.00)
Small	11.22	-	-	1.12	1.87	0.66	0.24	15.11
	(74.26)			(7.41)	(12.38)	(4.37)	(1.58)	(100.00)
Medium	12.19	-	-	2.17	3.23	0.79	0.16	18.54
	(65.75)			(11.70)	(17.42)	(4.26)	(0.86)	(100.00)
Large	15.24	-	-	5.82	4.81	1.15	0.47	27.49
	(55.44)			(21.17)	(17.49)	(4.18)	(1.71)	(100.00)
All farms	12.70	-	-	3.08	3.26	0.85	0.28	20.17
	(62.96)			(15.27)	(16.17)	(4.21)	(1.39)	(100.00)

Note-Figures in parentheses indicate the per cent of total retention.

Out of the respective quantity retained on various farm size categories the major proportion was retained for self-consumption (varying from 55.24 per cent on large farms to 80.52 per cent on marginal farms) followed by that for feed and seed purposes. Significant proportion (about 4 per cent) of total renention of wheat was also kept for others miscellaneous uses on all the categories of farms.

Total retention of wheat on sample farms on an average accounted for 9.95 per cent of farm production (Table 15). Purpose-wise the home consumption, seed, feed and pyaments in kind accounted for 6.26, 1.52, 1.61 and 0.14 per cent of wheat production, respectively. Percentage share of total as well as purpose-wise retention of wheat in total farm production declined with the increase in farm size. Total wheat retention on marginal, small, medium and large accounted for 32.42, 20.82. 12.57 and 7.21 per cent of total production.

TABLE 15: PURPOSE-WISE PROPORTIONATE SHARE OF RETENTION OF WHEAT TO THE TOTAL PRODUCTION

(per cent)

Farm Size	Self-consumption (1)	Seed (2)	Feed (3)	Others (4)	Payments in kind (5)	Total retention (1+2+3+4+5)
Marginal	26.06	1.82	2.99	1.23	0.32	32.42
Small	15.48	1.52	2.58	0.91	0.33	20.82
Medium	8.26	1.47	2.19	0.54	0.11	12.57
Large	4.00	1.53	1.26	0.30	0.12	7.21
All farms	6.26	1.52	1.61	0.42	0.14	9.95

Marketed Surplus and Sale Pattern of Paddy and Wheat

The marketed surplus accounted for 99.37 per cent of the paddy output on the sample farms (Table 16). Category-wise the ratio of marketed surplus to production of paddy was recorded highest on the large farms at 99.50 per cent and the least on marginal farms at 97.74 percent. The entire marketed surplus on different categories of farms was disposed off in the months of October and November *viz*. immediately after harvesting and 99.20 per cent of this was sold to the government procurement agencies at the MSP of Rs 1110/q. The average distance covered to sell the marketed surplus was only 4.78 km. A very small proportion of marketed surplus on large farms

was sold to the private traders and processors who purchased at relatively low prices.

In case of wheat the marketed surplus accounted for 90.06 per cent of total wheat output on the sample farms (Table 17). Category-wise the ratio of marketed surplus to production of wheat was recorded highest on the large farms at 92.79 per cent and the least on marginal farms at 67.64 per cent. Regarding time of sale, it was found that entire marketed surplus on different categories of farms was disposed off in the months of April and May *viz*. immediately after harveswting of the crop and 98.39 per cent of this was sold to the governments procurement agencies at the MSP of Rs. 1285/q. The average distance covered to sell was only 4.57 km. Contrarily to the other farm size categories, a significant proportion of the marketed surplus on marginal farms was sold to the processors (4.81%) and to others (14.17%), although the prices received from them were same as provided by the government procurement agencies.

TABLE 16: MARKETED SURPLUS OF PADDY AND ITS SALE PATTERN

Size Class of Farms	Total Production	Total quantity sold	Month of Sale*	Distance (in km)	To whom and quantity sold in quintals							
					Govt. Agencies		Prvt. Trader or Money Lender		Processor/Miller		Others	
					Quantity (%)	Price	Quantity (%)	Price	Quantity (%)	Price	Quantity (%)	Price
Marginal	34.01	33.24 (97.74)	10-11	3.94	100.00	1110	0.00	0.00	0.00	0.00	-	-
Small	87.83	86.74 (98.76)	10-11	3.92	100.00	1110	0.00	0.00	0.00	0.00	-	-
Medium	172.40	171.21 (99.31)	10-11	5.15	100.00	1110	0.00	0.00	0.00	0.00	-	
Large	434.77	432.58 (99.50)	10-11	5.19	98.80	1110	0.21	1090	0.99	1063	-	-
All farms	233.33	231.85 (99.37)	10-11	4.78	99.20	1110	0.14	1090	0.67	1063	-	-

*10 October and 11: November

TABLE 17: MARKETED SURPLUS OF WHEAT AND ITS SALE PATTERN

Size Class of Farms	Total Production	Total quantity sold	Month of Sale*	Distance (in km)	To whom and quantity sold in quintals							
					Govt. Agencies		Prvt. Trader or Money Lender		Processor/Miller		Others	
					Quantity (%)	Price	Quantity (%)	Price	Quantity (%)	Price	Quantity (%)	Price
Marginal	34.12	23.08 (67.64)	4-5	3.52	81.02	1285	0.00	0.00	4.81	1285	14.17	1285
Small	72.47	57.36 (79.15)	4-5	3.93	99.56	1285	0.00	0.00	0.00	0.00	0.49	1285
Medium	147.61	129.06 (87.43)	4-5	4.57	99.24	1285	0.00	0.00	0.00	0.00	0.77	1285
Large	381.05	353.56 (92.79)	4-5	5.27	98.39	1285	1.32	1347	0.00	0.00	0.29	1290
All farms	203.00	182.83 (90.06)	4-5	4.57	98.39	1285	0.92	1347	0.07	1285	0.62	1287

*4 April and 5 May

During 2010-11, the total production of paddy and wheat in the state was 161.48 and 164.72 lakh tones, respectively. As per the results of present study the respective proportionate share of the marketable surplus of paddy and wheat was 99.36 and 90.05 per cent of the total production. With these coefficients, total marketable

surplus of paddy and wheat in Punjab state was estimated at 160.45 and 148.33 lakh tones, respectively.

Factors Affecting the Marketed Surplus

Most important socio-economic factor influencing the marketable surplus of wheat and paddy was the operational area on the farm. Size of the operational area had a positive relationship with the marketed surplus. Crop farming as main occupation has also positive effect on the marketed surplus of the study crops. Education of household head taken as years of schooling had shown positive relationship with the marketed surplus. On the other hand, under social grouping the belonging of farm household to schedule casts or other backward class had shown the negative relationship with the marketed surplus of wheat and paddy crop.

Under Agricultural Produce Markets Act, 1961 the market charges in Punjab have been regularized and transactions are conducted by open auction in the regulated markets. The weights and measurement act provides for standardization of weights and measures used in the markets. The number of regulated market in Punjab has increased from 88 in 1970-71 to 146 in the year 2010-11. Over this period, the geographical area and average number of villages served per regulated market in Punjab decreased from 573 to 345 sq. Km and from 139 to 84, respectively. This assured market for paddy and wheat has great effect on the generation of marketed surplus of these crops. Print media mainly the news papers was the major source of price information of the respondents. Other major sources of the market information were the Primary Agricultural Cooperative Societies followed by Market Committees and traders. Larger size categories of farmers were found to have better access to the print media as compared to the smaller size categories. Marginal farmers were found to be relatively more dependent on traders for this purpose. Overall, 96 per cent of the sample farmers were having access to the credit. Major source of the credit was found to be Primary Agricultural Credit Societies (54.51%) followed by commission agents (35.42%) and commercial banks (9.38%)

Looking at infrastructure, Punjab Mandi Board the coordinating body for market committees played the lead role in developing market yards on priority to facilitate the efficient marketing of farm produce. Hundred per cent villages of Punjab are linked with the all weather metalled roads which helped in efficient marketing of farm output in state. With large scale state procurement of foodgrains in the recent years many steps has been taken and total state owned storage capacity increased from 176.39 lakh tons in 2007-2008 to 226.33 lakh tones in 2010-11 which was almost equivalent to the total state procurement of wheat and paddy in the state.

In case of paddy the entire marketed surplus on marginal, small and medium categories of farmers was disposed off through the regulated markets only. Large farmers while sold their 98.78 per cent proportion of marketed surplus through the regulated markets, and rest 1.21 per cent was sold by them directly to the rice mills in the unregulated or out of the regulated markets. In case of wheat the entire marketed surplus was disposed through the primary markets and 98.39 per cent of this was sold in the regulated markets. Average distance of primary market for the respondent farmers was 4.77 km, ranging from 3.93 km for small farmers to 5.18 km for the large farmers. On average about 89 per cent of the distance to the market covered by the farmers for disposing the marketed surplus was the pucca roads.

In regression analysis, the total production and the quantity utilized at home were found out to be the major factors affecting paddy and wheat marketed surplus in Punjab state significantly. The magnitude of the significantly positive coefficient of production indicated that with one percent increase in output of paddy and wheat, marketed surplus of these crops would increase by 1.004, and 1.387 percent, respectively. On the other hand the coefficient of home consumption which was found out by significantly negative, indicated that with one percent increase in home retention of paddy and wheat, marketed surplus of these crops would decrease by 0.0013 and 0.473 percent, respectively.

Effective price policy through significant increase in Minimum Support Prices (MSP), assured procurement and development of market infrastructure particularly for wheat and paddy coupled with relatively better production technology available has driven the state agriculture at remarkable rate and resulted into the emergence of paddy and wheat crops as the most secure and profitable ones in the state. Tremendous increase in production of paddy and wheat was coupled with simultaneous increase of marketed surplus/arrivals of these crops.

Policy Implications

In Punjab the advancement of agricultural technologies as well as improvement in market infrastructure contributed significantly in the overall development of farm sector by ensuring better returns to farmers through tremendous increase in production of rice and wheat as well as marketed surplus of these crops. The present policy of providing assured marketing of paddy and wheat at procurement prices had played great role in remarkable increase in market arrivals of these crops through providing favourable technological/institutional and infrastructural developments and, thus ensuring the food security in country. Any change in this policy need to be examined in the context of serious issue of food security.

Looking at the role of infrastructural and institutional factors in generating marketed surplus and development of farm sector in Punjab, all states need to regulate the markets and provide all weather roads to the villages. As significant proportion of farmers especially the marginal still dependent upon the traders for price information, there is need of providing wider coverage and dissemination of agricultural market intelligence/information so that prices prevailing in each and every market is available to them for making adequate marketing decisions. Lack of awareness regarding future trading and use of Warehouse Receipts Programme among the farmers of agriculturally most developed state of Punjab suggests for taking serious and effective steps for promotion of these services.

Sale of almost entire marketed surplus of farmers immediately after harvesting has serious implications in the form of handling and storage costs to the procurement agencies. Farmers need to be encouraged to opt for farm level storage through helping in creation of efficient storage structures at farm level. Staggered procurement by having functional rise in price from post harvest to lean period may help in this regard. Harvesting losses accounted for the major proportion of the total losses at various stages of handling in both of the paddy and wheat output. To minimize the harvesting losses during harvesting operations strict standard need to be fixed and applied on the manufacturing of harvesting machinery (combine harvesters).

It can be concluded that with existing technology and policy the farm level marketed surplus of rice and wheat in state have been reached at almost its peak level (99.37 and 90.06 per cent of the paddy and wheat output). As there is no further scope for increase in area under these crops, the future increase in marketed surplus on state farms depends only on the technological break-through leading to significant rise in paddy and wheat productivity.

Foodgrains

During the month of January, 2015 the Wholesale Price Index (Base 2004-05=100) of pulses, cereals and foodgrains increased by 4.94%, 0.26% and 1.11% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base: 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of January, 2015	WPI for the Month of December, 2014	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	239.2	240.3	230.0	-2.08	4.00
Wheat	1.116	216.6	214.5	220.2	0.98	-1.63
Jowar	0.096	283.1	290.7	252.6	-2.61	12.07
Bajra	0.115	241.1	237.1	255.2	1.69	-5.53
Maize	0.217	241.2	233.4	248.6	3.34	-2.98
Barley	0.017	243.8	235.4	222.3	3.57	9.67
Ragi	0.019	328.7	324.5	321.6	1.29	2.21
Cereals	3.373	233.7	233.1	229.9	0.26	1.65
Pulses	0.717	254.9	242.9	226.9	4.94	12.34
Foodgrains	4.09	237.4	234.8	229.4	1.11	3.49

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

The following Table indicates the State Wise trend of Wholesale Prices of Cereals during the month of January, 2015.

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

Procurement of Rice

4.51 million tonnes of Rice (including paddy converted into rice) was procured during January 2015 as against 4.72 million tonnes of rice (including paddy converted into rice) procured during January 2014. The total procurement of Rice in the current marketing season *i.e*. 2014-2015, up to 30.01.2015 stood at 19.43 million tones, as against 20.96 million tonnes of rice procured, during the corresponding period of last year. The details are given in the following table:

PROCUREMENT OF RICE

(In Thousand Tonnes)

State	Marketing Season 2014-15 (upto 30.06.2014)		Corresponding Period of last year 2013-14		Marketing Year (October-September) 2013-14		2012-13	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	986	2.64	2336	8.46	3722	11.76	6464	19.00
Chhatisgarh	3136	9.33	4067	14.95	4290	13.56	4804	14.12
Haryana	1996	13.66	2403	15.33	2406	7.60	2609	7.67
Maharashtra	96	0.40	90	0.30	161	0.51	192	0.56
Punjab	7781	53.26	8106	51.84	8106	25.62	8558	25.16
Tamil Nadu	4	0.03	55	0.35	684	2.16	481	1.41
Uttar Pradesh	1067	3.35	647	1.88	1127	3.56	2286	6.72
Uttarakhand	338	1.03	204	0.76	463	1.46	497	1.46
Others	2383	16.31	958	6.13	10678	33.75	8129	23.89
Total	**19432**	100.00	**20961**	100.00	**31637**	100.00	**34020**	100.00

Source: Department of Food and Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season *i.e.* 2014-2015 up to June, 2014 is 27.99 million tonnes against a total of 25.04 million tonnes of wheat procured during last year. The details are given in the following table:

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

State	Marketing Season 2014-15 (upto 30.06.2014)		Corresponding Period of last year 2013-14		Marketing Year 2013-14		2012-13	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	6495	23.20	5873	23.45	5873	23.41	8665	22.71
Madhya Pradesh	7094	25.34	6325	25.26	6355	25.33	8493	22.26
Punjab	11641	41.58	10878	43.44	10897	43.43	12834	33.64
Rajasthan	2159	7.71	1268	5.06	1268	5.06	1964	5.15
Uttar Pradesh	599	2.14	683	2.73	683	2.72	5063	13.27
Others	6	0.02	13	0.05	16	0.06	1129	2.96
Total	**27994**	100.00	**25040**	100.00	**25092**	100.00	**381.48**	100.00

Source: Department of Food & Public Distribution.

COMMERCIAL CROPS

Oilseeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 204.0 in January, 2015 showing an increase of 0.7 percent and 0.1 percent over the previous month and year, respectively. The WPI of Niger Seed (6.0 percent), Copra (4.0 percent), Soyabean (3.4 percent), Rape & Mustard Seed (2.0 percent) and Groundnut seed (0.6 percent) increased over the previous month. However, the WPI of Cotton Seed (6.5 percent), Sunflower Seed (2.2 percent) and Gingelly seed (1.8 percent) decreased over the previous month. However, the WPI of Sunflower seed remained unchanged during the month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood at 145.8 in January, 2015 showing an increase of 1.2 percent over the previous month. However, it is lower by 2.0 percent over the previous year. The WPI of Groundnut Oil (5.1 percent), Copra oil (3.0 percent), Mustard Oil (2.0 percent), Soyabean Oil (0.5 percent) and Gingelly Oil (0.3 percent) increased over the previous month. However, the WPI of Sunflower Oil (0.7 percent) decreased over the previous month. WPI of Cotton seed oil remained unchanged during the month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of fruits & Vegetable as a group stood at 247.3 in January, 2015 showing a decrease of 1.3 percent over the previous month. However, it is higher by 19.9 percent over the previous year.

Potato

The Wholesale Price Index (WPI) of Potato stood at 202.8 in January, 2015 showing a decrease of 33.4 percent over the previous month. However, it is higher by 53.2 percent over the previous year.

Onion

The Wholesale Price Index (WPI) of Onion stood 335.1 in January, 2015 showing a decrease of 4.4 percent over the previous month. However, it is higher by 2.6 percent over the previous year.

Condiments & Spices

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 310.1 in January, 2015 showing an increase of 0.7 percent and 15.8 percent over the previous month and year, respectively. The WPI of Black Pepper and Chillies (Dry) decreased by 2.4 percent and 1.3 percent over the previous month, respectively. However, WPI of Turmeric increased by 5.7 percent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 185.4 in January, 2015 showing a decrease of 3.3 percent and 20.8 percent over the previous month and year, respectively.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 298.1 in January, 2015 showing a decrease of 0.3 percent over the previous month. However, it is higher by 9.0 percent over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF JANUARY, 2015

Commodity	Latest	Month	Year	% Variation over	
	January, 15	December, 14	January, 14	Month	Year
Oil Seeds	204.0	202.5	202.2	0.7	0.1
Groundnut Seed	207.1	205.8	193.7	0.6	6.2
Rape & Mustard Seed	202.2	198.3	192.7	2.0	2.9
Cotton Seed	161.8	173.1	175.8	-6.5	-1.5
Copra (Coconut)	180.1	173.1	138.4	4.0	25.1
Gingelly Seed (Sesamum)	404.1	411.5	473.0	-1.8	-13.0
Niger Seed	214.1	201.9	177.8	6.0	13.6
Safflower (Kardi Seed)	121.8	121.8	153.5	0.0	-20.7
Sunflower	177.4	181.3	196.5	-2.2	-7.7
Soyabean	203.2	196.6	220.5	3.4	-10.8
Edible Oils	145.8	144.1	147.1	1.2	-2.0
Groundnut Oil	176.3	167.7	173.0	5.1	-3.1
Cotton Seed Oil	171.9	171.9	184.2	0.0	-6.7
Mustard & Rapeseed Oil	162.6	159.4	159.2	2.0	0.1
Soyabean Oil	153.8	153.0	158.6	0.5	-3.5
Copra Oil	148.0	143.7	124.2	3.0	15.7
Sunflower Oil	124.4	125.3	128.2	-0,7	-2.3
Gingelly Oil	177.1	176.5	188.2	0.3	-6.2
Fruits & Vegetables	247.3	250.5	209.0	-1.3	19.9
Potato	202.8	304.3	198.6	-33.4	53.2
Onion	335.1	350.6	341.6	-4.4	2.6
Condiments & Spices	310.1	307.8	265.7	0.7	15.8
Black Pepper	747.4	765.4	603.5	-2.4	26.8
Chillies (Dry)	319.3	323.6	301.4	-1.3	7.4
Turmeric	249.0	235.6	213.1	5.7	10.6
Raw Cotton	185.4	191.8	242.3	-3.3	-20.8
Raw Jute	298.1	299.1	273.6	-0.3	9.0

PART-II STATISTICAL TABLES

Wages

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

(in Rs.)

Sate	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	Sep, 14	8	333.3	250	400	NA	250	NA	300	NA	NA
	Guntur	Tadikonda	Sep, 14	8	262.5	200	300	NA	250	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	Aug, 14	8	241.6	183.3	NA	NA	NA	NA	NA	NA	NA
Karnataka	Bangalore	Harisandra	Aug, 14	8	250	200	300	225	300	225	350	350	NA
	Tumkur	Gidlahali	Aug, 14	8	250	200	300	200	300	200	300	250	NA
Maharashtra	Nagpur	Mauda	Feb, 12	8	100	100	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Feb, 12	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	April, 12	8	100	100	NA	90	90	NA	58	58	NA

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

State	District	Centre	Month & Year	Type of Labour	Normal Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Car penter	Black Smith	Cobbler
Assam	Barpeta	Loharapara	Aug, 14	M	8	250	250	250	250	250	200	350	250	350
				W	8	NA	NA	200	200	200	NA	NA	NA	NA
	Muzaffarpur	Bhalui Rasul	June, 12	M	8	130	120	80	130	150	120	200	180	250
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Shekhpura	Kutaut	June, 12	M	8	NA	NA	185	NA	185	NA	245	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihaba	Oct, 14	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Rajkot	Rajkot	Jan, 13	M	8	209	225	150	170	147	150	360	360	240
				W	8	NA	169	150	179	145	142	NA	NA	NA
Gujarat	Dahod	Dahod	Jan, 13	M	8	100	100	100	100	100	NA	200	144	150
				W	8	NA	100	100	100	100	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Nov, 14	M	8	350	350	350	300	300	NA	NA	NA	NA
				W	8	NA	250	250	250	250	NA	NA	NA	NA
Himachal	Mandi	Mandi	Dec, 13	M	8	NA	162	162	162	162	162	NA	NA	NA
Pradesh			W	8	NA	162	162	162	162	NA	260	240	240	NA
	Kozhikode	Kuduvally	Oct, 14	M	4-8	1020	550	NA	550	785	NA	650	NA	NA
				W	4-8	NA	NA	450	450	500	NA	NA	NA	NA
Kerala	Palakkad	Elappaly	Oct, 14	M	4-8	500	500	NA	450	466.66	NA	600	NA	NA
				W	4-8	NA	NA	300	300	300	NA	NA	NA	NA
	Hoshangabad	Sangarkhera	Oct, 14	M	8	200	200	200	200	150	150	350	350	NA
				W	8	NA	200	200	200	150	150	NA	NA	NA
Madhya	Satna	Kotar	Oct, 14	M	8	280	150	150	150	200	150	300	300	300
Pradesh			W	8	NA	150	150	150	150	150	NA	NA	NA	NA
	Shyopurkala	Vijaypur	Oct, 14	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Odisha	Bhadrak	Chandbali	June, 14	M	8	250	250	NA	250	262.5	250	300	250	250
				W	8	NA	NA	NA	200	212.5	200	NA	NA	NA
	Ganjam	Aska	June, 14	M	8	250	200	NA	250	270	200	400	300	200

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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
				W	8	NA	100	100	150	110	100	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	June, 20	M	8	265	270	270	270	260	NA	325	NA	NA
			13	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Barmer	Vishala	Feb, 14	M	8	310	310	NA	NA	NA	NA	100	400	300
				W	8	310	310	NA	NA	NA	NA	NA	300	NA
Rajasthan	Jalore	Panwa	Feb, 14	M	8	NA	NA	NA	NA	200	350	300	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Thanjavur	Pulvarnatham	Oct, 14	M	8	NA	307.14	NA	300	308.23	NA	NA	NA	NA
				W	8	NA	NA	113.91	125	121.25	NA	NA	NA	NA
Tamil Nadu*	Tirunelveli	Malayakulam	Oct, 14	M	8	NA	300	NA	NA	417.65	NA	NA	NA	NA
				W	8	NA	135	149	143.5	300	NA	NA	NA	NA
Tripura	State Average		March, 12	M	8	238	201	203	209	207	199	253	235	240
				W	8	NA	154	152	154	154	149	NA	NA	NA
	Merrut	Ganeshpur	Apr, 14	M	8	250	231	231	NA	234	NA	365	NA	NA
				W	8	NA	181	196	181	191	NA	NA	NA	NA
Uttar	Aurraiya	Aurraiya	Apr, 14	M	8	NA	NA	NA	NA	150	NA	250	NA	NA
Pradesh				W	8	NA	NA	NA	150	150	NA	NA	NA	NA
	Chandauli	Chandauli	Apr, 14	M	8	NA	NA	200	200	200	NA	350	NA	NA
				W	8	NA	NA	200	200	200	NA	NA	NA	NA

M-Man

W-Woman

NA-Not Reported

* States reported district average daily wages.

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	Jan.-15	Dec.-14	Jan.-14
Wheat	PBW 343	Quintal	Punjab	Amritsar	1500	1500	NA
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1590	1550	1630
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1698	1660	1823
Jowar	-	Quintal	Maharashtra	Mumbai	2300	2200	2600
Gram	No III	Quintal	Madhya Pradesh	Sehore	2850	2850	2440
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1365	1325	1400
Gram Split	-	Quintal	Bihar	Patna	4500	4420	4615
Gram Split	-	Quintal	Maharashtra	Mumbai	4000	3900	4800
Arhar Split	-	Quintal	Bihar	Patna	7010	6900	6650
Arhar Split	-	Quintal	Maharashtra	Mumbai	7000	6800	6800
Arhar Split	-	Quintal	NCT of Delhi	Delhi	6350	6075	6340
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	8200	7700	6400
Gur	-	Quintal	Maharashtra	Mumbai	3300	3400	3500
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4650	4650	4200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2300	2250	2285
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3350	3340	3340
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3900	3850	3550
Mustard Seed	-	Quintal	West Bengal	Kolkata	4300	4400	3200
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4200	4260	4140
Linseed	Small	Quintal	Utar Pradesh	Varanasi	-	-	3685
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1100	1200	1650
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2000	2000	1550
Castor Seed	-	Quintal	Andhra Pradesh	Hyderabad	3775	3900	3600
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	-	-	5720
Copra	FAQ	Quintal	Kerala	Alleppey	9650	9150	8000
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	4500	4500	3800
Groundnut	-	Quintal	Maharashtra	Mumbai	5500	5100	6300
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1223	1200	1241
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1380	1380	1230
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1470	1275	1200
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1320	1290	1230
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1466	1493	1332
Castor Oil	-	15 Kg.	Andhra Pradesh	Hyderabad	1298	1305	1230
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1900	1900	1335
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2775	2805	3000
Coconut Oil	-	15 Kg.	Kerala	Cochin	2085	1965	1718
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	1840	1780	1930

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

Commodity	Variety	Unit	State	Centre	Jan.-15	Dec.-14	Jan.-14
Groundnut Cake	-	Quintal	Andhra Pradesh	Hyderabad	3143	3000	2600
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	3750	3800	4600
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	3306	3066	NT
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	3200	3125	2850
Jute Raw	W 5	Quintal	West Bengal	Kolkata	3150	3075	2800
Oranges	-	100 No.	NCT of Delhi	Delhi	417	417	417
Oranges	Big	100 No.	Tamil Nadu	Chennai	355	360	460
Oranges	Nagpuri	100 No.	West Bengal	Kolkata	700	-	420
Banana	-	100 No.	NCT of Delhi	Delhi	333	292	250
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	501	484	458
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	63000	60000	55000
Almonds	-	Quintal	Maharashtra	Mumbai	72000	67000	61000
Walnuts	-	Quintal	Maharashtra	Mumbai	68000	67000	64000
Kishmish	-	Quintal	Maharashtra	Mumbai	24000	22000	13000
Peas Green	-	Quintal	Maharashtra	Mumbai	4500	4500	4600
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1350	1025	880
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2500	3000	2600
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1500	1500	1000
Potatoes	Red	Quintal	Bihar	Patna	800	1000	1000
Potatoes	Desi	Quintal	West Bengal	Kolkata	600	1440	700
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayar	2363	-	2333
Onions	Pole	Quintal	Maharashtra	Nashik	1300	1400	950
Turmeric	Nadan	Quintal	Kerala	Cochin	11500	11000	10000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	8200	8400	9500
Chillies	-	Quintal	Bihar	Patna	9200	9900	9200
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	60000	67000	49500
Ginger	Dry	Quintal	Kerala	Cochin	20000	20000	20000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	105000	130000	125000
Cardamom	Small	Quintal	West Bengal	Kolkata	120000	115000	95000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3600
Ghee Deshi	Deshi No. 1	Quintal	NCT of Delhi	Delhi	26680	28681	28681
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	40000	40000	30500
Ghee Deshi	Deshi	Quintal	Uttar Pradesh	Kanpur	35150	35700	30460
Fish	Rohu	Quintal	NCT of Delhi	Delhi	7600	9200	10000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	31700	29000	32000
Eggs	Madras	1000 No.	West Bengal	Kolkata	4300	4500	4700
Tea	-	Quintal	Bihar	Patna	21000	21000	20000
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	34000	34000	13000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	30200	30000	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	15600	15500	14000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	4850	4700	2950
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3700	3600	2850
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3900	3900	3700
Rubber	-	Quintal	Kerala	Kottayam	10000	10700	13500
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29800	29900	29500

3. Month-end Wholesale Prices of some important Agricultural Commodities in International Market during year 2015

Commodity	Variety	Country	Centre	Unit	Jan
Cardamom	Guatmala Bold Green	U.K.	-	Dollar/M.T.	12000.00
				Rs./Qtl	74160.00
Cashew Kernels	Spot U.K. 320S	U.K.	-	Dollar/M.T.	3.60
				Rs./Qtl	49034.59
	Spot U.K. 320S	U.K.	-	Dollar/M.T.	7877.32
				Rs./Qtl	48681.84
Castor Oil	Any Origin ex tank	Netherlands	-	Dollar/M.T.	1700.00
	Rotterdam			Rs./Qtl	10506.00
Chillies	Birds eye 2005 crop	Africa	-	Dollar/M.T.	4100.00
				Rs./Qtl	25338.00
Cloves	Singapore	Madagascar	-	Dollar/M.T.	10500.00
				Rs./Qtl	64890.00
Coconut Oil	Crude	Netherlands	-	Dollar/M.T.	1080.00
	Phillipine/Indonesia,			Rs./Qtl	6674.40
Copra	Phillipines cif	Phillipine	-	Dollar/M.T.	679.50
	Rotterdam			Rs./Qtl	4199.31
Corriander		India	-	Dollar/M.T.	2000.00
				Rs./Qtl	12360.00
Cummin Seed		India	-	Dollar/M.T.	2250.00
				Rs./Qtl	13905.00
Ginger	Split	Nigeria	-	Dollar/M.T.	2250.00
				Rs./Qtl	13905.00
Groundnut	US 2005, 40/50	European	-	Dollar/M.T.	1350.00
Kernels		Ports	-	Rs./Qtl	8343.00
Groundnut Oil	Crude any Origin cif	U.K.	-	Dollar/M.T.	1200.00
	Rotterdam			Rs./Qtl	7416.00
Maiz		U.S.A.	Chicago	C/56 lbs	373.25
				Rs./Qtl	906.53
Oats		Canada	Winnipeg	Dollar/M.T.	365.75
				Rs./Qtl	2260.34
Palm Kernal Oil	Crude	Netherlands	-	Dollar/M.T.	945.00
	Malaysia/Indonesia,			Rs./Qtl	5840.10
Palm Oil	Crude	Netherlands	-	Dollar/M.T.	630.00
	Malaysia/Sumatra,			Rs./Qtl	3893.40
Pepper (Black)	Sarawak Black lable	Malaysia	-	Dollar/M.T.	10000.00
				Rs./Qtl	61800.00

Commidity	Variety	Country	Centre	Unit	Jan
Rapeseed	Canola	Canada	Winnipeg	Can	449.80
				Dollar/M.T.	2204.02
	UK delivered	U.K.	-	Pound/M.T.	242.00
	rapeseed, delivered			Rs./Qtl	2554.96
Rapeseed Oil	Refined bleached and	U.K.	-	Pound/M.T.	577.00
	deodorised			Rs./Qtl	5376.49
Soyabean Meal	UK produced 49% oil	U.K.	-	Pound/M.T.	334.00
	& protein			Rs./Qtl	3112.21
Soyabean Oil		U.S.A.	-	C/lbs/Rs. Qtl	30.34
					4132.53
Soyabean Oil	Refined bleached and	U.K.	-	Pound/M.T.	756.00
	deodorised			Rs./Qtl	7044.41
Soyabeans	US No. 2 yellow	Netherlands	Chicago	Dollar/M.T.	420.90
				Rs./Qtl	2601.16
		U.S.A.	-	C/60 lbs	970.25
				Rs./Qtl	2200.59
Sunflower seed	Refined bleached and	U.K.	-	Pound/M.T.	664.00
Oil	deodorised			Rs./Qtl	6187.15
Tallow	High grade delivered	U.K.	London	Pound/M.T.	295.00
				Rs./Qtl	2748.81
Wheat		U.S.A	Chicago	C/60 lbs	505.25
				Rs./Qtl	1145.94

Source: Public Ledger

Exchange Rate	Jan
US Dollar	61.80
Can Dollar	49.00
U.K. Pound	93.18

Crop Production

4. Sowing and Harvesting operations normally in progress during March, 2015

State	Sowing	Harvesting
1	2	3
Andhra Pradesh	Summer	Winter rice, Summer rice, Jowar (R), Maize (R), Ragi (R), Wheat, Barley, Small Millets (R), Gram, Tur (K) other Kharif Pulses Urad (R), Mung (R), Other Rabi Pulses, Sugarcane, Chilies (Dry), Castorseed, Linseed, Cotton, Turneric, Onion (2nd crop), Tapioca
Assam	Small Millets (R), Summer Potato (Hills), Sugarcane, jute, Mesta	Wheat Gram,Tur(K), Urad (R), Tobacco, Rapeseed and Mustard, Linseed
Bihar	Jute	Wheat, Barley, Gram, Tur(K), Winter Patato (Plains), Sugarcane, Rapeseed and Mustard, Linseed Wheat, Barley, Gram, Tur (K), Winter Potato.
Gujarat	Sugarcane	Sugarcane, Chillies (Dry), Castorseed, Rapeseed and Mustard, Cotton, Onion
Himachal Pradesh	Sugarcane, Cotton	Rapeseed and Mustard, Linseed Winter Rice, Jowar (R), Wheat, Gram, Urad (R), Mung (R), Winter Potato (Plains), Summer Potato
Karnataka	Sugarcane	(Plains), Sugarcane, Linseed, Cotton, Turmeric, Cardiseed, Onion
Kerala	Sugarcane, Sesamum (1st crop), Tapioca (2nd crop)	Summer Rice, Sesamum (3rd crop), Cotton, Sweet Potato Jowar (R), Wheat, Barley Small Millets (R), Gram, Tur, Urad (R), Mung (R), Other Rabi
Madhya Pradesh	Sugarcane	Pulses, Winter Potato, Sugarcane, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, sannhemp Cardiseed, Onion Jowar (R), Maize (r), Wheat Barley, Gram, Tur (K), Other Rabi Pulses, Chillies (Dry), Tobacco, Catorssed,
Maharashtra	Sugarcane	Rapeseed and Mustard, Linseed, Cotton, Cardiseed, Onion,
Manipur	Maize, Jute	Wheat, Gram, Castorseed, Rapeseed and Mustard, Linseed,
Orissa	Sugarcane	Bajra, Ragi, Wheat, Barley, Urad (R), Mung (R), Rapeseed and Mustard,
Punjab and Haryana	Winter Potato (Hills), Summer Potato (Hills), Sugarcane, Ginger, Chillies (Dry), Tobacco, Turmeric, Onion	Gram, Tur(K), Summer Potato, Sugarcane, Castorseed, Rapeseed and Mustard, Linseed, Turmeric
Rajasthan	Small Millets (R), Sugarcane	Wheat, Barley, Gram, Tur (K), Urad (R), Mung (R), Other Rabi Pulses, winter Potato (Plains), Castorseed, Rapeseed and Mustard, Linseed
Tamil Nadu	Summer Rice, Jowar (R), Sugarcane, Groundnut (Early), Sesamum, Onion	Winter Rice, Jowar (R), Bajra, Ragi, Small Millets (K), Mung (K), Other Rabi Pulses (Kulthi), Winter Potato, Sugarcane, Tobacco, Castorseed, Sesamum (Late), Cotton, Onion

4. Sowing and Harvesting operations normally in progress during March, 2015—*Contd.*

1	2	3
Tripura	Autumn Rice, Sugarcane, Sesamum, Cotton Jute	Summer Rice, Urad (R), Mung (R), Other Rabi Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Rapeseed and Mustard, Wheat Barley, Small Millets (R) Gram, Tur (K),
Uttar Pradesh	Small Millets(R), Sugarcane, Ginger, Jute, Mesta, Tapioca	Winter Potato (Hills), Ginger, Tobacco, Castersood, Rapeseed and Mustard, Linseed, Sweet Potato, Onion, Tapioca Wheat, Barlery, Gram, Tur (K), Urad (R), Other Rabi
West Bengal	Autumn Rice, Sugarcane, Ginger, Sesamum, Jute	Pulses, Winter Potato (Plains, Sugarcane, Ginger, Tobacco, Sesamum, Rapeseed and Mustard, Chillies (Dry)
Delhi	Sugarcane, Tobacco, Jute	Barley, Gram, Sugarcane, Tobacco

METRIC WEIGHTS AND MEASURES

SIMPLE CONVERSION TABLES

I. WEIGHTS

Tons to metric Tonnes

Tons	1	2	3	4	5	6	7	8	9	10
Metric tonnes	1.02	2.03	3.05	4.07	5.08	6.10	7.11	8.13	9.14	10.16

Pounds (av.) to Kilograms

Pounds	1	2	3	4	5	6	7	8	9	10
Kilograms	0.45	0.91	1.36	1.81	2.27	2.72	3.18	3.63	4.08	4.54

Tolas to grams

Tolas	1	2	3	4	5	6	7	8	9	10
Grams	11.66	23.33	34.99	46.66	58.32	69.98	81.65	93.31	104.97	116.64

Seers to Kilograms

Seers	1	2	3	4	5	6	7	8	9	10
Kilograms	0.93	1.87	2.80	3.73	4.67	5.60	6.53	7.46	8.40	9.33

Maunds to Quintals

Maunds	1	2	3	4	5	6	7	8	9	10
Quintals	0.37	0.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73

II. LENGTHS

Miles to Kilometres

Miles	1	2	3	4	5	6	7	8	9	10
Kilometres	1.61	3.22	4.83	6.44	8.05	9.66	11.27	12.87	14.47	16.09

Yards to Metres

Yards	1	2	3	4	5	6	7	8	9	10
Metres	0.91	1.83	2.74	3.66	4.57	5.49	6.40	7.32	8.23	9.14

Inches to Millimetres

Inches	1	2	3	4	5	6	7	8	9	10	11	12
Millimetres	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40	304.80

III. AREA

Acres to Hectares

Acres	1	2	3	4	5	6	7	8	9	10
Hectares	0.40	0.81	1.21	1.61	2.02	2.43	2.83	3.24	3.64	4.04

Square Yards to Square Metres

Square Yards	1	2	3	4	5	6	7	8	9	10
Square Metres	0.84	1.67	2.51	3.34	4.18	5.02	5.85	6.69	7.53	8.36

IV. CAPACITY

Gallons (Imperial) to Litres

Gallons	1	2	3	4	5	6	7	8	9	10
Litres	4.55	9.09	13.64	15.14	22.73	27.28	31.82	36.37	40.91	45.44

ISSN 0002-167
Regn. No. : 840

P. Agri. 21-2-2015
600

List of other Publications of the Directorate

Periodicals

Agricultural Prices in India

Agricultural Wages in India

Cost of Cultivation of Principal Crops in India

District-wise Area and Production of Principal Crops in India

Year Book of Agro-Economic Research Studies

Land Use Statistics at a Glance

Farm Harvest Prices of Principal Crops in India

Agricultural Statistics at a Glance

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

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