IMPACT OF PRICE INCENTIVES ON PRODUCTION AND PROCUREMENT OF PADDY IN PUNJAB

Thesis

Submitted to the Punjab Agricultural University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE
in
AGRICULTURAL ECONOMICS
(Minor Subject: Statistics)

By

Sikitu Anyosisye
(L-2011-BS-314-M)

College of Basic Sciences and Humanities

LUDHIANA-141004

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CERTIFICATE – I

This is to certify that the thesis entitled, **"Impact of price incentives on production and procurement of paddy in Punjab"** submitted for the degree of **Master of Science,** in the subject of **Agricultural Economics** (Minor subject: **Statistics**) to the Punjab Agricultural University, Ludhiana, is a bonafide research work carried out by **Mr. Sikitu Anyosisye (L-2011-BS-314-M)** under my supervision and that no part of this thesis has been submitted for any other degree.

The assistance and help received during the course of investigation have been fully acknowledged.

_____

(Dr. S.S. Chahal)
Major Advisor
Director,
Technology Marketing and IPR Cell,
Punjab Agricultural University
Ludhiana-141004 (India)

CERTIFICATE – II

This is to certify that the thesis entitled, **"Impact of price incentives on production and procurement of paddy in Punjab"** submitted by **Mr. Sikitu Anyosisye (L-2011-BS-314-M)** to the Punjab Agricultural University, Ludhiana, in partial fulfillment of the requirements for the degree of **Master of Science** in the subject of **Agricultural Economics** (Minor subject: **Statistics**) has been approved by the Student's Advisory Committee along with Head of the Department after an oral examination on the same, in collaboration with an External Examiner.

(Dr. S.S. Chahal)
Major Advisor

(Dr. Gurmail Singh)
External Examiner
Professor
Department of Economics
Panjab University
Chandigarh – 160 014

(Dr. M.S. Sidhu)
Head of the Department

(Dr. Gursharan Singh)
Dean, Post-Graduate Studies

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Date:

Place: *(Sikitu Anyosisye)*

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ABSTRACT

The minimum support price (MSP) is fixed at incentive level, so as to induce the farmers to make capital investment for the improvement of their farm and to motivate them to adopt improved technologies to step up their production and thereby, their net income. In the absence of such a guaranteed price, there is a concerned that farmers may shift to other crops causing shortage in these commodities such as rice. The aim of the present study was to investigate the impact of MSP on production and procurement of paddy in Punjab. The study was entirely based on the secondary data pertaining to paddy area, production, productivity, market arrivals, procurement and minimum support prices for the period 1950-51 to 2011-12 which were collected from various issues of Statistical Abstract of Punjab, Agricultural Statistics At A Glance, Economic Surveys and www.indiastat.com. The Karl-Pearson coefficient of correlation (r) was computed to examine the degree and the direction of the relationship between MSPs and production/procurement. The results revealed positive relationship between MSP and production as well as MSP and procurement. As the results of assured price and public purchase of paddy over years, farmers have been motivated to expand the area under the same crop and adopted modern agricultural technology and consequently the increase in production. The highest compound growth rate (16.35 percent per annum) of paddy production was recorded during Green Revolution as a result of high growth rates of area and yield, 10.59 and 5.21 percent per annum, respectively. Also, the results indicate that, Punjab is still the major contributor of rice to the Central Pool in the country. Punjab contributed 34.41 percent during 1985-86 to 2010-11. However, its contribution has been declining over years because of the increased contribution of rice to the Central Pool from other states. Overall the study conclude that MSP as an incentive price has contributed to the increase in production and procurement of paddy in Punjab.

Key words: Minimum support price, production, market arrivals, procurement and paddy

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Signature of Major Advisor Signature of the Student

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ਸਾਰ-ਅੰਸ਼

ਕਿਸਾਨਾਂ ਨੂੰ ਇੰਨਸੇਂਟਿਵ ਦੇਣ ਲਈ ਫ਼ਸਲਾਂ ਦਾ ਘੱਟੋ ਘੱਟ ਸਮਰੱਥਨ ਮੁੱਲ ਨਿਰਧਾਰਤ ਕੀਤਾ ਜਾਂਦਾ ਹੈ ਤਾਂ ਜੋ ਇਸ ਤੋਂ ਉਤਸ਼ਾਹਿਤ ਹੋ ਕਿ ਕਿਸਾਨ ਆਪਣੇ ਖੇਤ ਦੇ ਸੁਧਾਰ ਲਈ ਕੰਮ ਕਰਨ ਅਤੇ ਆਧੁਨਿਕ ਤਕਨੀਕਾਂ ਦੀ ਵਰਤੋਂ ਕਰਕੇ ਆਪਣੀ ਪੈਦਾਵਾਰ ਅਤੇ ਆਪਣੀ ਕਮਾਈ ਵਿੱਚ ਵਾਧਾ ਕਰਨ। ਜੇਕਰ ਅਜਿਹਾ ਨਾ ਕੀਤਾ ਜਾਵੇ ਤਾਂ ਹੋ ਸਕਦਾ ਹੈ ਇਹਨਾਂ ਫ਼ਸਲਾਂ ਨੂੰ ਛੱਡ ਕੇ ਦੂਜਿਆਂ ਫ਼ਸਲਾਂ ਦੀ ਕਾਸ਼ਤ ਵੱਲ ਰੁੱਖ ਕਰ ਜਾਣ ਜਿਸ ਨਾਲ ਇਹਨਾਂ ਫ਼ਸਲਾਂ ਜਿਵੇਂ ਕਿ ਝੋਨੇ ਦੀ ਘਾਟ ਦਾ ਹੋ ਸਕਦੀ ਹੈ। ਪੰਜਾਬ ਵਿੱਚ ਝੋਨੇ ਦੀ ਪੈਦਾਵਾਰ ਅਤੇ ਖਰੀਦਦਾਰੀ ਉਪਰ ਘੱਟੋ ਘੱਟ ਸਮਰੱਥਨ ਮੁੱਲ ਦੇ ਪ੍ਰਭਾਵ ਦਾ ਆਂਕਣਲ ਕਰਨ ਲਈ ਮੌਜੂਦਾ ਖੋਜ ਕੀਤੀ ਗਈ। ਕਈ ਤਰ੍ਹਾਂ ਦੇ ਸਰੋਤਾਂ ਜਿਵੇਂ ਕਿ ਸਟੈਟਿਸਟਿਕਲ ਐਬਸਟ੍ਰੇਕਟ ਪੰਜਾਬ, ਐਗਰੀਕਲਚਰਲ ਸਟੈਟਇਸਟਿਕਸ ਐਟ ਅ ਗਲਾਂਸ, ਇਕਨਾਮਿਕ ਸਰਵੇ ਅਤੇ www.indiastat.com ਤੋਂ ਸੰਨ 1950-51 ਤੋਂ 2011-12 ਦੇ ਅਰਸੇ ਦੌਰਾਨ ਝੋਨੇ ਦੀ ਕਾਸ਼ਤ ਵਾਲੇ ਖੇਤਰਾਂ, ਝੋਨੇ ਦੀ ਪੈਦਾਵਾਰ, ਉਪਤਦਕਤਾ, ਮੰਡੀਆਂ ਵਿੱਚ ਝੋਨੇ ਦੀ ਆਮਦ ਅਤੇ ਘੱਟੋ ਘੱਟ ਸਮਰੱਥਨ ਮੁੱਲ ਸਬੰਧੀ ਆਂਕੜੇ ਇਕੱਠੇ ਕੀਤੇ ਗਏ। ਘੱਟੋ ਘੱਟ ਸਮਰਥਨ ਮੁੱਲ ਅਤੇ ਪੈਦਾਵਾਰ/ਉਤਪਾਦਕਤਾ ਵਿੱਚ ਸਬੰਧ ਅਤੇ ਇਸਦਾ ਰੁਝਾਣ ਵੇਖਣ ਲਈ ਇਕੱਠੇ ਕੀਤੇ ਆਂਤ੍ਰਿਕਆਂ ਦਾ ਕਾਰਲ ਪੀਅਰਸਨ ਕੋਫੀਸ਼ੀਐਂਟ ਸਹਿ-ਸਬੰਧ (ਆਰ) ਵੇਖਿਆ ਗਿਆ। ਨਤੀਜਿਆਂ ਤੋਂ ਘੱਟੋ ਘੱਟ ਸਮਰਥਨ ਮੁੱਲ ਅਤੇ ਪੈਦਾਵਾਰ/ਉਤਪਾਦਕਤਾ ਵਿੱਚ ਧਨਾਤਮਕ ਸਬੰਧ ਵੇਖਣ ਨੂੰ ਮਿਲਿਆ। ਮੁੱਲ ਅਤੇ ਮੰਡੀਆਂ ਵਿੱਚ ਝੋਨੇ ਦੀ ਖਰੀਦ ਯਕੀਨੀ ਹੋਣ ਕਾਰਨ, ਕਿਸਾਨ ਵਿੱਚ ਝੋਨੇ ਅਧੀਨ ਰਕਬੇ ਵਿੱਚ ਵਾਧਾ ਕਰਨ ਸਬੰਧੀ ਉਤਸ਼ਾਹਿਤ ਹੋਏ ਅਤੇ ਉਹਨਾਂ ਨੇ ਪੈਦਵਾਰ ਵਧਾਉਣ ਲਈ ਆਧੁਨਿਕ ਤਕਨੀਕਾਂ ਦੀ ਵਰਤੋਂ ਕੀਤੀ। ਝੋਨੇ ਦੀ ਸਭ ਤੋਂ ਵਧੇਰੇ ਕੰਪਾਉਂਡ ਵਿਕਾਸ ਦਰ (16.35 ਪ੍ਰਤੀਸ਼ਤ ਪ੍ਰਤੀ ਸਾਲ) ਹਰੀ ਕ੍ਰਾਂਤੀ ਦੌਰਾਨ ਵੇਖੀ ਗਈ। ਇਸ ਅਰਸੇ ਦੌਰਾਨ ਝੋਨੇ ਅਧੀਨ ਰਕਬੇ ਅਤੇ ਪੈਦਾਵਾਰ ਵਿੱਚ ਪ੍ਰਤੀ ਸਾਲ ਕ੍ਰਮਵਾਰ 10.59 ਅਤੇ 5.21 ਪ੍ਰਤੀਸ਼ਤ ਵਾਧਾ ਹੋਇਆ। ਨਤੀਜਿਆਂ ਤੋਂ ਇਹ ਵੀ ਪਤਾ ਚੱਲਿਆ ਕਿ ਬਾਕੀ ਸੂਬਿਆਂ ਦੇ ਮੁਕਾਬਲੇ ਝੋਨੇ ਦੇ ਕੇਂਦਰੀ ਭੰਡਾਰ ਵਿੱਚ ਪੰਜਾਬ ਦਾ ਯੋਗਦਾਨ ਹੁਣ ਵੀ ਸਭ ਤੋਂ ਵਧੇਰੇ ਹੈ। ਸੰਨ 1985-86 ਤੋਂ 2010-11 ਦੌਰਾਨ ਪੰਜਾਬ ਦਾ ਯੋਗਦਾਨ 34.41 ਪ੍ਰਤੀਸ਼ਤ ਸੀ। ਹਾਲਾਂਕਿ ਪਿਛਲੇ ਸਾਲਾਂ ਦੌਰਾਨ ਝੋਨੇ ਦੇ ਕੇਂਦਰੀ ਭੰਡਾਰ ਵਿੱਚ ਬਾਕੀ ਸੂਬਿਆਂ ਦੇ ਯੋਗਦਾਨ ਵਧਣ ਨਾਲ ਪੰਜਾਬ ਦੇ ਯੋਗਦਾਨ ਵਿੱਚ ਗਿਰਾਵਟ ਵੇਖੀ ਗਈ। ਕੁੱਲ ਮਿਲਾ ਕੇ ਅਧਿਐਨ ਤੋਂ ਇਹ ਸਿੱਟੇ ਨਿਕਲੇ ਕਿ ਝੋਨੇ ਦਾ ਘੱਟੋ ਘੱਟ ਸਮਰਥਨ ਮੁੱਲ ਹੋਣ ਕਾਰਨ ਪੰਜਾਬ ਵਿੱਚ ਝੋਨੇ ਅਧੀਨ ਰਕਬੇ ਅਤੇ ਇਸਦੀ ਖਰੀਦਦਾਰੀ ਵਿੱਚ ਵਾਧਾ ਹੋਇਆ।

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ਪ੍ਰਮੁੱਖ ਸਲਾਹਕਾਰ ਦੇ ਹਸਤਾਖਰ

ਵਿਦਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ

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CHAPTER – I

INTRODUCTION

Agriculture is one of the most important activities in both developed and developing countries which provide basic raw materials to human beings and various agro-based industries. It continues to be the mainstay of the Indian economy contributing 14.1 per cent of GDP and the largest employment providing sector (58.2 per cent).

In a country which depends mainly on agriculture, it is absolutely necessary to modernize the age-old traditional agriculture. The transformation of agriculture into dynamic business proposition is primarily a techno-economic process, which can be accelerated by providing a suitable environment to the farmers. One of the necessary conditions to speed-up this transformation is to stabilize the prices of agricultural products. The stability of farm prices plays a vital role in the development of farm production, stabilization of farm incomes in particular and the farm economy in general. Prices in the economy act as allocators of resources, distributors of income and catalyst of capital formation. Instability in the prices of farm produces tends to cause inefficient allocation of resources and induce income fluctuations over time and across different categories of farmers. These result in distributing changes in cropping pattern in the economy.

On the contrary, a stable price level would provide incentives to the producers to increase the production of required commodities thereby, helping to achieve a balanced growth of the economy. An efficient pricing of agricultural commodities, therefore, assumes a crucial role in initiating and maintaining the development process. A system of efficient pricing is very important in maximizing agricultural production. It also leads to maximum social welfare from the given output. The objectives can be achieved only if the marketing system ensures prices, which are stable and remunerative to producers. The prices must be reasonable to consumers as well to drive the demand for the increased production. The prices play a vital role in predominantly agricultural economies like India. It determines not only what shall be produced but also how much to be produced. The price system is a powerful tool to transmit essential economic information and stimulate appropriate decision by producers and consumers. Similarly, price is the most important determinant of profit or loss in the farm enterprise. In a farm enterprise, time factor is very important. While crops are grown in one period, these are harvested in another period. This long gestation period exercises significant influence on price determination. Therefore, the prices prevailing during the marketing period are of great significance.

Considering the importance of price in the agricultural economy, in 1965 India initiated Minimum Support Price (MSP) programme as one of the key instrument for agricultural price policy. MSP is a form of market intervention by the Government of India to

ensure agricultural producers against any sharp fall in form of prices. The minimum support prices (MSPs) are fixed by the Government of India at the beginning of the sowing season for certain crops on the basis of the recommendations of the Commission for Agricultural Costs and prices (CACP). The MSP is viewed as being in the nature of long term guarantee to the producers that any glut in the market which may be caused by excess production will not be able to depress their incomes to unduly low levels. Once the minimum support price of a crop is announced, it is implied that the government is committed to purchase, at the announced level of support price, unlimited quantities of the crop concerned, irrespective of the size of the harvest and the level of market prices. The purchases by government agencies at minimum support prices is, thus, open ended and these prices set a floor below which market prices can not fall. The major objectives are to support the farmers from distress sales and to procure food grains for public distribution.

The MSP is fixed at incentive level, so as to induce the farmers to make capital investment for the improvement of their farm and to motivate them to adopt improved technologies to step up their production and thereby, their net income. In the absence of such a guaranteed price, there is a concerned that farmers may shift to other crops causing shortage in these commodities (such as paddy/rice, wheat etc.). For example, the continued increase in the production and procurement of wheat and paddy during period 1980-99 were possible due to assured prices under minimum support prices along with the development of various infrastructural facilities and other market incentives provided in the regulated markets of Punjab (Chahal *et al*., 2001). The MSP of paddy was ₹53 per quintal in 1970-71 which increased to ₹105 per quintal in 1980-81 while MSP of super fine variety of paddy was ₹113 per quintal. The MSP of paddy has increased from ₹205 per quintal in 1990-91 to ₹950 in 2010-11 while corresponding figures for grade 'A' were ₹225 and ₹1030 per quintal respectively.

The MSPs are currently announced for 24 commodities including seven cereals (paddy, wheat, barley, jowar, bajra, maize and ragi), five pulses (gram, arhar/tur, moong, urad and lentil), eight oilseeds (groundnuts, rapeseed/mustard,toria, soyabean, sunflower seed, sesamum, safflower seed and nigerseed), copra, raw cotton, raw jute and virgia flu cured (VFC) tobacco.

Among the various crops cultivated in India, MSP has been provided for paddy for more than 46 years now, starting from 1965-66. Paddy is an important crop which contributes to about 40 percent of India's total foodgrains production (Narayanamoorthy and Suresh, 2012). Paddy also supports the livelihood of large number of farmers besides helping to sustain the food security of the country. It is also one among the two crops, where support price has been implemented since mid-sixties.

Among the paddy growing countries, India has the largest area under paddy in the world (44 million hectares) and ranks second in production, next to China. India's paddy production stood at 144 million tonnes during 2010. Major paddy producing states in the country during 2009-10 were West Bengal (16.10 percent), Punjab (12.61 percent), Uttar Pradesh (12.13 percent), Andhra Pradesh (11.83 percent), Orissa (7.76 percent), Tamil Nadu (6.36 percent), Assam (4.87 percent), Chhattisgarh (4.61 percent),Karnataka (4.14 percent), Haryana (4.07 percent), and Bihar (4.04 percent) (Anonymous, 2011). More than 50 percent of total paddy production came from the first four states.

Punjab is one of the major paddy producing states in the country. Its production stood at 16.98 million tonnes during 2010-11. Currently, annual total planting area under rice is 2.83 million hectares; comprising six percent of India's rice cultivated area. Punjab ranks first under Indian context with average paddy productivity (6 tonnes per hectare) level which is at par with average productivity of China (Mahajan *et al.*, 2012). The availability of assured irrigation facilities (98 percent of cultivated area is irrigated), introduction of high yielding varieties, use of chemical fertilizers, and mechanization of agricultural operations together led to a rapid expansion in paddy's area from 0.39 million hectares during 1970-1971 to 2.83 million hectares during 2010-2011 and increased its productivity from 3.34 tonnes to 6 tonnes per hectare during the same period. This gave a tremendous jump to its production from 1.3 million to 16.98 million tonnes (13.1 times). Since, paddy is not a staple food of the Punjabis, volume of its market arrivals increased from 0.85 to 13.14 million tonnes (65.38 to 81.36 percent of its total production in the state) during same period.

As mentioned earlier, paddy is among the 24 crops whose markets are assured under minimum support price. Food Corporation of India (FCI) on behalf of Central Government procures marketed surplus of paddy from the markets at the minimum support prices to build up stocks to feed the public distribution system (PDS) and meet the requirements for buffer stocks. Along with FCI, various state procurement agencies also make procurement on behalf of the FCI from the wholesale regulated food grains market. After getting paddy milled from rice shellers on a custom hiring basis rice is distributed to the deficit states through the public distribution system at the central issue prices. Since, the production is concentrated in few states of India; there is large regional mismatch between supply and demand of food grains, which is eliminated by movement of grains between surplus and deficit states (Jha *et al.*, 2006). The government of India plays an important role in procuring grains from surplus states at minimum support price to sell through its agency, the Food Corporation of India.

Though the state-wise contribution to total procurement had considerably changed in the recent years, Punjab continued to be the leading contributor for both rice and wheat (Acharya and Agarwal, 2011). The contribution of Punjab state towards rice Central Pool

declined from 45.3 percent during 1980-1981 to about 28.9 percent during 2010–11. This might have been due to variations of production and the relationship between procurement prices/minimum support prices and open market prices. Also, it can be due to increased contribution from other states.

As stated above that, paddy is an important crop in Indian economy and Punjab is the major contributor of rice to the Central Pool, therefore, a study on the impact of price incentives on production and procurement of paddy in Punjab state is important. The study helps in finding out the effect of minimum support price on the production and procurement of paddy in the state of which its results are very useful to both farmers and the policy makers in enhancing production and procurement of paddy in the state. In the backdrop of this, the present study was undertaken with the following specific objectives:

i. to examine the growth performance of paddy in Punjab,
ii. to examine the market arrivals and procurement patterns in Punjab
iii. to study the contribution of rice to the Central Pool by Punjab vis-à-vis other states and
iv. to examine the relative movement patterns of minimum support prices of paddy vis-à-vis other competing crops.

CHAPTER – II

REVIEW OF LITERATURE

The production and procurement performance of paddy in different states and India as a whole is reflected in the extensive literatures on the subject. Within it, four significant observations emerge. First is the growth trend in area, production and productivity of rice. Second is the effect of area, productivity and their combined (area and productivity) effect on rice production. Third is about the sources of rice area expansion and increases in productivity, and the last being the influence of prices/MSP on growth of production and procurement of paddy. These are discussed in the following two sections.

Growth Performance of Paddy

The area under rice, production and productivity increased significantly in different study periods. The rice production in Punjab recorded a high growth rate of 16.10 percent per year. During the sixties the contribution of yield was the main factor of growth but in the subsequent years area and yield both made almost similar contribution to the growth of the crop (Sharma and Singh (1986), Sharma (1988) and Bhatnagar (1995). In the coastal regions rice yield witnessed a higher growth rate as compared to rice acreage, whereas in the case of non-traditional rice growing areas the growth in rice acreage was higher than the growth in yield. The acreage under rice was influenced mainly by lagged acreage, rainfall received during pre-sowing months and farm harvest prices. The yield response indicated that the area under HYVs, irrigation, rainfall and fertilizer consumption had positive and significant impact on rice yield in majority of the cases (Sharma and Joshi, 1995).

Jain and Garg (1995) found that, four states namely Assam, Madhya Pradesh, Punjab and West Bengal recorded significant growth in area under rice in the eighties whereas for India as a whole growth in area was non-significant during the study period. During the Post-Green Revolution period, output of rice in Orissa state grew at annual rate of 1.43 percent and this was contributed solely by the yield. The technological factors like fertilizers, HYVs and irrigation led to higher per hectare yield of rice.

The yield of rice in West Bengal had increased manifolds during 1970-71 to 1994-95. The increase mainly was due to the development in the field of irrigation and increasing fertilizers application. In Kerala, the area as well as production was on increase trend till mid seventies and after that both area and production were on decline. The growth rate of area for rice (1.012), production (1.051) and productivity (1.038) in Karnataka were positive and showed increasing trend. The positive growth rate in production of rice was partly due to expansion in area and partly due to increase in productivity over the years (De, 1999, Thomas and Sundareasan, 2000 and Shripad *et al.,* 2000). The food grains production in the state of

Madhya Pradesh increased from 5.9 to 17.4 million tonnes during 1951-52 to 1996-97 achieving an annual growth of 2.38 percent. Although, the yield during this period increased from 461 to 1105kg per hectare but that was still very low compared to all India average of 1614kg per hectare. The low yield could be attributed to lower use of agricultural inputs mainly fertilizer and irrigation water. The analysis revealed that the fertilizer consumption in the state increased from 0.01kg per hectare in 1951-51 to 39.19 per hectare during 1996-97 which had positive effect on yield. The net irrigated area under food grain crops increased from 6.1 percent to 31.7 percent during 1951-52 to 1996-97. The standardized regression coefficients estimate values, based on time series data, exhibited that fertilizer (0.42) was the most important input followed by irrigation (0.38) and power (0.18) but from the spatial data for the year 1996-97, irrigation (0.52) played the most vital role followed by fertilizer (0.38) and power (0.05) in increasing productivity. As regards the input use level, there was deficit use of all the important inputs in general and manure in particular for those crops. The positive and highly significant coefficient of area for crops indicated that increase in the area under the crops could add to the yield gap. The human labour, fertilizers, seeds and plant protection and number of irrigation were effective in minimizing the yield gaps of the crops (Singh and Chandra, 2000 and Navadkar *et al*., 2004).

The study on the cost efficient yield level for paddy and wheat in India found that fertilizer input was most significant responsive factor to paddy yield in Andhra Pradesh as one percent increase in the level of this input was likely to increase paddy yield by 0.64 percent. In Haryana, fertilizer and area under HYV's turned out to be significant explanatory inputs explaining the variation in wheat yield. It was found that with one percent increase in fertilizer use could increase the wheat yield by 0.22 percent while one percent further increase in area under HYV's could result into 0.81 percent increase in yield of wheat. It is evident from the growth rate analysis that the increasing trend in production over the years for rice, maize, groundnuts and all horticultural crops was partly due to the expansion of area under them and partly due to the increase in productivity over years (Roy and Jain, 2004).

The technical efficiency in rice cultivation showed that there was considerable variation in efficiency across regions and size categories. In Tamil Nadu, the technical inefficiency varied widely ranging from 46.5 to 96.7 percent across sample farms. The existing gap between the realized and potential yield emphasized the need for improving farmers' practices through extension services and training programmes. And the main reason for high technical efficiency was observed to be timely transplantation and application of irrigation, fertilizers and pesticides in appropriate dosages in time (Singh and Kumar, 1998 and Mythili and Shanmugam, 2000). Prasoon *et al.* (2001) studied technology adoption, yield gaps and production constraints in rice and wheat in the plains of North-western Uttar

Pradesh. The results indicated that there existed considerable gaps between potential farm yield and the actual farm yield in rice and wheat in the region. This was due to partial adoption of recommended level of technology including high yielding variety seeds of rice. Another study conducted by Shukla *et al.,* (2003) showed that, aberrant weather conditions and socio-economic factors apparently deteriorated the rice productivity and created inter-state disparities. The lack of mechanization, low purchasing power, lack of technical knowledge, low efficiency of farm labourers and conservative thinking also led to decline in the rice yield and regional imbalance in rice production. Moreover, it was found that the coefficients of area, fertilizer, plant protection chemicals, bullock labour and machine labour in Bihar were positive and significant. The technical inefficiency of sample farms ranged between 6.67 and 66.42 percent with an average value of 25.55 percent. The study revealed the existence of technical inefficiency in the production of rice in the study area. It was concluded that, yield of rice could considerably be improved without increasing the level of inputs in the study area if the inefficiency were reduced (Reddy and Sen, 2004).

The study by Deka and Sarmah (2004) on the growth trends in area, production and productivity of banana in Assam revealed that, the Coefficient of Multiple Determination (R^2) values in linear regression were found to be 93.1 percent for area, 93.6 percent for production and 66.2 percent for yield. The results revealed a significant compound growth rate at 3.13 percent for area and 3.63 percent for production. However, in the case of productivity, growth rate was non-significant. Moreover, it was observed that the growth in production of banana was influenced more by the growth in area rather than productivity. The productivity of vegetables at national level had increased by 45 percent during the study period whereas the same for North- East region had increased only by 24 percent. Similarly, the productivity of fruits had increased by 20 percent at national level whereas the same had increased only by 12 percent in the region during same period. The growth in area of vegetables was 2.51 percent per annum in the region. The area under fruits in the region had grown at a rate of 2.35 percent per annum. The growth in productivity of vegetables was also observed but some of the crops had shown very high yield instability. The results revealed that, absolute yield variability tend to increase with introduction of the new technology (Kumar and Badal, 2004).

Rice production which had attained a growth rate of 7.00 percent during 1980-81 to 1989-90, declined to 2.56 percent during 1990-91 to 1999-00. The fall of rice production in decade of liberalization was more than 62 percent in comparison with what it was in the previous decade. In the Pre-Green Revolution Period, the growth in production was solely due to increase in area under rice while during Post-Green Revolution Period was due to the increase of productivity. The Productivity level of rice varied widely between different states

ranging above three tonnes per hectate to a level of one tone per hectare (Siju and Kombairaju, 2001 and Hazra, 2001).

The analysis of effects of modern technology in paddy production in Karnataka revealed that, growing HYVs of paddy resulted in about 54.5 percent of additional output and 42.5 percent of additional employment for the farmers. As regards the contribution of the different inputs to the total output growth nitrogen, seeds and bullock labour turned out to be the crucial contributors. The production and supply of quality seeds and use of recommended dose of fertilizer are therefore essential to facilitate timely sowing and to raise their cropping potential (Kunal *et al*., 2003).

It was observed that, despite a decline of 10.19 percent in the area under rice, production had increased by 19.59 percent during the period of 1981-2000 in Bihar state (Sinha and Kumar, 2003). The productivity of the crop had increased by 89.45 percent. This means that the increase in production was due to the increase in productivity. Chahal *et al.* (2003) reported that the results corresponding to the acreage response showed that lagged area had a significant and positive effect on the allocation of area to cotton in Punjab. Using secondary data from ten large food grains producing states in India for the year 1981-82 to 1998-99, Kumar and Jain (2004) pointed out that production and yield of rice increased at the rate of 2.82 percent and 2.42 percent per annum respectively. The different story was in Kerala where area and production of rice showed a declining trend and the rate of decline in area was steeper than in production. The productivity on the other hand showed a rising trend throughout (Job and Nandamohan, 2004). Another study on the growth performance of agriculture in agro-climatic zones of Tamil Nadu for the period 1975-76 to 1999-2000 concluded that area under rice declined in all the agro-climatic zones. However, the production exhibited growth due to significant growth in productivity (Jahanmohan *et al.,* 2005). Similarly, the production of rice in India had increased from merely 20 to 93 million tonnes between 1950-51 and 2001-02. Although, the growth in rice production came from both, acreage expansion and yield, high growth in yield was the major factor for significant growth in rice production. The increase in rice area mainly came from a shift away from coarse cereals and pulses, and also from an increase in cropping intensity. The significant growth in yield could be largely attributed to the introduction of the new dwarf high yielding variety associated with the use of complementary inputs, particularly fertilizers and irrigation (Singh *et al*., 2005).

The growth rate of productivity of food grains was 1.86 percent during Pre-Green Revolution and it increased significantly to 2.24 percent during Green Revolution and further accelerated to 2.32 percent during Post- Green Revolution (Gupta and Bawa, 2004). It was observed that adoption of technology as reflected through NPK (Kg/ha) use had negative

influence on yield instability (Kumar *et al.,* 2005a). The proportion of HYVs to the total area had significant and negative influence on maize. The total area under the crop also has significant influence on yield variability as larger the area under the crop greater the probability that high yield of one yield of one region (due to good rainfall) would compensate for low yield (due to bad rainfall) of another region. An improved infrastructure captured through road density had significant bearing on yield instability.The wide network of roads influence timely availability of inputs and technical know-how.

The production performance of maize crop in northern India was studied by Kumar *et al*., (2005b). The results revealed that most of the districts, constituting significant maize area in the six states experienced very low growth in maize yield and had low harvest than the national average yield. However, among the six states under the study, Bihar was the only state which performed well and registered high growth rate in maize yield with higher level of maize yield. Punjab state was next to Bihar with nearly 76 percent of the maize area recording higher yield but had slow growth.

The quantification of changes in instability in production of foodgrains between two time periods 1981-82 to 1990-91 and 1991-92 to 2000-01 was undertaken to identify the sources of increase or decrease in the instability through decomposition analysis. The analysis of data showed an increase in average production of food grain crops namely rice, wheat, maize etc. in nineties compared to eighties. The production of individual crops including total foodgrains became stable in nineties compared to eighties. The results regarding contribution of different components of change towards increase in foodgrains production change in yield accounted for a very large proportion of increase in the average production in almost all states. The change in area was yet another important factor contributed to changes in production in the states like Punjab, Haryana, Rajasthan, Karnataka and West Bengal (Sharma *et al.,* (2006). The production of rice in Rajasthan reflected a declining trend during 1980-81 to 1989-90 because of the decline in area under the crop over and above its positive yield growth rate. During 1990-91 to 1999-2000 production increased due to the increase in the area under it. In the main period (1980-81 to 1999-2000) while area increased by only 0.86 percent per annum, yield increased by 2.18 percent per annum, both giving rise to a 3 percent per annum production growth rate of the crop. It was noticed that due to frequent failure of nature, discontinuity in the provision of irrigation, HYV seeds, pest and weed control measures, financial supports different other pre and post harvesting measures are some of the prominent reasons behind the persistence of high degree of variability in the growth of crops in Rajasthan agriculture (Swain and Bhakar, 2006).

An economic analysis of productivity and profitability in rice production in India done by Sushila *et al*. (2006) indicated that, for the country as a whole, rice yield increased

from 793 kg per hectare during 1951-52 to 1994kg per hectare in the year 2001-02. The change of the scenario of rice production in the country was contributed by the introduction of fertilizer and irrigation responsive varieties of rice crop.

While minimum support price policy proved effective in maintaining producer incentives and assuring supplies of food grains, experience suggests that this price intervention distorted output crop-mix. During 1998-99 to 2000-01, area under wheat increased by 0.53 million hectares in Haryana, Punjab and Uttar Pradesh. A study by the Department of Agriculture and Cooperation showed that between 1990-91 and 1999-2000, the area under rice in Punjab increased from 2 million hectares to 2.6 million hectares, presumably in response to ever increasing procurement prices, whereas the area under maize, cotton and oilseeds declined (Jha *et al.*, 2006).

The technological change in paddy production was studied by Basavaraja *et al.* (2008). It was compared the traditional and system of rice intensification methods of cultivation. The study was based on the input-output data obtained from sample paddy growing farmers in Andhra Pradesh. The findings showed the superiority of system rice intensification method of cultivation in terms of yield and returns. The area, production and productivity of rice in Punjab have increased by 6, 23 and 3.9 times, respectively. The increase in rice production mainly was due to increased grain yield rather than increased planting area. This increase has come from the development of high-yielding varieties and improved crop management practices, such as optimum transplanting time, nitrogen fertilization, improved weed and irrigation management (Mahajan *et al.*, 2012). The development of irrigation infrastructure in Punjab had played a major role in improving the productivity of rice in the state. Punjab, constituting 1.5 percent geographical area of the country, has been contributing 40 to 50 percent of its production to the Central Pool for the last four decades.

Market arrivals, procurement and minimum support prices

Several researchers have given out different observations relating to this sub-section. A study conducted by Sidhu and Sidhu (1985) evaluated relative merits of the price support versus fertilizer subsidy policy for food self sufficiency in India. The study focused on rice and wheat crops over the period 1965-66 to 1980-81. An acreage, yield and supply equations were estimated along with the fertilizer consumption equation. The results revealed that fertilizer turned out to be superior to the price support policy in terms of net social benefits and benefit cost ratio. However, the price support policy was preferred over the fertilizer subsidy in terms of foreign exchange savings. Low price elasticity of output supply, high price elasticity of fertilizer demand and high production elasticity of fertilizer were the reasons for relative superiority of fertilizer subsidy policy over price support policy.

It was found that agricultural price policy was found to widen the income inequalities among the paddy farmers in Punjab during the period of study (Singh *et al.*, 1986a). Sufficiently higher prices of output, covering their costs of production were emphasized to improve incomes, though this could further widen the inequality by adversely affecting the purchasing power of consumers. The effect of agricultural price policy along with decomposition of the contribution of price to the increase in farm income was examined by (Rai *et al.*, 1986). Agricultural price policy for inputs (fertilizer) and outputs (wheat and rice) was found to have benefited all sections of the society by increasing the agriculture production. Similarly, Patel and Shiyani (1997) analysed the impact of agricultural price policy for foodgrains on farm income in Gujarat for the period 1960-61 to 1990-91. The decomposition analysis revealed that rise in prices contributed the most towards growth in farm income for all the crops. The interaction effect of price and productivity was higher only in the case of paddy.

After examining the relationship between procurement price/support price and area under food crops, food prices, agricultural inputs and farm investments in Uttar Pradesh, it was concluded that there existed a positive and significant relationship between procurement price/support price and the area under wheat crop, though such relationship was non-significant for paddy (Singh *et al.*, 1986b). The influence of agricultural prices on market arrivals of paddy in three agricultural markets located in Karimnagar district of telangana region in the state of Andhra Pradesh was examined by Chary and Upender (1996). The findings revealed that higher quantity of market arrivals of paddy were observed during the peak marketing period. The probable reason was that the farmers who were economically not sound sold their produce soon after harvest to meet their financial obligations. In some markets the percentage of market arrivals was relatively higher in the lean marketing period. The main reason for such tendency was that the farmers who did not sell their produce in peak marketing period sold their produce in lean marketing period when prices were high to reap the maximum benefits.

The farmers' response to change in support price in land allocation to wheat was examined by Pandey (1998). The time series data from 1967-68 to 1994-95 were used with regard to support price, area, production and productivity of wheat in India. This growth was found to be positive with respect to the above parameters since Green Revolution era. The price showed a positive impact on area allocation. Also, it was observed that, the increase in the production would continue provided prices do not go down significantly (Gopal, 1999). Therefore, minimum support price would play a key role in increasing production. The minimum support price for cotton crop showed the highest rate of increase during the period 1985-86 to 2000 followed by pulse and rice (Singh *et al.*, 2000). The price policy was found

less effective for cotton crop (as compared to rice and wheat) as its market price was higher than the minimum support price. Another study by Jain and Singh (2000) indicated that, at the state level, 58 percent of paddy farmers in 1980-81 had covered their cost of production by the minimum support prices but declined to 45 percent in 1990-91 thereby showing that Punjab had become a high cost producer of paddy in India. Similarly, policy proved less beneficial overtime as the area benefited declined from 65 to 63 percent in the period concerned.

It has been observed by Sinha and Sen (2000) that the important acreage shifters under paddy were in year lagged yield of paddy, yield of competing crops and relative yield. The prices of paddy and competing crops were observed with lower values of coefficients. It was, thus, concluded that improvement in the productivity of paddy could be most appropriate policy measure for increasing the area under paddy crop in Uttar Pradesh**.** Minimum support price was found to have enhanced the market arrivals of paddy and wheat in the regulated markets of Punjab and the country as a whole (Chahal *et al.*, 2001). While Deshpande and Naika (2002) showed that cropping pattern in Karnataka largely got influenced by the market prices rather than minimum support price. It was concluded that minimum support prices in India favoured wheat and rice production and resulted in shift of good quality land and other resources to these crops away from pulses, oilseeds and other important crops (Chand, 2003). Similarly, the shift in the cropping pattern and farmers, tilt towards rice and wheat was driven more by the assured market at pre-fixed prices rather than the amount of profit margins which were shrinking as a result of raising capital costs of production (Chahal *et al*., 2004).

The effectiveness of minimum support prices in 11 states of India was examined (ADRT 2003). The time series data analysis was supported by the primary data collected from various districts of the concerned states. It was found that the procurement objective was largely successful during the nineties especially in the states of Punjab, Haryana and to certain extent in Uttar Pradesh, Tamil Nadu, Mandhya Pradesh and Bihar. It was observed that the states, where, the minimum support price was below the farm harvest price (FHP) and wholesale price (WSP), procurement had been undertaken and largest procurement was effected from those states only. This defied the objective of the minimum support price as a protective policy. An inter crop price parity with wheat and rice (cereals which benefited most from minimum support price policy) indicated a continuously downward trend for coarse cereals and sugarcane. It was emphasized that technological breakthrough of the Green Revolution had been highly biased towards irrigated areas. The remunerative and assured prices for rice and wheat caused a huge shift in land and other resources towards cultivation of these crops (Chand and Pal, 2003).

Another study by Panda (2003) examined the trends and variability in prices and the production of foodgrains and non-foodgrains during post liberalization period (1991-92 to 1999-2000). The results revealed positive and significant relationship between the average whole prices and crop production. In view of the price incentives playing less important in boosting agricultural production, there was a need to emphasize on other areas such as developing market infrastructure to ensure remunerative prices and stable income to the farmers for boosting agricultural production in the state. A study by Rathi and Awasthi (2003) in which attempt was made to examine the impact of domestic price policy on agricultural production, cropping pattern and productivity of cotton in Madhya Pradesh for the period 1980-81 to 2000-01. The results indicated that price influenced cotton production. Similarly attempt was made by Nampoothiry (2003) to examine the trends in cropping pattern vis-à-vis price trends in India and the results was that, during the period 1993-94 to 1999-2000, the index of minimum support price for rice rose by 58.1 percent while the index of area under rice rose by 5.4 percent during the same period. This indicates that, minimum support price played a role in the choice of crops for cultivation by farmers. This means that there was positive relation between minimum support price and area under rice. However, Sinha (2000) mentioned that mismatch of agriculture education, research and resource management in agriculture have adversely affected on agricultural production in India.

The findings by Sulemain *et al*., (2004) revealed that, farmers at least in the more commercial central and southern zones responded positively and significantly to price incentives. Farmers in the Northern zone are least commercial and least responsive to price. In general, non-price factors, especially rainfall and market access were found to be more important than prices in affecting production. The importance of these factors varied depending on the crop and region in question. Other researchers stated that the results of the area response function for the different states showed that the effect of lagged profitability was positive and significant. The area response to lagged year prices was positive and significant. The number of sugar factories also had a positive and significant effect on the area response function. One year lagged area had a positive and significant effect on the current area.

It was found that the regression coefficients pertaining to MSP were all statistically non- significant even at 20 per cent level except for tur and groundnut. Therefore, it was concluded that MSP did not help in deciding the area allocation under the crop during the next season. But, there were subtle differences between crops. The area decisions in the case of major crops and inferior cereals did not seem to depend on MSP. The relative economics seemed to work more strongly against inferior cereals. The negative coefficient for tur indicated that the area under tur was going down as MSP increased, which in itself is a

perplexing results. But MSP was acting positively on area under groundnut, whereas relative MSP of groundnut in relation to paddy seemed to discourage area allocation. However, degrees of freedom were not sufficient to conclude about the role of MSP as incentive prices. The lagged relationship with area as well as production did not indicate the role of MSP as an incentive price and therefore, it seemed only to serve as a psychological support in the case of price collapse and not as an instrument of price incentive as envisaged (Deshpande and Raveendra, 2004). It was also indicated that there was no relationship between the production trends and MSP (Lagged or otherwise).

The food grains management system of India covering public procurement, storage, and distribution was examined (Gulati *et al.*, 2007). The study pointed out the benefits that Punjab state gained from public market intervention which included the extensive irrigation, high fertilizer use, high tractor density, abundant roads, good markets, improved communication, and increased wheat and paddy production. The Government of India's Foodgrains management strategy was based on the twin pillars of procurement and distribution to ensure food security, and by simultaneously providing remunerative prices for Foodgrains to farmers through the mechanism of the Minimum Support Price and also ensuring availability of foodgrains to the public at reasonable prices through the Public Distribution System (Pitta and Singh, 2012). The public foodgrains management system in Punjab has evolved in such a way that production of wheat and rice has been accelerated by the government contracting wheat and rice at high, stable prices, and foodgrains security has been assured in the state and throughout the country by making more grain available, including through public distribution. However, in the process, providing an assured market for wheat and rice at prices higher than full costs (including imputed costs for labor and land) has led to farmers devoting as much land to growing as much wheat and rice as they can, taking incentives away from growing high-value commodities.

The production and price relationship for potato in Turkey for the period 1975-2007 was examined by Erda *et al.,* (2009). It was observed that potato production had been influenced by the lag value of average price formed in the market. It was revealed by Sidhu and Singh (2010) that paddy arrivals increased from 95 lakh tonnes in 1997-98 to 157 lakh tonnes in 2005-06. Further, the arrivals increased from 136 lakh tonnes to 142 lakh tonnes during the year 2006-07 and 2007-08 respectively. The increase of market arrivals was due to the increase in its production in the respective years. The study of marketable and marketed surplus of major food grains in Punjab by Grover *et al*. (2012) indicated that assured market at remunerative prices, market infrastructures and better production technology encouraged the farmers to push up the wheat and paddy production and market arrivals. Market arrivals of paddy increased from 6.37 to 131.36 lakh tonnes during 1970-71 and 2010-11 respectively. It

was also argued that, the reason for higher area under cultivation of paddy and wheat in Punjab partly might have been due to inception of new farm technology comprising high yielding varieties and partly might have been due to assigned to greater rise in the minimum support price of paddy and wheat as compared to that of other competing crops. An effectiveness of minimum support price policy for paddy in India with a case study of Punjab for the period 1980-81 to 2006-07 was examined by Ali *et al*. (2012). The results showed that there was a positive relationship between minimum support prices and paddy area, production and productivity. It was noticed that, an assured market with minimum support price encouraged the use of modern production technology which in turn increased productivity and improved profitability of rice. Consequently, production of rice increased manifold through area and productivity increases.

It was observed that MSP does not provides sufficient protection to farmers against crash in price although the main purpose of MSP is to ensure reasonable returns to the farmers, motivating them to adopt new technology and make investment in agriculture This is because the cost of production is higher than MSP. In the case of cotton, the cost of production was 22.68 percent higher than MSP, but in the case of paddy, from 2007-08 to 2009-10, the cost of production in Maharashtra was lower than MSP fixed by centre. However, the cost increased in 2010-11 and was 24 percent higher than MSP. In case of soyabean, in every year, the cost of production was higher than MSP and in 2010-11, the cost was as much as 40 percent higher than MSP (Shroff and Kajale, 2012).

The trend in MSP of paddy vis-à-vis that of other crops for the period 1965-66 to 2011-12 in India was examined by Narayanamoorthy and Suresh (2012). The results show that although the absolute support price provided for paddy is relative lower than wheat over the years; the rate of increase in paddy price was found to have increased at a faster rate as compared to wheat price between 1965-66 and 2011-12. The intercrop price parity (ratio) between paddy and wheat has reduced over the years from 67 in 1965-66 to 3 percent in 2011-12. On the procurement front, although, the procurement of paddy to its total production was very low (about eight percent) as compared to its counterpart wheat procurement (about 21 percent) during the seventies, it has remarkably increased to 34 percent during 2010-11. The procurement of paddy was as high as 80 percent of production in Punjab, whereas it was only about seven percent (lowest among the states) in West Bengal.

As such general observation emerged from past studies that, most of the available literatures found that, there were positive relationship between MSP and production of related crops up to some extent. However, some researchers indicated that, MSP was not the only determinant of cropping pattern and production of agricultural commodities. The agricultural inputs, productivity, irrigation, power availability, mechanisation are important determinants

of agricultural production. Also, in most cases, rice production has been found to have positive trends.

However, it was observed that not much work has been done recently to study the effect of price incentives on production and procurement of paddy in Punjab. The paddy procurement patterns in Punjab and the contribution of rice to the Central Pool by Punjab were not examined. Also, there were no specific studies on the relative movement patterns of minimum support prices of paddy vis-a-vis its competing crops in Punjab. So, the present study is a modest attempt in this direction to examine the impact of price incentives on production and procurement of paddy in Punjab.

CHAPTER – III

MATERIAL AND METHODS

This chapter presents the broad frame work of the study including the location of the study, the type and source of data used, horizon of the study period and the analytical tools employed.

Locale of the study

The present study was confined to Punjab state. This state contributed more than 18 percent of the total rice production in India during 2010-11 and, thus was considered as one of the major rice producing states in India. Also, Punjab has more developed procurement infrastructures as well as minimum support price system.

Collection of data

The research work has been entirely carried out with the secondary data pertaining to paddy area, production, productivity, market arrivals, procurement and minimum support prices for the period 1950-51 to 2011-12 which were collected from various issues of Statistical Abstract of Punjab, Agricultural Statistics At A Glance, Economic Surveys and www.indiastat.com.

Analysis of data

For analytical purpose, the entire time period of analysis was divided into different sub-periods with the assumption that each sub-period has distinct nature and pattern of development. The data for area, production and yield of rice were divided into three sub-periods: Period I: 1950-51 to 1965-66 referred to as Pre-Green Revolution**,** Period II: 1966-67 to 1985-86 referred to as Green Revolution, Period III: 1986-87 to 2010-11 referred to as Post- Green Revolution, and Overall period: 1950-51 to 2011-12. The data for market arrivals were divided into two sub-periods, that is, Period I**:** 1970-71 to 1990-91 and Period II: 1991-92 to 2010-11.

Estimation of Growth Rates

The growth rate estimates have special advantage over comparison of actual data in the sense that growth rates bring all units in a single scale and enable better comparison between different trends. Moreover, it is based on each year value. In the present study the compound growth rates were computed by fitting the exponential function to area, production, yield, market arrivals and procurement:

$$Y_t = AB^t$$

Where,

Y_t = Area/production/yield/market arrivals/procurement of a crop for the year 't'.

t = Time variable (1, 2…n) for each period.

B = (1+r)

A = Constant

Log transformation of the above function is:

$\ln Y_t = \ln A + t (\ln B)$.

Where,

$\ln B = \ln (1+r)$, and

$r = [\text{antilog} (\ln B) - 1]$

CGR (%) = $[\text{antilog} (\ln B) - 1] \times 100$.

Decomposition analysis of growth of rice production

The observed changes in production of rice were decomposed into area effect, yield effect and interaction effect. The following additive scheme of decomposition has been used:

$$\Delta P = A_1 \Delta Y + Y_1 \Delta A + \Delta A \times \Delta Y$$

Where,

ΔP = Difference in average production during two periods

ΔY = Difference in average yield during two periods

ΔA = Difference in average area during two periods

A_1 = Average area under rice crop during the base year

Y_1 = Average yield of rice crop during the base year.

Thus, changes in production (ΔP) are due:

(i) $Y_1 \Delta A$: Represents an area effect,

(ii) $A_1 \Delta Y$: Represents yield effect and

(iii) $\Delta A \Delta Y$: Represents an interaction of area and yield effect.

Variability in area, production and productivity of rice

The variability in area, production and productivity for rice has been computed by using Cuddy Della Valle Index (Singh and Byrlee, 1990). Since the simple coefficient of variation over-estmates the level of instability in time-series data characterized long-term trends, this index corrects the coefficient of variation. The variability has been computed for all periods mentioned above using the following formula:

$$\text{Coefficient of variation (CV\%)} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

The Cuddy Della Valle Index (CV*) were calculated by using the formula as:

$$CV^* = Cv \times (1 - R^2)^{0.5}$$

Where,

R^2 is the estimated coefficient of multiple determinations.

Descriptive statistical techniques were used to determine the patterns in individual shares of public and private procurement agencies to the total market arrivals in the state, to examine the contribution of Punjab's rice into central pool and to examine the relative movement patterns of minimum support prices of paddy vis-à-vis its competing crops.

The trends in the index numbers of MSP vis-à-vis area under crops were computed using unweighted simple aggregate method (Nampoothiry, 2003):

$$P_{01} = \frac{P1}{P0} \times 100$$

Where;

P_{01} = Index number

P_1 = Current year area under cultivation or MSP for crops

P_0 = Base year area under cultivation or MSP for crops

The correlation between MSP and production as well as MSP and procurement of paddy were computed to study the degree and the direction of the relationship between MSPs and production/procurement. The formula used to compute the coefficient of correlation was that of Karl Pearson coefficient of correlation (r):

$$r\,(X,Y) = \frac{Cov\,(X,Y)}{\sigma_x \sigma_y}$$

Where,

$Cov(X,Y) = \text{Covariance of X and Y series of data}$

$\sigma_x = \text{Standard deviation of x}$

$\sigma_y = \text{Standard deviation of y}$

CHAPTER – IV

RESULTS AND DISCUSSION

SECTION-I

Growth Performance of Paddy in Punjab

Measuring agricultural growth has been one of the most extensively researched areas. The growth analysis helps in evaluating development programs which were launched with specific objectives or specific time span. A statistically significant positive growth rate reveals an increase related aspect by its magnitude per annum. The statistically non-significant growth rates indicate that there is no growth at all. The data and compound annual growth rates in respect to area, production and yield per hectare in the case of rice are presented in Table 4.1.1.

Table 4.1.1: Area, production and yield of rice in Punjab, 1950-51 to 2011-12

Year	Area (000 tonnes)	Production (000 tonnes	Yield ($kgha^{-1}$)
1950-51	244	177	725
1955-56	275	215	782
1960-61	227	229	1009
1965-66	292	292	1000
1970-71	390	688	1764
1975-76	567	1447	2552
1980-81	1183	3233	2733
1985-86	1714	5485	3200
1990-91	2015	6506	3229
1995-96	2161	6768	3132
2000-01	2612	9157	3506
2001-02	2489	8824	3545
2002-03	2530	8880	3510
2003-04	2614	9656	3694
2004-05	2647	10437	3943
2005-06	2642	10193	3858
2006-07	2621	10138	3868
2007-08	2609	10486	4019
2008-09	2735	11000	4022
2009-10	2802	11236	4010
2010-11	2831	10837	3828
2011-12	2818	10542	3741

Source: Statistical Abstract of Punjab and www.indiastat.com

The perusal of Table 4.1.1 reveals that the area under rice has increased from 244 thousand hectares in 1950-51 to 2,818 thousand hectares in 2011-12. The trend was positive up to 2000-01 except during 1960-61where the area decreased from 275 thousand hectares in 1955-56 to 227 in 1960-61, may be because farmers were not getting un-remunerative returns from rice and hence they decided to shift some of the areas from rice to other crops. After that it increased continuously up to 2011-12 except during 2001-02, 2005-06 and 2006-07. The compound growth rate was estimated to be 0.67 percent per annum of area under rice which was statistically non-significant during Period-I but it increased significantly to 10.59 percent per annum during Period-II. After that, it decelerated to 1.93 percent during Period-III. During the overall period under study, area under rice grew at the rate of 5.50 percent per annum (Table 4.1.2). This upward movement of area under rice was mainly due to remunerative minimum support price provided by the government to promote rice and wheat cultivation. An assured minimum support price influences the farmers' behaviour in shifting away some of the area from coarse cereals and pulses to rice and wheat cultivation. Also, increase in area under rice might have been due to relatively high yield and handsome net return per unit area from rice in comparison with its competing crops.

The perusal of Table 4.1.1 further revealed that there was a positive trend in rice production. The production was 177 thousand tonnes during 1950-51 which increased to 10,542 thousand tonnes during 2011-12. However, rice experienced a decrease in production during 2001-02, 2005-06, 2006-07, 2010-11 and 2011-12. The fall in production was due to the decrease of area/or yield in the respective period. The compound growth rates in all periods were positive and statistically significant. The production increased at annual growth rate of 2.84 and 16.35 percent per annum in Period- I and II, respectively. But during Period-III, the production grew at the rate of 2.94 percent per annum while at the overall level, production increased at the rate of 8.58 percent per annum (Table 4.1.2). It was also observed from these results that the acceleration in rice production growth especially in Period-II was due to the rise in the contribution of both area and yield. But, the area growth had accelerated at higher rate as compared to yield growth. These results are in line with the findings of Swain and Bhakar (2006).

The results revealed that productivity per hectare of rice has shown a general upward movement over years. It was 725kg per hectare during 1950-51 and increased to 3741kg per hectare in 2011-12. The highest increase in productivity (4022kg per hectare) was recorded during 2008-09. However, in some years, yield has declined may be because of the problem of weather, pests and diseases. The growth rate of productivity increased from 2.16 percent per annum during Period-I to 5.21 percent during Period-II and after that it decreased to 0.99 percent during Period-III. During the overall Period, productivity grew at the rate of 2.92

percent (Table 4.1.2). The significant growth in yield can be largely attributed to the introduction of high yielding varieties associated with the use of fertilizer and irrigation.

Additionally, the overall trends in area, production and yield of rice in Punjab can also be explained by the help of Figure 4.1.1.

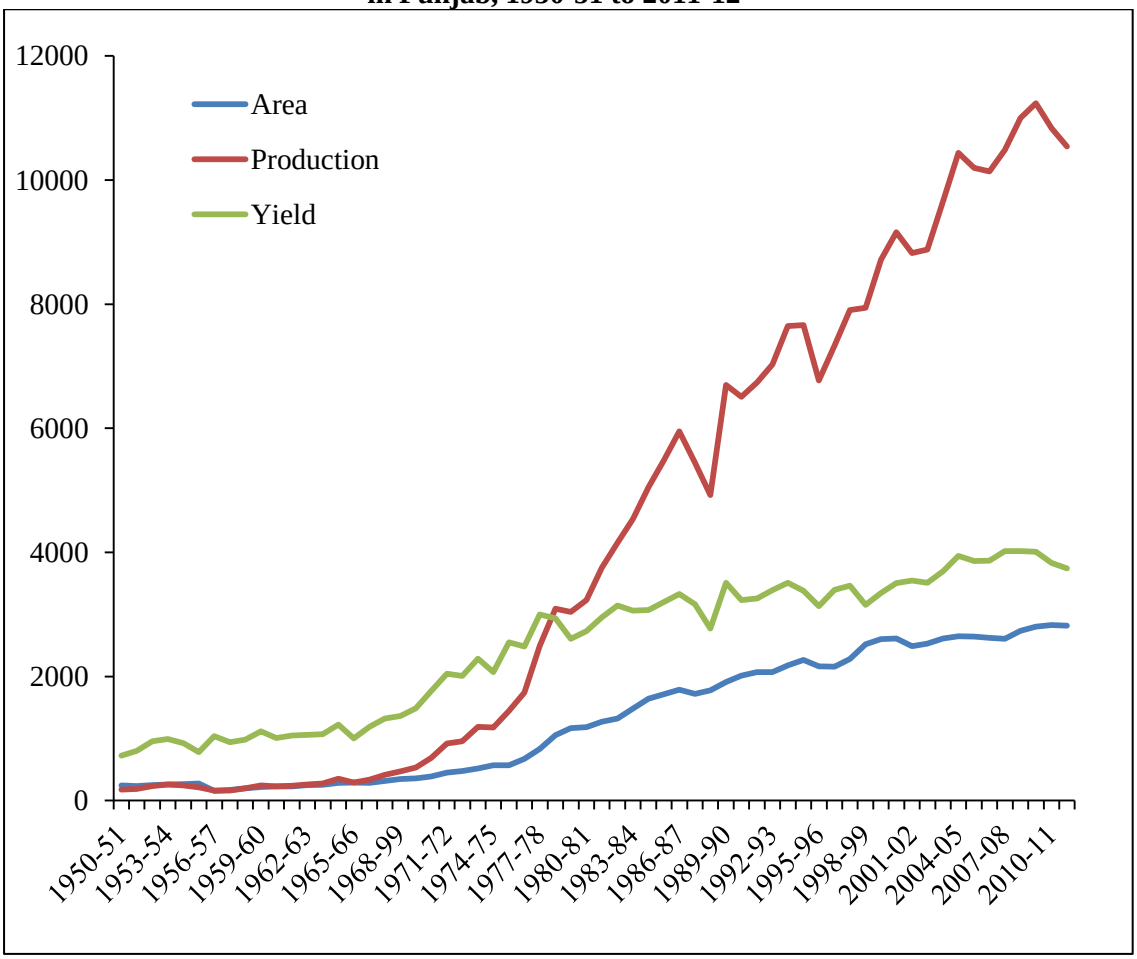
Table 4.1.2: Compound growth rate of rice in Punjab, 1950-51 to 2011-1

(Percent)

Period	Area	Production	Yield
I	0.67^{NS}	2.84**	2.16**
II	10.59***	16.35***	5.21***
III	1.93***	2.94***	0.99***
Overall	5.50***	8.58***	2.92***

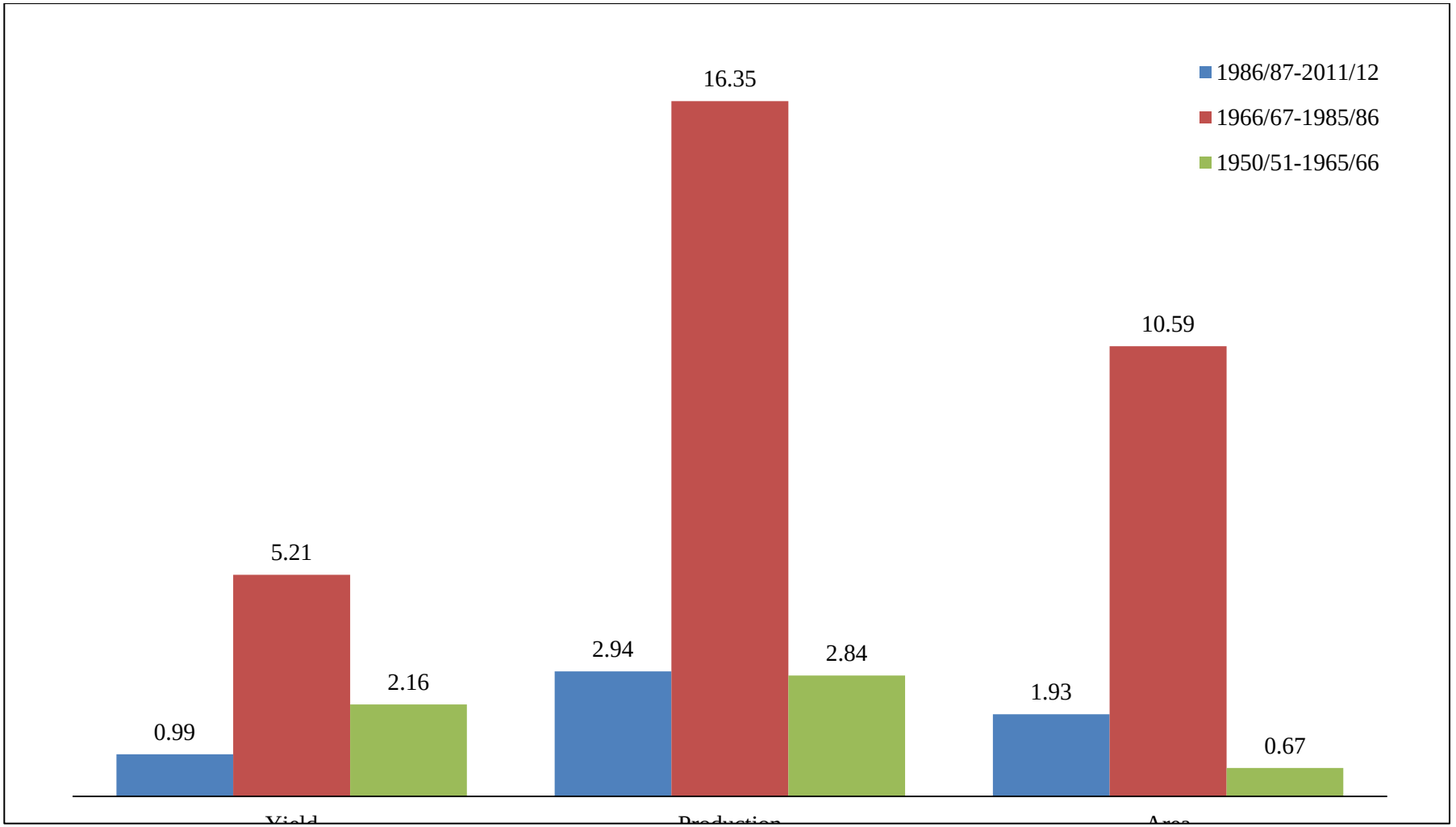
Source: Own computations from Statistical Abstract of Punjab data
****** and ** are significant at 1and 5 percent level of significance***
NS: Non-significant

Figure 4.1.1: Trends in area (000 ha), production (000 tonnes) and yield (kg/ha) of rice in Punjab, 1950-51 to 2011-12



Source: Statistical Abstract of Punjab and www.indiastat.com

Figure 4.1.2: Compound growth rate of rice in Punjab, 1950-51 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

Decomposition analysis

The growth analysis of area, production and yield of rice crop revealed the general pattern of growth and direction of changes in yield and area. But, this analysis does not evaluate the exact contribution of area and yield towards the production growth. So, it is necessary to examine the sources of output growth. To appraise the sources of output growth for rice crop, the change in production was divided into three effects, namely, area, yield and interaction effects. The relative contribution of area, yield and their interaction to changes in production of rice crop is presented in Table 4.1.3. During Pre-Green Revolution period, area, yield and interaction effects were found to be 30.24, 58.30 and 11.47 percent respectively. This indicates that during this period large contribution to rice production came from yield. But, during the Green Revolution period, interaction effect to the changes of rice production was higher than individual effect of area and yield. During this period, the interaction effect stood at 55.92 percent. However, during Post-Green Revolution period area effect was more pronounced than yield and interaction effects. Also at the overall level, interaction effect was the most powerful factor to bring the changes in rice production in the State.

Table 4.1.3: Growth Decomposition in production of rice in Punjab, 1950-51 to 2011-12

(Percent)

Period	Area effect	Yield effect	Interaction effect
I	30.24	58.30	11.47
II	32.93	11.15	55.92
III	74.85	15.94	9.21
Overall	18.00	7.10	74.90

Source: Own computations from Statistical Abstract of Punjab data

The decomposition of maize production is presented in the Table 4.1.4. The results clearly show that the yield was the major contributor to the increased production of maize in all periods. The contribution by area and interaction were only positive in the Period I and negative in Period II and III. The strong negative area and interaction effects nullified the positive yield effect and brought about the decline in the production of maize during Periods II and III. This was different from paddy whose production increased in all periods due to increases in its area and yield over time.

Table 4.1.4: Growth Decomposition of maize production in Punjab, 1950-51 to 2011-12

(Percent)

Period	Area effect	Yield effect	Interaction effect
I	0.55	98.42	1.03
II	-126.00	44.40	-18.40
III	-344.20	528.80	-284.60

Source: Own computations from Statistical Abstract of Punjab data

The decomposition of cotton production is presented in Table 4.1.5. The perusal of Table 4.1.5 shows that the increase in cotton production was predominantly due to area effect in the first period (Green Revolution). It came out to be 51.47 percent during this period, whereas the yield effect was 37.76 percent and interaction effect was only 10.77 percent. The strong positive yield effect offset the negative area and interaction effects and brought about increased production of cotton during second period (Post-Green Revolution).

Table 4.1.5: Growth Decomposition of cotton production in Punjab, 1981-82 to 2011-12

(Percent)

Period	Area effect	Yield effect	Interaction effect
I	51.47	37.76	10.77
II	-137.93	279.31	-41.38

Source: Own computations from Statistical Abstract of Punjab data

Coefficient of variation in area, production and productivity of rice

The coefficient of variation is the most commonly used measure of relative variation. It is used to compare the variability of two or more than two series. That series (or group) for which the coefficient of variation is greater is said to be more variable or conversely less consistent, less uniform or less stable. On the other hand, the series for which coefficient of variation is less is said to be less variable or more consistent, more uniform or more stable. On the same basis, the area, production and yield instability of rice in Punjab has been analyzed for three sub-periods and the results allow comparison in the Pre-Green Revolution, Green Revolution and Post-Green Revolution periods. Moreover, the variation in the same variables for the overall period was determined and the results are presented in the Table 4.1.6. The perusal of Table 4.1.6 shows that the area instability of rice has declined steadily from 15.33 percent in Period- I through 7.11 percent in Period-II and finally to 4.33 percent in the Period III. A similar pattern was observed in the variability of production. It came out to be 16.51, 9.83 and 6.21 percent in Period-I, II and III respectively. The results further revealed that the instability of yield of rice increased from 8.27 percent in Period-I to 9.52 percent in Period-II which again declined to 5.18 percent during Period- III. In the overall period of study, the production has shown less stability as compared to area and yield. The coefficient of production was 24. 79 percent while those for area and yield were 20.50 and 15.61 percent respectively. The highest variability in yield was recorded during Green Revolution probably because of new Green Revolution technology as argued by many researchers. Mehra (1981) observed that the yield variability of rice and wheat increased in more than 50 percent of the states, during the period 1967-68 to 1977-78 (Green Revolution period) compared to the Period 1952-53 to 1964-65.

Table 4.1.6: Variability in area, production and productivity of rice in Punjab, 1950-51 to 2011-12

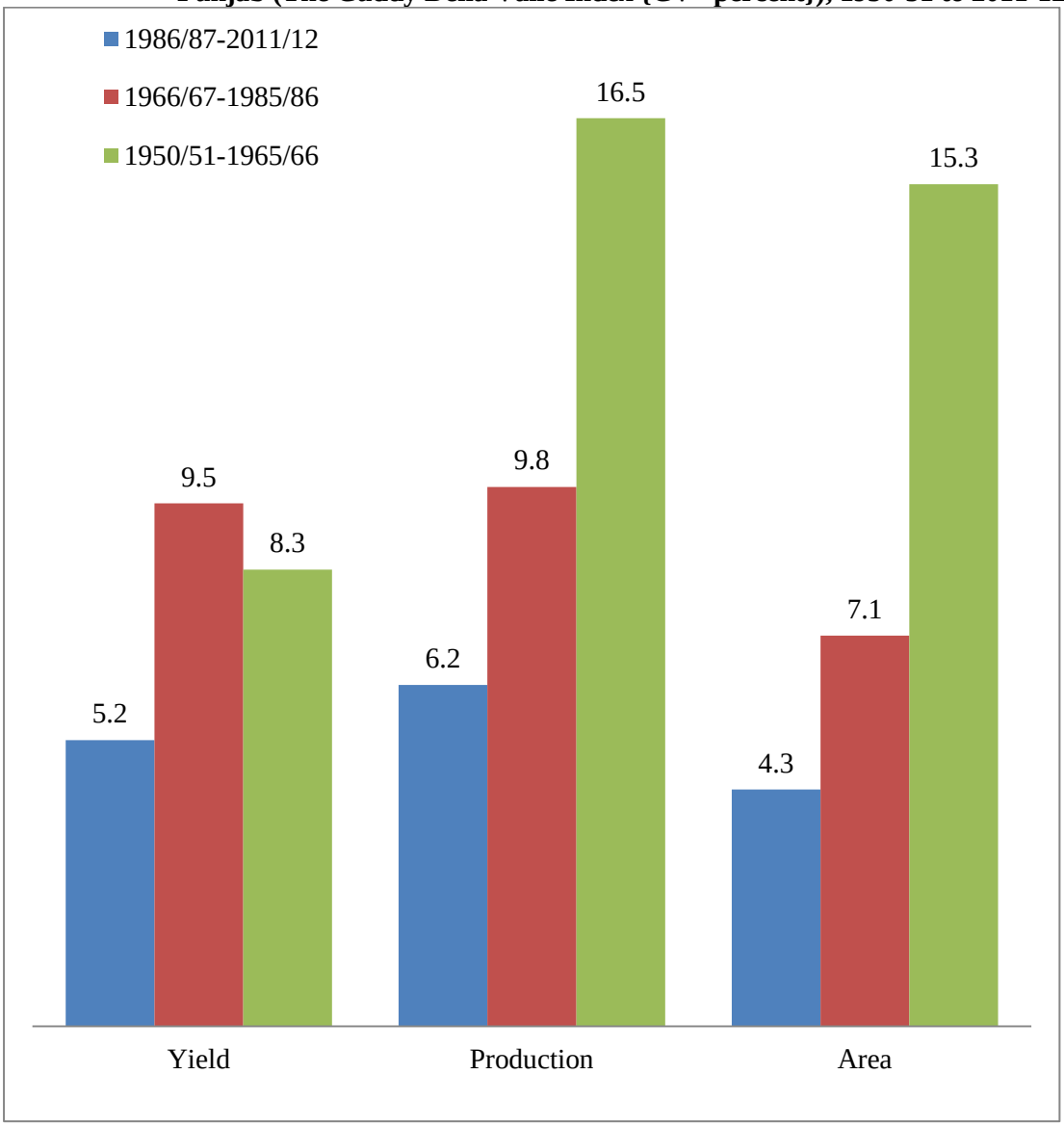
(CV* percent)

Period	Area	Production	Productivity
I	15.33	16.51	8.27
II	7.11	9.83	9.52
III	4.33	6.21	5.18
Overall	20.50	24.79	15.61

The Cuddy Della Valle Index (CV*) = (CV) $(1-R^2)^{0.5}$

Source: Own computations from Statistical Abstract of Punjab data

Figure 4.1.3: Coefficient of variation in area, production and productivity of rice in Punjab (The Cuddy Della Valle Index {CV* percent}), 1950-51 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

SECTION-II

Trends in market arrivals and procurement of paddy in Punjab

The results obtained from analysis of data are discussed as under:

Market arrivals

The trend in market arrivals are the changes of arrivals through time. The trends in arrivals are associated with development in technology of production, input supply and infrastructure. The study of trends enables us to indicate the general direction of changes in arrivals.

In order to ascertain the long-run movement of market arrivals of paddy for the period 1970-71 to 2010-11 in Punjab state, trend was computed and the results were presented in the Table 4.2.1.

Table 4.2.1: Market arrivals of paddy in Punjab, 1970-71 to 2010-11

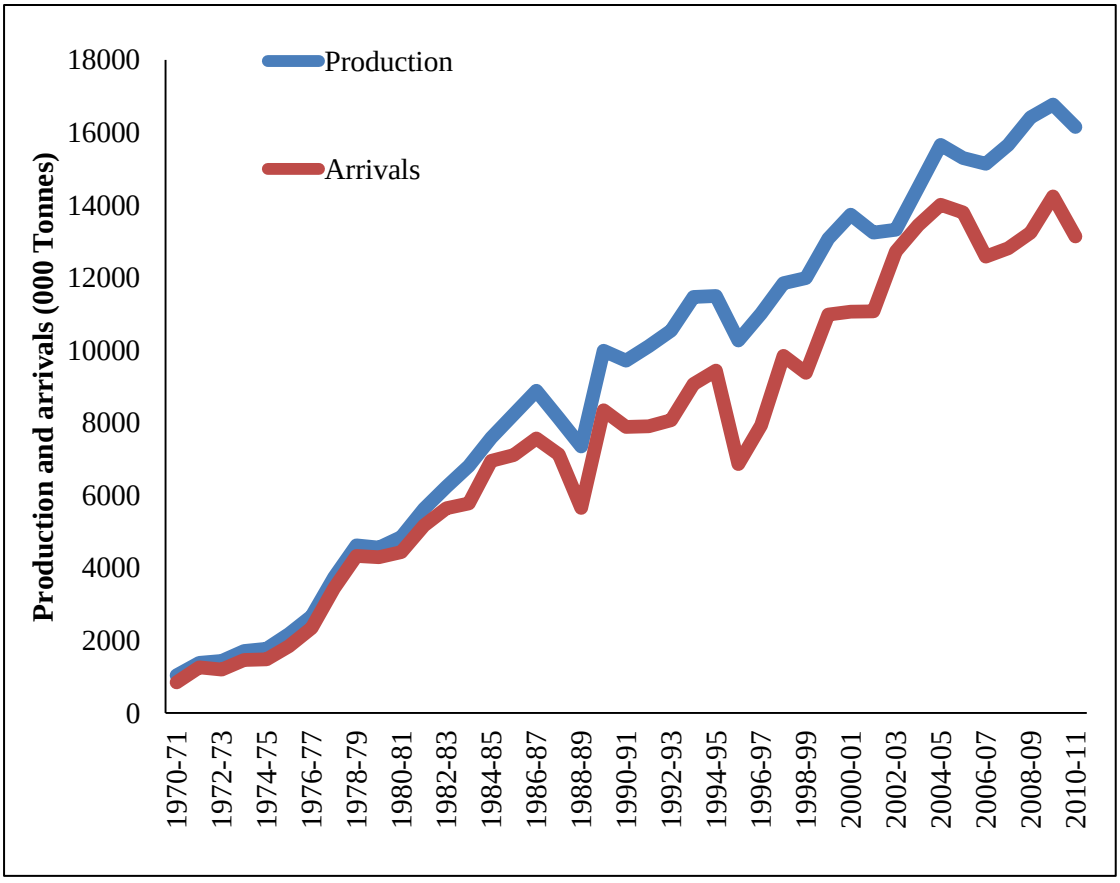
Year	Production (000 tonnes	Arrivals (000 tonnes)	Arrivals as percent to production
1970-71	1032	846	81.98
1976-77	2664	2342	87.91
1980-81	4850	4432	91.38
1986-87	8877	7565	85.22
1990-91	9710	7882	81.17
1996-97	11007	7925	72.00
2000-01	13735	11057	80.50
2006-07	15131	12577	83.12
2010-11	16148	13136	81.35
From 1970-71 to 1990-91			
C.G.R	12.01***	11.82***	-0.17^{NS}
CV	14.82	18.13	4.11
From 1991-92 to 2010-11			
C.G.R	2.77***	3.47***	0.68**
CV	4.18	9.46	6.88

****** and ** are Significant at 1and 5 percent level of significance.***
NS: Non-Significant
Source: Statistical Abstract of Punjab

It can be seen from Table 4.2.1 that market arrivals in absolute term have increased consistently from 846 thousand tonnes in 1970-71 to 13136 thousand tonnes in 2010-11, showing an increase of 15.53 times. It was 2342 thousand tonnes in 1976-77, which increased to 7882 thousand tonnes in 1990-91. During 1996-97, 2000-01 and 2006-07 market arrivals stood at 7925, 11057 and 12577 thousand tonnes respectively. The highest (14237 thousand

tonnes) and lowest (846 thousand tonnes) were observed during the year 2009-10 and 1970-71 respectively (Appendix I). The positive trend in market arrivals was due to increase in the production of rice in the respective years. Contrary to this, the share of market arrivals to its total production has slightly decreased from 81.98 percent to 81.35 percent during period 1970-71 and 2010-11 respectively. The highest share which was 95.46 percent was observed during 2002-03 and the lowest figure turned out to be 66.86 percent during 1995-96. The percent share of arrivals to production of paddy was stagnant during 1970-71 to 1990-91and after that it started growing slowly at the growth rate of 0.68 percent per annum. . During some years such as 1972-73, 1974-75, 1980-81 and 1982-83, the share of market arrivals to its total production declined despite increased production. It may be because farmers might have either sold paddy directly outside the state or built up stocks in expectation of higher prices than minimum support prices or the inadequate expansion in the marketing infrastructural facilities might also have influenced farmers to dispose of part of the produce at the farm gate. Also, the recently decline in the share of paddy market arrivals might be due to exclusion of basmati rice from market arrivals of non-basmati rice (Figure 4.2.1).

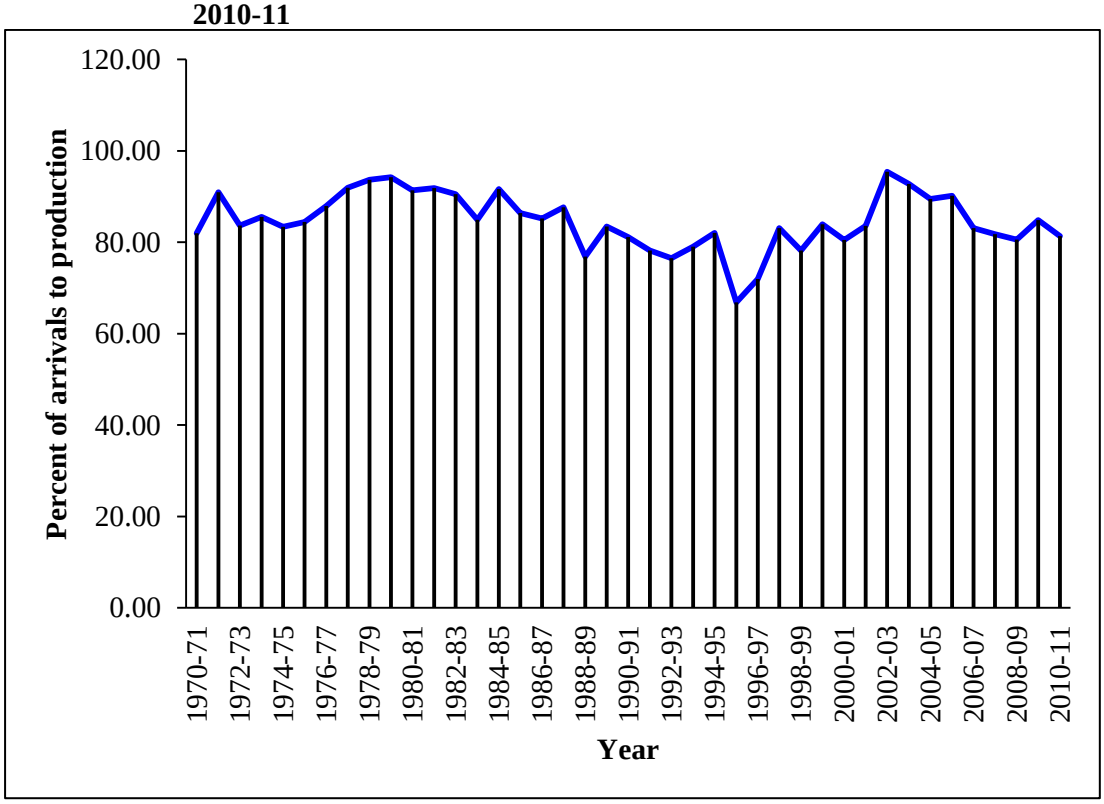
Figure 4.2.1: Trends in market arrivals and production of paddy in Punjab, 1970-71 to 2010-11



Source: Statistical Abstract of Punjab

In order to compute growth rate of market arrivals, exponential trend function was employed for two different periods as shown in Table 4.2.1. The perusal of Table 4.2.1 reveals that the growth rate of absolute arrivals which was 11.82 percent during Period 1970-71 to 1990-91 was significant statistically and higher than that of period 1991-92 to 2010-11. The growth rate was estimated to be 3.47 percent per annum in the latter period. The growth rate of the share of market arrivals to its total production was negative but statistically non-significant in the period 1970-71 to 1990-91 while it was found to be positive and statistically significant during 1991-92 to 2010-11. The coefficient of variation (18.13 percent) of market arrivals was found to be higher during 1970-71 to 1990-91 than in 1991-92 to 2011-12 which was 9.46 percent. This was due to higher variations in production during 1970-71 to 1990-92.

Figure 4.2.2: Percent share of arrivals to production of paddy in Punjab, 1970-71 to 2010-11



Source: Own computations from Statistical Abstract of Punjab data

Procurement of paddy

Initial objective of procurement of foodgrains by the government agencies was to ensure remunerative prices to producers and reasonable prices to consumers and to maintain price stability. Since, the private trade was not performing these tasks satisfactorily; government had to intervene in grain markets. As a result of this intervention, government procured substantial part of marketed surplus from food surplus states. When India initiated economic reforms in year 1991, a move towards increased participation by private sector in various spheres of economic activities was started which in other words imply reduced role of

Government in marketing and services. Economic reforms in the case of agriculture might have brought some changes in the trends in foodgrains procured by public procuring agencies which in turn could affect the objective of procurement of foodgrains as explained above. Therefore, with this respect an attempt was made to know the patterns of paddy procurement purchased by public and private agencies over time in Punjab. The data pertaining to the procurement covering from 1980-81 to 2010-11 have been used for this analysis and the results are presented in Table 4.2.2.

Table 4.2.2: Growth rates of procurement of paddy by public and private agencies in Punjab, 1980-81 to 2010-11

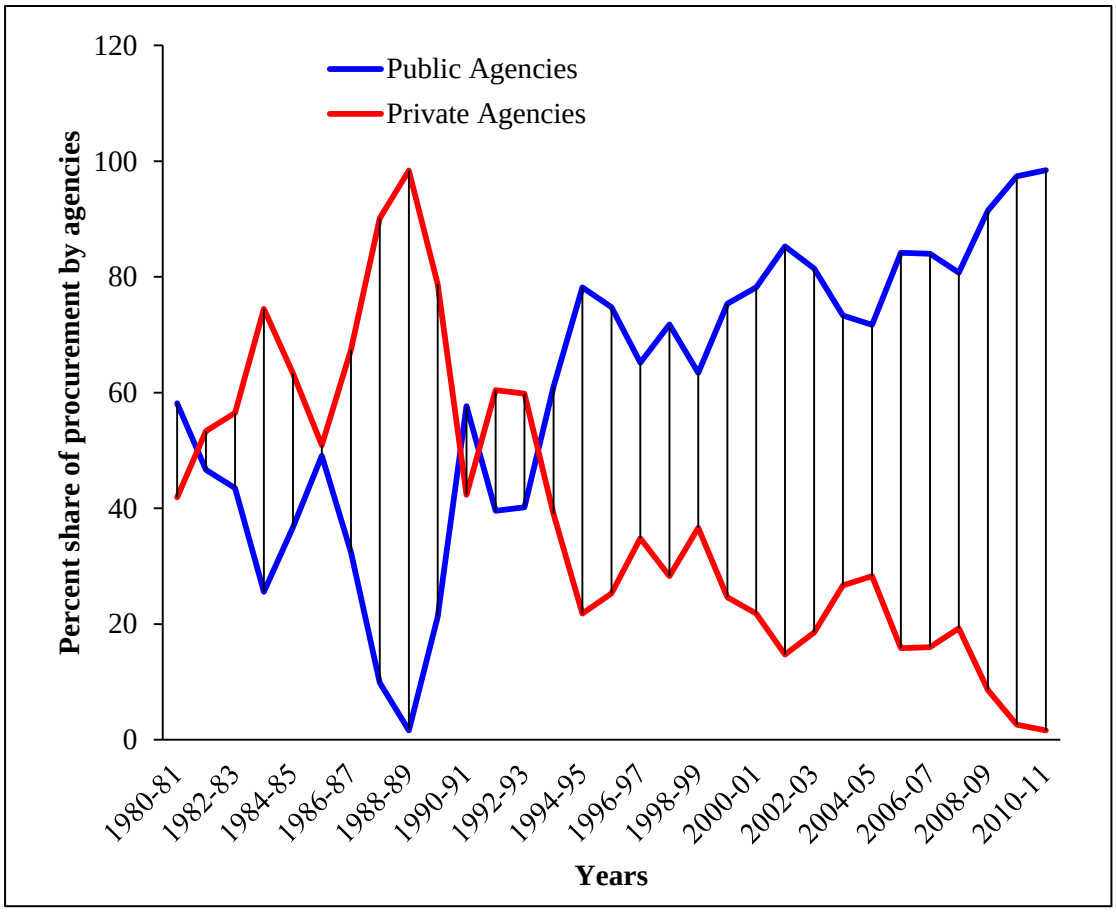
Agency value	C.G.R (%)	t-value
Public agencies	**8.70*** **	**5.50**
Food corporation of India	-3.03^{NS}	-1.65
State Government	11.91***	5.75
MARKFED	13.67***	7.88
PUNSUP	13.37***	7.29
Private/traders	**-4.76*** **	**-4.18**

Source: Own computations from Statistical Abstract of Punjab data
****** Significant at 1 percent level of significance***
NS: Non-significant

Out of the total market arrivals, the procurement by all public procurement agencies averagely constituted about 60.58 percent during the entire period. The results revealed that year to year examination of the percentage share of the procurement by public agencies shows a mixed trend. It was 58.13 percent during 1980-81 which decreased to 40.18 percent in 1992-93 (Table 4.2.3). It picked up from 61.01 percent during 1993-94 to 85.25 percent in 2001-02. After that the share dropped to 81.47 percent in 2003-04 which again through ups and downs touched to 98.41 percent in 2010-11. The lowest share of procurement by public agencies was observed during period 1988-89 when it came out to be 1.63 percent. May be this is because public procurement agencies rejected most of the arrivals which did not meet the prescribed specifications of the Government. On the other hand private agencies became more active and might have decided to purchase all those quantities of paddy rejected by Government agencies by offering price much below the support price fixed by the Government. However, the general trend in procurement by public agencies shows upward movement with statistically significant growth rate of 8.70 percent per annum. Though, the Food Corporation of India's share has been declining over years at the rate of -3.03 percent per annum, FCI has been contributing the largest share to the public procurement since 1980-

81 to 2002-03 as shown in the Table 4.2.3. After that the large share had been taken by State Government, MARKFED and PUNSUP whose growth rates were found to be positive and statistically significant. Their respective growth rates were 11.91, 13.67 and 13.37 percent per annum. On the other hand, private procuring agencies have shown their declining role in paddy procurement over years. It was indicated that their share to total arrivals declined from 41.87 to 1.59 percent during 1980-81 to 2010-11 periods respectively with statistically significant growth rate of -4.76 percent per annum. This observation is in agreement with the results of Chand (2003). In the recent years private trade played much reduced role in grain trade. The reason for this could be huge build up of buffer stock. The private sector had a feeling that government would be required to reduce the level of excessive stock, which would dampen the domestic prices and might cause losses to the private sector. This means that the level of procurement by the government agencies always directly influences on the market price of paddy which in turn can cause losses to private traders.

Figure 4.2.3: Percentage shares of procurement of paddy by public and private agencies in Punjab, 1980-81 to 2010-11



Source: Own computations from Statistical Abstract of Punjab data

Table 4.2.3: Percentage shares of procurement of paddy by public and private agencies in Punjab, 1980-81 to 2010-11

Year	Arrivals (000 tonnes)	Percent share of Public Agencies							Percent share of Traders
		FCI	State Government	MARKFED	PUNSUP	P.S.W.P	PAIC	Total	
1980-81	4432	40.28	6.59	6.05	5.21	DNA	DNA	58.13	41.87
1981-82	5166	32.68	5.84	5.00	3.13	DNA	DNA	46.66	53.34
1982-83	5644	31.35	5.71	2.69	3.73	DNA	DNA	43.48	56.52
1983-84	5777	20.42	2.72	0.96	1.46	DNA	DNA	25.55	74.45
1984-85	6950	27.17	5.28	1.29	2.98	DNA	DNA	36.72	63.28
1985-86	7106	26.09	11.31	4.17	6.78	DNA	DNA	49.07	50.93
1986-87	7565	20.34	5.12	2.75	4.40	DNA	DNA	32.42	67.42
1987-88	7122	7.25	0.97	0.46	0.86	DNA	DNA	9.86	90.14
1988-89	5650	1.12	0.11	0.41	DNA	DNA	DNA	1.63	98.37
1989-90	8337	16.35	1.02	2.04	1.86	DNA	DNA	21.27	78.73
1990-91	7882	38.84	5.01	7.36	6.47	DNA	DNA	57.68	42.32
1991-92	7902	19.07	5.80	7.28	7.40	DNA	DNA	39.55	60.45
1992-93	8066	19.59	6.43	6.87	7.29	DNA	DNA	40.18	59.82
1993-94	9063	25.61	9.35	12.09	12.05	1.91	DNA	61.01	38.99
1994-95	9432	29.12	11.02	15.21	16.83	6.02	DNA	78.20	21.80
1995-96	6863	25.70	9.75	14.92	14.48	9.88	DNA	74.73	25.27
1996-97	7925	21.68	8.01	12.83	14.59	8.06	DNA	65.17	34.83
1997-98	9843	29.57	6.73	13.63	11.96	8.42	1.42	71.74	28.26
1998-99	9377	25.36	6.20	10.56	10.58	9.13	1.57	63.39	36.61
1999-00	10977	22.00	8.91	15.10	15.40	11.62	2.31	75.35	24.65
2000-01	11057	25.24	8.48	13.43	14.40	12.15	4.50	78.20	21.80
2001-02	11066	21.57	11.33	16.25	16.46	13.95	5.69	85.25	14.75
2002-03	12715	20.60	11.25	16.66	17.63	8.85	6.48	81.47	18.53
2003-04	13438	12.06	13.69	14.92	16.88	8.55	7.23	73.34	26.66
2004-05	14004	8.13	15.57	14.76	17.25	8.65	7.35	71.72	28.28
2005-06	13794	7.55	18.44	17.64	20.10	10.29	10.18	84.18	15.82
2006-07	12577	1.80	23.06	17.31	21.64	9.38	10.78	83.98	16.02
2007-08	12802	1.03	20.89	18.95	20.40	10.59	8.85	80.71	19.29
2008-09	13234	1.55	27.41	20.97	20.51	11.35	9.66	91.44	8.56
2009-10	14237	4.71	29.18	20.12	22.27	11.85	9.26	97.39	2.61
2010-11	13136	3.94	31.01	20.61	23.00	11.33	8.53	98.41	1.59

DNA- Data Not Available

Source: Statistical Abstract of Punjab

SECTION-III

Contribution of rice to the Central Pool by Punjab vis-à-vis other states.

The timely and efficient procurement and building up of adequate buffer stocks in the Central Pool through efficient storage and movement of food grains are central to the food security strategy of Government of India. The procurement of food grains for the Central Pool is carried out by agencies such as Food Corporation of India, State Government Agencies and private rice millers. In addition, 10 states/UnionTerritory which are presently under Decentralized Procurement Scheme also procure food grains for the Central Pool but directly store and distribute under Targeted Public Distribution System (TPDS) and other welfare schemes based on allocation made by the Government of India.

One of the intentions of procurement of food grains by Government is to build up adequate stock to ensure the supply of subsidized food grains to the needy and poor through TPDS and other welfare schemes. It has been observed that sometimes, it is very difficult to procure food grains up to the targeted quantity during the short marketing season (Acharya and Agarwal, 2011). This might be due to the reason that the farmers are reluctant to dispose of to government agencies. More specifically the target could not be achieved because of the following reasons:

I. Farmers preferred to sell food grains to traders to fulfill their financial obligations
II. Traders and consumers purchased directly from farmers at a price higher than the procurement price which reduce the quantity at the market;
III Farmers faced a number of difficulties when they disposed of food grains to Government Agency, such as delayed payment; payment by cheque instead of cash; delay in the market for their turn to deliver and weigh the produce and rejection of the produce by the Government agencies
IV. Farmers had to travel long distance to reach the purchasing centres.

The state-wise contribution to the National Total Procurement has considerably changed in the recent years, though; Punjab continues to be the leading contributor for rice. In the back drop of this, it is important to examine the contribution to the Central Pool by Punjab vis-à-vis other major rice producing states. The state-wise percentage share to the total procurement of rice has been worked out and presented in Table 4.3.1.

The first five states in terms of their contribution to Central Pool are Punjab, Andhra Pradesh, Uttar Pradesh, Chhattisgarh and Orissa (Table 4.3.1). The perusal of Table 4.3.1 shows that, Punjab as compared to other states has contributed more significantly towards strengthening India's self sufficiency of food by contributing a major share in the Central

Pool over time. On an average Punjab contributed 34.41 percent for period 1985-86 to 2010-11. Next to Punjab was Andhra Pradesh which contributed 23.46 percent in the same period. Rice is not a staple food in Punjab that is why Punjab contributes maximum to the Central Pool. Other factors may include high yield, increased cropping and irrigation facilities which together work to the advantage of Punjab. However, the contribution of Punjab to the Central Pool has been fluctuating over time (Figure 4.5.4). The share of Punjab decreased from 42.70 percent during 1985-86 to 32.88 percent during 2000-01. After that it increased to 48.34 during 2002-03. Thereafter the share decreased continuously and touched 25.39 percent during 2008-09. Again, the share rose up to 34.58 percent during 2009-10 which finally dropped to 26.69 percent in 2010-11. This might be due to the increased contribution to the Central Pool by other states such as Uttar Pradesh, Orissa and Chhattisgarh. These results are in agreement with the findings of Kaur and Kaur (2012).

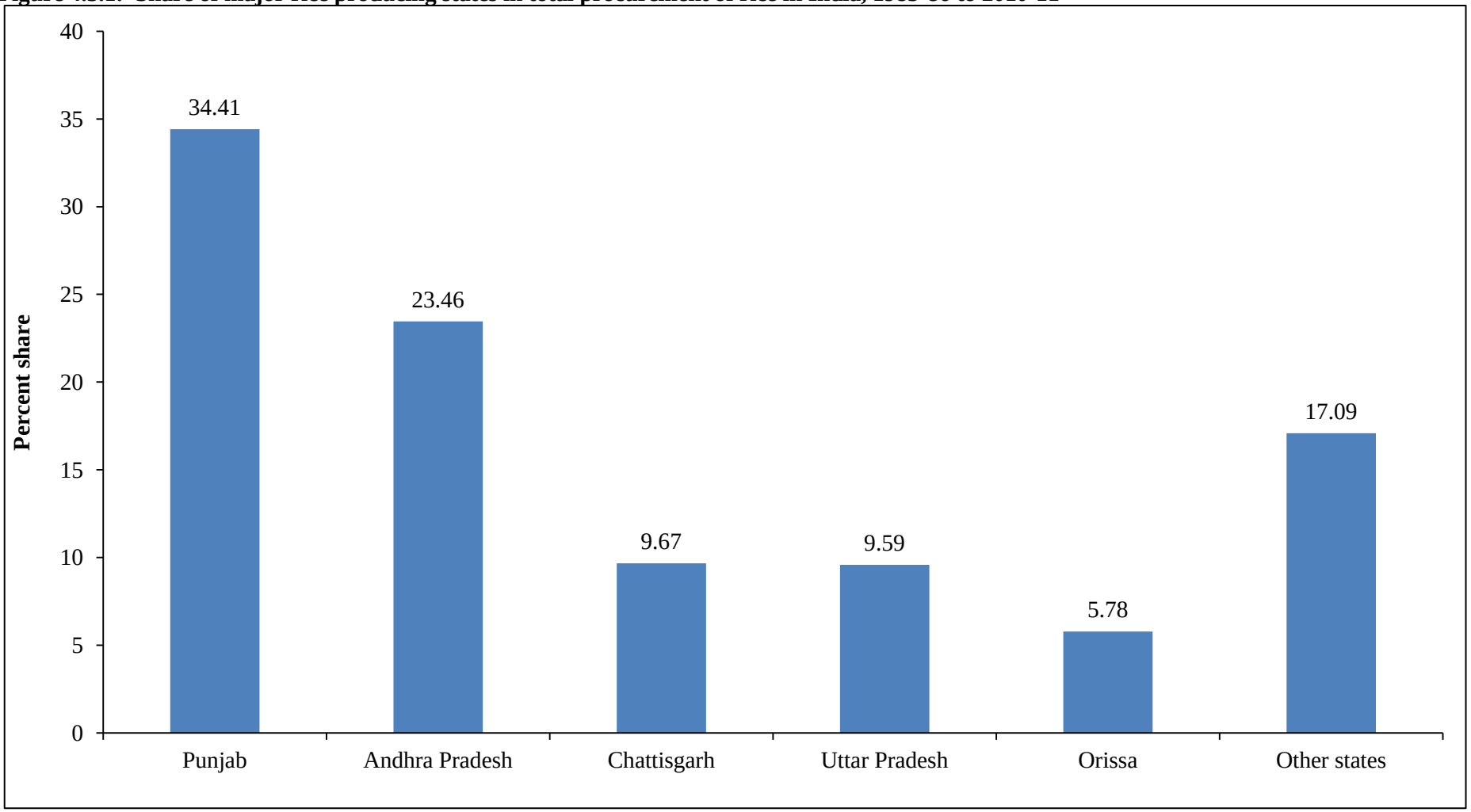
Table 4.3.1: State-wise contribution of rice in Central Pool in India (1985-86 to 2010-11)

(Percent)

Year	Punjab	AP	Chattisgarh	UP	Orissa	Others
1985-86	42.7	15.94	DNA	10.81	1.42	29.13
1990-91	38.05	26.32	DNA	10.83	1.69	23.11
1995-96	34.46	36.64	DNA	7.17	4.54	17.19
2000-01	32.88	33.87	4.05	5.54	4.33	19.32
2001-02	32.91	29.04	8.68	8.75	5.66	14.96
2002-03	48.34	16.05	7.86	8.28	5.42	14.05
2003-04	37.94	18.53	10.4	11.19	6.01	15.93
2004-05	36.89	15.82	11.49	12.04	6.44	17.32
2005-06	32.02	17.97	11.8	11.4	6.45	20.36
2006-07	31.18	21.22	11.41	10.07	7.97	18.15
2007-08	27.77	26.44	9.55	10.06	8.2	17.98
2008-09	25.39	26.9	8.46	10.95	8.28	20.47
2009-10	34.58	16.67	11.44	9.78	7.04	20.49
2010-11	26.69	27.08	11.23	7.43	7.5	20.07

Source: Own computations from Statistical Abstract of Punjab data

Figure 4.3.1: Share of major rice producing states in total procurement of rice in India, 1985-86 to 2010-11



Source: Own computations from Statistical Abstract of Punjab data

Table 4.3.2: State-wise Procurement of Rice for Central Pool in India, 1985-86 to 2010-11

(000' tonnes)

Marketing year	Punjab	Haryana	UP	AP	MP	Orissa	Tamil Nadu	WB	Chattisgarh	Uttrakhand	Others	All India
1985-86	4217	1033	1068	1574	569	140	950	69	-	-	-	9876
1986-87	4378	678	1015	1471	459	123	887	49	-	-	-	9156
1987-88	3365	318	607	1522	279	68	564	64	-	-	-	6902
1988-89	2859	674	1216	1483	285	134	755	98	-	-	-	7729
1989-90	5003	957	1516	2490	342	235	950	102	-	-	-	11867
1990-91	4821	1063	1373	3335	631	214	899	103	-	-	231	12670
1991-92	4248	921	831	2262	404	266	997	80	-	-	245	10254
1992-93	4905	909	1186	3296	689	380	1232	170	-	-	286	13053
1993-94	5486	1248	1295	3987	804	388	589	161	-	-	302	14260
1994-95	5826	1425	727	4024	760	327	291	151	-	-	175	13705
1995-96	3462	690	720	3681	687	456	97	133	-	-	121	10047
1996-97	4249	1205	910	4525	580	476	727	159	-	-	137	12968
1997-98	6059	1269	1073	3855	1029	700	1231	203	-	-	172	15591
1998-99	4404	300	868	5119	430	481	733	141	-	-	123	12599
1999-00	6815	987	1421	5498	1104	889	919	351	-	-	244	18228
2000-01	6964	1481	1174	7174	175	918	1695	434	857	42	267	21181
2001-02	7282	1484	1936	6425	274	1253	852	48	1921	235	418	22128
2002-03	7939	1325	1360	2635	159	890	107	126	1291	232	358	16422
2003-04	8662	1334	2554	4230	112	1373	207	925	2374	323	734	22828
2004-05	9106	1662	2971	3906	42	1590	652	944	2837	316	658	24684
2005-06	8855	2054	3151	4971	136	1785	926	1275	3265	336	902	27656
2006-07	7829	1777	2529	5328	74	2002	1077	642	2865	176	777	25106
2007-08	7981	1574	2891	7597	69	2357	969	1429	2743	147	979	28736
2008-09	8553	1425	3687	9061	245	2790	1199	1667	2848	349	1860	33684
2009-10	9273	1816	2623	4471	167	1887	981	977	3069	340	1212	26816
2010-11	8635	1687	2403	8760	403	2426	1431	1003	3633	417	1554	32352

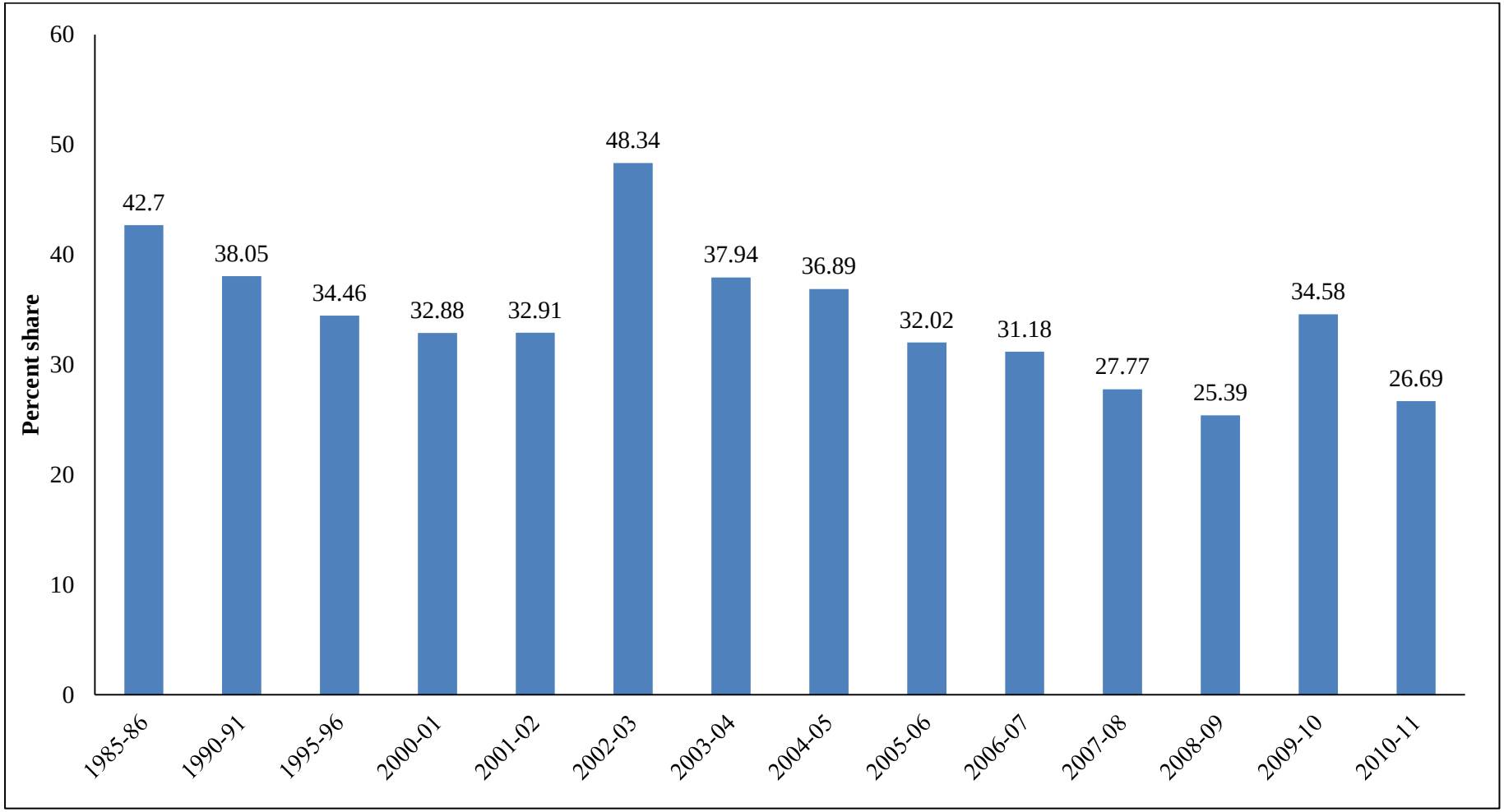
Source: Agricultural Statistics At A Glance and www.indiastat.com

Note: i) Chattisgarh state was formed in the year 2000. Therefore, the data for Chattisgarh are not available from 1985-86 to 1999-2000.

ii) Uttrakhand state was also formed in the year 2000. Therefore, the data for Uttrakhand are not available from 1985-86 to 1999-2000**.**

iii) Other states include, Karnataka, Assam, Kerala, etc

Figure 4.3.2: Percentage share of rice of Punjab in Central Pool, 1985-86 to 2010-11



Source: Own computations from Statistical Abstract of Punjab data

Table 4.3.3: State-wise market arrivals per unit area under rice crop in India, 1985-86 to 2010-11

(tha^{-1})

Year	Punjab	Uttar Pradesh	Andhra Pradesh	Orissa	Chhattisgarh
1985-86	2.46	0.19	0.46	0.03	DNA
1990-91	2.38	0.24	0.83	0.05	DNA
1995-96	1.60	0.13	1.00	0.10	DNA
2000-01	2.67	0.20	1.69	0.21	0.23
2001-02	2.93	0.32	1.68	0.28	0.50
2002-03	3.14	0.26	0.93	0.21	0.34
2003-04	3.31	0.43	1.42	0.31	0.62
2004-05	3.44	0.56	1.27	0.36	0.76
2005-06	3.35	0.56	1.25	0.40	0.87
2006-07	2.99	0.43	1.34	0.45	0.77
2007-08	3.06	0.51	1.96	0.53	0.73
2008-09	3.13	0.61	2.07	0.63	0.76
2009-10	3.31	0.51	1.30	0.43	0.84
2010-11	3.05	0.42	1.84	0.57	0.98

Source: Own computations from Statistical Abstract of Punjab data

The perusal of Table 4.3.3 reveals that, among the major rice producing states, Punjab contributes the highest market arrivals per unit area allocated to rice. The market arrivals per unit area averagely range from 2.0 to 3.4 tonnes per hectare. It was found that, Andhra Pradesh is the next to Punjab and its market arrivals per unit area range from 1.0 to 2.1 tonnes per hectare. The other states contribute less than 1.0 tonnes per hectare. This means that, area under rice in Punjab contributes higher market arrivals than in other states. May be this is because home consumption of rice by farmers in Punjab was lower as compared to other states where larger share of rice is retained at home for consumption and hence reducing the quantity to bring to the market.

SECTION-IV

Relative movement patterns of MSP of paddy vis-a-vis its competing crops

The minimum support price mechanisms help in sustaining farmers' income and hence, can provide an impetus for investing in modern agricultural technologies. Currently, MSP scheme covers 24 crops that accounts for about 85 percent of cropped area in India.

In this section, while studying the trends in MSP for paddy crop, an attempt has also been made to study the trends in MSP for other competing crops, so as to understand the relative position of MSP of paddy crop. The data on MSP for crops from 1975-76 to 2011-12 have been used to study the trend (Table 4.4.1).

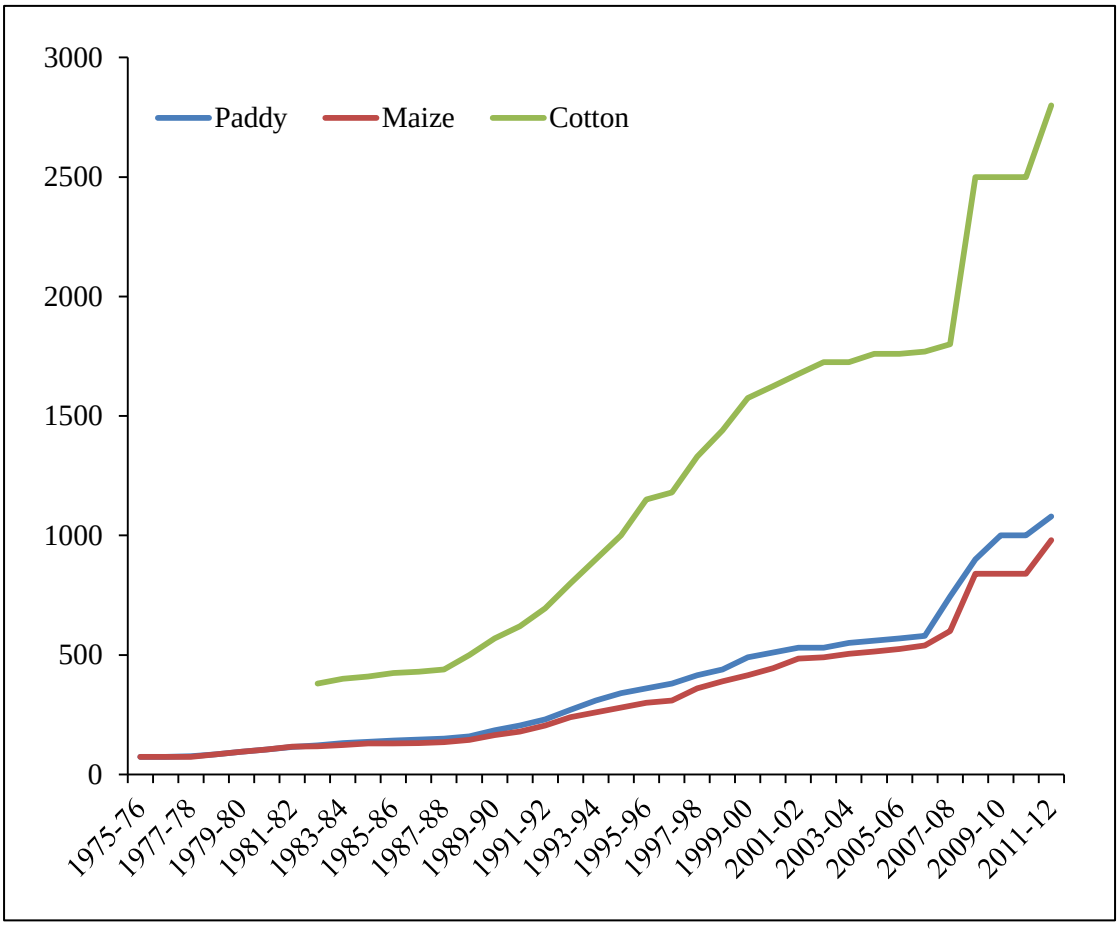
Table 4.4.1: Minimum Support Prices for different crops in Punjab, 1975-76 to 2011-12

(₹q^{-1})

Marketing year	Paddy	Maize	Cotton
1975-76	74	74	DNA
1977-78	77	74	DNA
1979-80	95	95	DNA
1981-82	115	116	DNA
1983-84	132	124	400
1985-86	142	130	425
1987-88	150 (17)	135	440
1989-90	185	165	570
1991-92	230	205	695
1993-94	310	260	900
1995-96	360	300	1150
1997-98	415	360	1330
1999-00	490	415	1575
2001-02	530	485	1675
2003-04	550	505	1725
2005-06	570	525	1760
2007-08	645 (100)	600	1800
2009-10	950 (50)	840	2500
2011-12	1080	980	2800
C.G.R (%)	**7.88*** **	**7.46*** **	**7.39*** **

****** Significant at 1 percent level of significance***
Source: Agricultural Statistics at a Glance and www.indiastat.com
Figures in parentheses represent bonus offered by the government
DNA: Data not available

Figure 4.4.1: Trends in MSP of paddy, maize and cotton in Punjab, 1975-76 to 2011-12



Source: Agricultural Statistics at a Glance and www.indiastat.com

The trend in MSP for paddy crop over the years presented in Table 4.6.1 shows that MSP for paddy in current prices has increased from ₹74 per quintal in 1975-76 to ₹1080 per quintal in 2011-12, that is, 14.6 times. Its trend was positive with growth rate of 7.88 percent per annum during this period.

The trends in maize and cotton were also positive. MSP for maize increased from ₹74 per quintal in 1975-76 to ₹980 per quintal in 2011-12, that is, 13.24 times. Its increase was 7.46 percent per annum during the same period. In the case of cotton, MSP increased from ₹400 per quintal during 1983-84 to ₹2800 per quintal during 2011-12 and its growth rate was 7.39 percent per annum.

In order to examine whether the support price for paddy was higher or lower than that of the competing crops (maize and cotton), the ratio between paddy and other crops were computed (Table 4.4.2). The higher the ratio is the higher the disparity between the MSPs of the crops and vice versa. The perusal of Table 4.6.3 indicates that support price provided to paddy during 1975-76 and 1979-80 (₹74 and ₹95 per quintal, respectively) was exactly equal to that of maize during the same period. That is why the ratio in respective period is 1.00

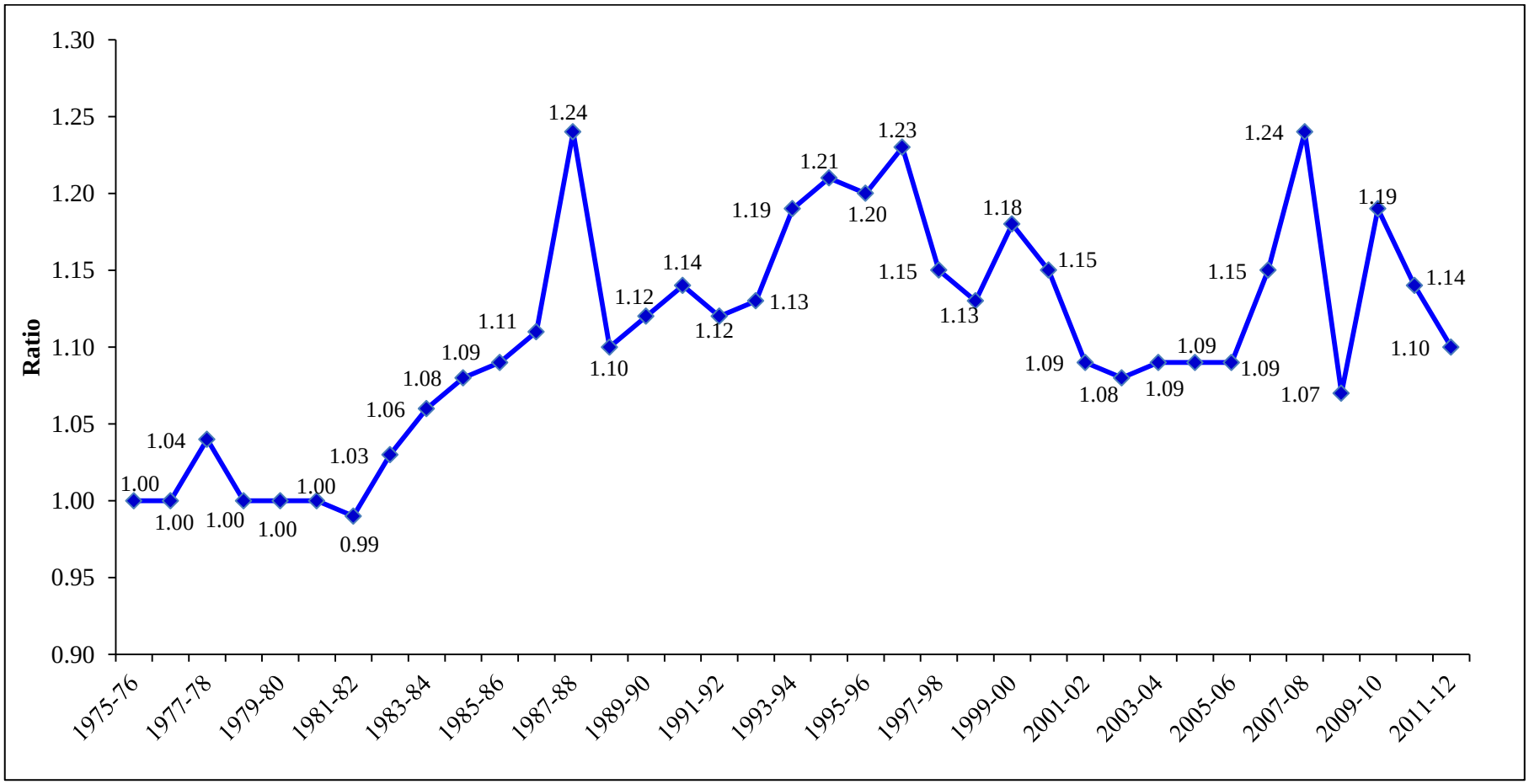
which implies that there was no difference between the MSPs for paddy and maize. But, after that, paddy has been receiving higher MSP than maize. The highest disparity was observed during 1987-88 and 2007-08. During this period the MSP ratio between paddy and maize was 1.24. In the remaining years, the price disparity ranged from 1.0 4 to 1. 20. The exceptional case was observed during 1981-82, when the ratio was worked out to 0.99 which implies that the price for maize was slightly higher than that of paddy (Figure 4.4.2). Also, Table 4.4.1 indicates that the MSP provided to paddy crop increased at higher growth rate (7.88 percent per annum) as compared to its competing crops. This situation motivated the farmers to shift away some of the area from maize to paddy because the latter has assured market by the Government.

Table 4.4.2: Ratio between MSP of paddy and competing Crops in Punjab, 1975-76 to 2011-12

Year	MSP(₹)			Ratio of MSPs	
	Common Paddy	Maize	Cotton	Paddy/Maize	Paddy/Cotton
1975-76	74	74	DNA	1.00	DNA
1977-78	77	74	DNA	1.04	DNA
1979-80	95	95	DNA	1.00	DNA
1981-82	115	116	DNA	0.99	DNA
1983-84	132	124	400	1.06	0.33
1985-86	142	130	425	1.09	0.33
1987-88	167	135	440	1.24	0.38
1989-90	185	165	570	1.12	0.32
1991-92	230	205	695	1.12	0.33
1993-94	310	260	900	1.19	0.34
1995-96	360	300	1150	1.20	0.31
1997-98	415	360	1330	1.15	0.31
1999-00	490	415	1575	1.18	0.31
2001-02	530	485	1675	1.09	0.32
2003-04	550	505	1725	1.09	0.32
2005-06	570	525	1760	1.09	0.32
2007-08	745	600	1800	1.24	0.41
2009-10	1000	840	2500	1.19	0.40
2011-12	1080	980	2800	1.10	0.39

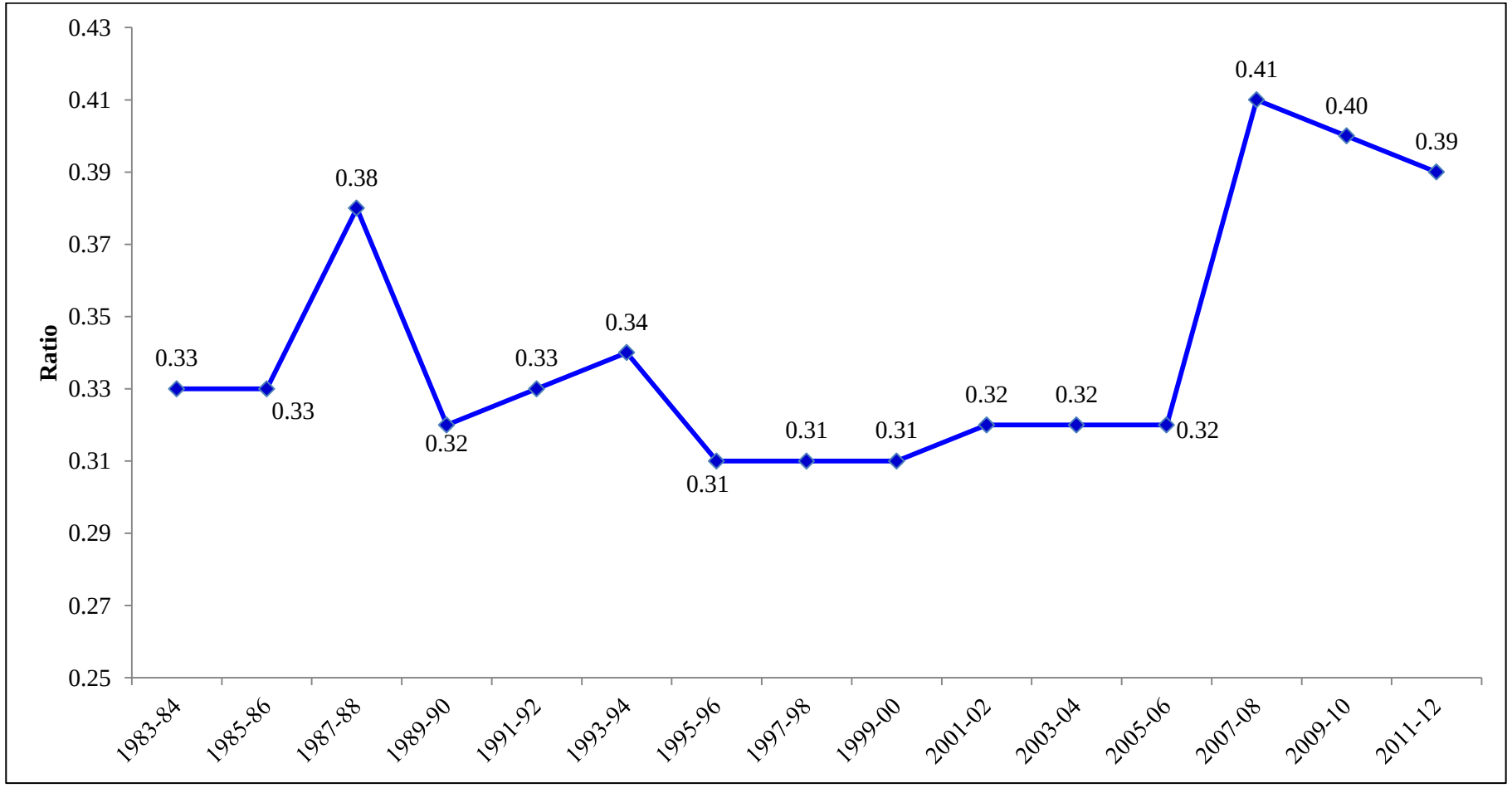
Source: Own computations from Statistical Abstract of Punjab data

Figure 4.4.2: Ratio between MSP of Paddy and Maize in Punjab, 1975-76 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

Figure 4.4.3: Ratio between MSP of Paddy and Cotton in Punjab, 1983-84 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

Apart from the disparity in support price between paddy and maize crops, also there are variations observed in the support price between paddy and cotton crops. The ratio between paddy and cotton was found to be less than 1.0 for the entire period of study (Figure 4.4.3). This means that paddy has been receiving lower MSP than that of cotton for the entire period of study. In spite of higher MSP for cotton over years, the rate of increase in MSP for paddy outpaced that of cotton. Compound growth rates for paddy and cotton were 7.88 and 7.39 percent per annum respectively during this period.

Growth of paddy area vis-à-vis MSPs

The explanation, at least in part, for changes in cropping pattern in favour of rice and wheat is often offered in terms of increase in the Minimum Support Price of rice and wheat vis-à-vis other crops (Nampoothiry, 2003). The high productivity potential of rice and wheat crops along with assured prices and market have changed entire cropping pattern in the state (Saran *et al*., 2013).

In order to examine the trends in area vis-à-vis MSPs, Index numbers of each variable were computed and presented in Table 4.4.3. Since, the Index Numbers are mostly widely used for measuring changes over a period of time; the time series so formed enables us to study the general trend of the phenomenon under study.

The perusal of Table 4.4.3 revealed that, during 1981-82 to 2010-11, the index of MSP of paddy rose by 769.57 percent while the index of area under paddy rose by 123.09 percent. The index of MSP for maize rose by 624.14 percent while the index of area under maize fell by 24 percent below the base level during the same period. The growth rates for MSP and area under paddy were both positive and statistically significant. While the growth rate for MSP of paddy was 7.85 percent per annum, that for area under paddy cultivation was 2.46 percent per annum. This indicates positive relationship between Changes in MSP and area under paddy crop. The growth rate (7.61 percent per annum) of MSP for maize was positively significant, while that (-0.24 percent per annum) for area under maize was non-significant. May be this is due to lack of assured market for maize. These results are in agreement with the results of (Nampoothiry, 2003). Setting MSP only without adequate infrastructures which could make sure that whatever amount of maize comes in the market is procured is not likely to influence the farmers to bring more area under such a crop even if its MSP is impressive. Similar observation was revealed in the case of cotton where the growth rate (7.52 percent per annum) for MSP was found to be positive and significant statistically, but that (-0.95 percent per annum) of the area under cotton was negative and significant statistically.

To bring more clearly what has been discussed from Table 4.4.3, the ratios between MSP and Gross returns of paddy and its competing crops for the period 1981-82 to 2010-11 were computed (Table 4.4.4).

Table 4.4.3: Area growth in crops vis-à-vis MSP growth in Punjab, 1981-82 to 2010-11
(Base year: 1981-82)

Year	Paddy		Maize		Cotton	
	MSP	Area	MSP	Area	MSP	Area
1981-82	100.00	100.00	100.00	100.00	100	100
1982-83	106.09	104.18	101.72	87.36	102.70	105.54
1983-84	114.78	116.71	106.90	87.36	108.11	94.75
1984-85	121.74	129.55	112.07	92.16	110.81	68.80
1985-86	123.48	135.07	112.07	65.92	114.86	81.49
1986-87	126.96	140.74	113.79	94.08	116.22	82.65
1987-88	145.22	135.54	116.38	58.40	118.92	90.52
1988-89	139.13	140.11	125.00	46.88	135.14	110.50
1989-90	160.87	150.35	142.24	63.04	154.05	106.85
1990-91	178.26	158.79	155.17	53.28	167.57	102.19
1991-92	200.00	163.04	176.72	55.20	187.84	104.81
1992-93	234.78	163.28	206.90	69.76	216.22	102.33
1993-94	269.57	171.71	224.14	57.60	243.24	84.11
1994-95	295.65	178.49	241.38	51.52	270.27	87.17
1995-96	313.04	170.29	258.62	49.12	310.81	108.16
1996-97	330.43	170.13	267.24	56.16	318.92	108.02
1997-98	360.87	179.75	310.34	56.32	359.46	105.54
1998-99	382.61	198.50	336.21	55.20	389.19	81.92
1999-00	426.09	205.20	357.76	56.32	425.68	69.53
2000-01	443.48	205.83	383.62	67.20	439.19	69.10
2001-02	460.87	196.14	418.10	73.76	452.70	88.34
2002-03	460.87	199.37	422.41	71.84	466.22	65.60
2003-04	478.26	205.99	435.34	49.60	466.22	65.89
2004-05	486.96	208.59	443.97	73.44	475.68	74.20
2005-06	495.65	208.20	452.59	67.52	475.68	81.20
2006-07	539.13	206.54	465.52	64.48	478.38	88.48
2007-08	647.83	205.59	517.24	76.96	486.49	88.19
2008-09	782.61	215.52	724.14	83.36	675.68	76.97
2009-10	869.57	220.80	724.14	82.24	675.68	74.49
2010-11	869.57	223.09	724.14	76.00	675.68	70.41
C.G.R (%)	**7.85*** **	**2.46*** **	**7.61*** **	**- 0.24^{NS}**	**7.52*** **	**-0.95*** **

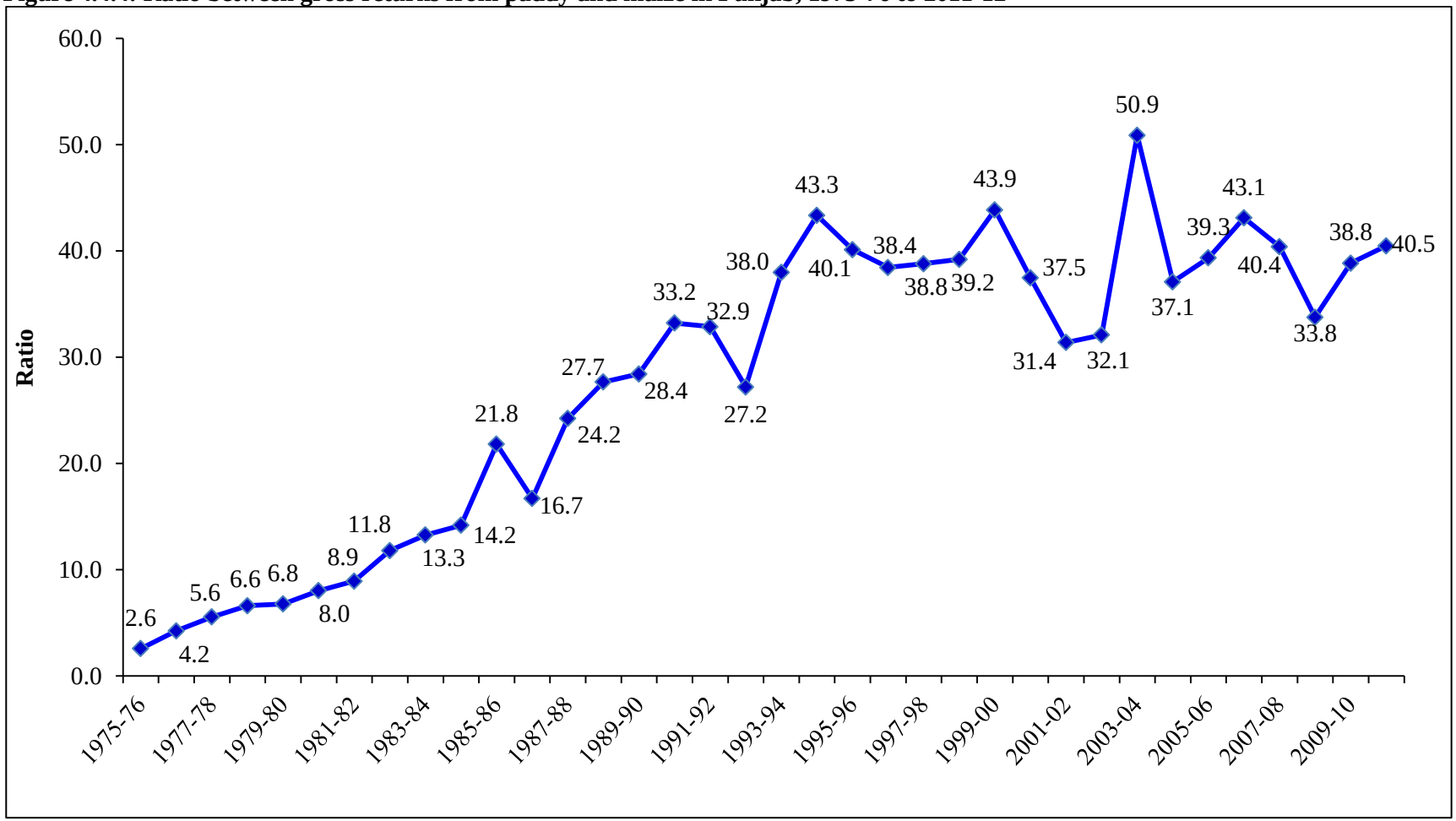
Source: Own computations from Statistical Abstract of Punjab data
****** Significant at 1 percent level of significance***
NS: Non-significant

Table 4.4.4: Ratio between gross returns of paddy and competing crops in Punjab, 1975-76 to 2010-11

Year	Gross returns (MSP in rupees * output in tonnes)			Ratio of gross returns	
	Paddy	Maize	Cotton	Paddy/Maize	Paddy/Cotton
1975-76	1609500	626040	DNA	2.6	DNA
1976-77	1971360	465460	DNA	4.2	DNA
1977-78	2876720	518000	DNA	5.6	DNA
1978-79	3922750	593300	DNA	6.6	DNA
1979-80	4327250	638400	DNA	6.8	DNA
1980-81	5092500	635250	DNA	8.0	DNA
1981-82	6468750	725000	802900	8.9	8.1
1982-83	7605480	644280	786828	11.8	9.7
1983-84	8981280	677040	480760	13.3	18.7
1984-85	10613400	748800	865141	14.2	12.3
1985-86	11679500	535600	1017068	21.8	11.5
1986-87	12960420	776160	1236336	16.7	10.5
1987-88	11939340	492750	1393524	24.2	8.6
1988-89	11755200	424850	1802200	27.7	6.5
1989-90	18472250	650100	2377641	28.4	7.8
1990-91	19905500	599400	2012768	33.2	9.9
1991-92	23248400	707250	2959866	32.9	7.9
1992-93	28455300	1046400	3199680	27.2	8.9
1993-94	35547700	936000	2318220	38.0	15.3
1994-95	39076200	901600	3014300	43.3	13.0
1995-96	36950400	921000	3767975	40.1	9.8
1996-97	41826600	1088100	3854706	38.4	10.9
1997-98	49156750	1267200	2120153	38.8	23.2
1998-99	52751600	1345500	1457712	39.2	36.2
1999-00	64062600	1460800	2550713	43.9	25.1
2000-01	70048500	1869000	3315000	37.5	21.1
2001-02	70150800	2235850	3715820	31.4	18.9
2002-03	70596000	2200100	3179520	32.1	22.2
2003-04	79662000	1565500	4334235	50.9	18.4
2004-05	87668000	2363850	6247472	37.1	14.0
2005-06	87153000	2215500	7159504	39.3	12.2
2006-07	93812200	2176200	8057925	43.1	11.6
2007-08	116599950	2886000	7220160	40.4	16.1
2008-09	147762000	4376400	9706250	33.8	15.2
2009-10	167700000	4317600	8529750	38.8	19.7
2010-11	161480000	3990000	7741000	40.5	20.9

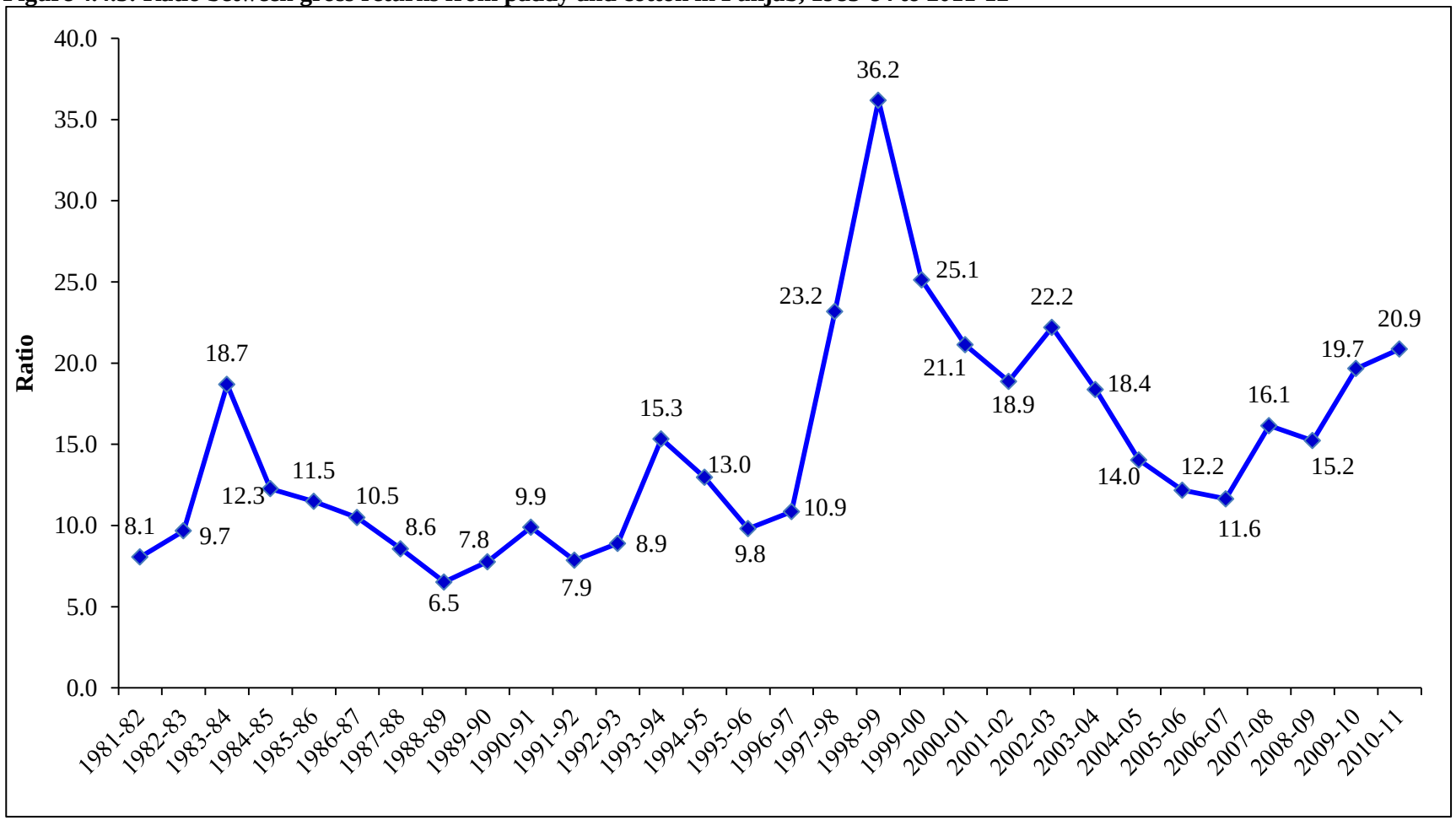
Source: Own computations from Statistical Abstract of Punjab data

Figure 4.4.4: Ratio between gross returns from paddy and maize in Punjab, 1975-76 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

Figure 4.4.5: Ratio between gross returns from paddy and cotton in Punjab, 1983-84 to 2011-12



Source: Own computations from Statistical Abstract of Punjab data

The Table 4.4.4 reveals that the ratio between the gross returns of paddy and its competing crops were higher than 1.0 throughout the study period. This indicates that, not only the area under paddy increased but also paddy generated more income to the farmers as compared to maize and cotton. Despite higher MSP of cotton its gross return is less than that of paddy because of higher production of the latter which is attributed by its assured purchase at remunerative MSP

In addition to the assured market and MSP for rice and wheat, the subsidized price of electricity was another incentive for the increased production of rice and wheat. The use of electricity in agriculture for irrigation following the Green Revolution had significantly contributed to agricultural productivity growth in Punjab (Saran *et al*., 2013). The results presented in Table 4.4.5 shows the changes in electricity consumption vis-à-vis changes in area under paddy over long period of time in Punjab.

The perusal of Table 4.4.5 indicates that the electricity consumption in agriculture changed from 100 percent during 1981-82 to 543.90 percent during 2010-11while the indices for the area under paddy changed from 100 percent to 223.09 percent during the same period. This indicates the positive response of area under paddy towards electricity subsidy in Punjab state. While electricity consumption increased from 1860.07 million kWh during 1981-82 to 10116.90 million kWh during 2010-11, area under paddy increased from 1269 thousand hectares to 2831 thousand hectares during the same period. The results are in line with (Saran *et al*., 2013). The compound annual growth rates of electricity consumption in agriculture during 1970s and 1980s have been about 16 and 13 percent respectively on account of drastic change in cropping pattern in favour of paddy cultivation which is highly water intensive in nature, consumes 3,000 litres of water to produce one kilo of rice. Moreover, the subsidy on electricity induced farmers to over use water in irrigation.

Table 4.4.5: Growth in electricity consumption in agriculture and area under paddy in Punjab, 1981-82 to 2010-11

(Base year: 1981-82)

Year	Electricity consumption (Million kWh).	Indices	Area under paddy (000 ha).	Indices
1981-82	1860.07	100.00	1269.00	100.00
1982-83	2115.00	113.71	1322.00	104.18
1983-84	2183.80	117.40	1481.00	116.71
1984-85	2359.00	126.82	1644.00	129.55
1985-86	2768.60	148.84	1714.00	135.07
1986-87	3570.70	191.97	1786.00	140.74
1987-88	4242.40	228.08	1720.00	135.54
1988-89	4220.40	226.89	1778.00	140.11
1989-90	5186.60	278.84	1908.00	150.35
1990-91	5104.50	274.43	2015.00	158.79
1991-92	5543.20	298.01	2069.00	163.04
1992-93	6144.20	330.32	2072.00	163.28
1993-94	6343.90	341.06	2179.00	171.71
1994-95	5979.90	321.49	2265.00	178.49
1995-96	5734.80	308.31	2161.00	170.29
1996-97	6347.00	341.22	2159.00	170.13
1997-98	6049.30	325.22	2281.00	179.75
1998-99	7531.30	404.89	2519.00	198.50
1999-00	8233.10	442.62	2604.00	205.20
2000-01	5534.30	297.53	2612.00	205.83
2001-02	5451.90	293.10	2489.00	196.14
2002-03	5818.50	312.81	2530.00	199.37
2003-04	6242.90	335.63	2614.00	205.99
2004-05	6468.30	347.74	2647.00	208.59
2005-06	7313.85	393.20	2642.00	208.20
2006-07	8229.49	442.43	2621.00	206.54
2007-08	10022.20	538.81	2609.00	205.59
2008-09	9325.42	501.35	2735.00	215.52
2009-10	10469.30	562.84	2802.00	220.80
2010-11	10116.90	543.90	2831.00	223.09
C.G.R (%)		**4.94*** **		**2.46*** **

***** *Significant at 1 percent level of significance***

Impact of price incentives on production and procurement of paddy in Punjab

Understanding the relationship between MSP and production of paddy is important. The Government of India fixes MSP at incentive level to motivate farmers to bring more resources under paddy investment in order to increase the production and procurement of the same crop for feeding the operational and buffer stock of the Central Pool. This section is an attempt to examine the relationship between MSP and production as well as MSP and procurement of paddy. To measure this, the Karl-Pearson Coefficient of Correlation (r) was computed and its results were presented in Table 4.4.6. The Table 4.4.6 generally reveals a positive correlation between MSP and production as well as MSP and procurement of paddy in all periods. However, the relationship between MSP and procurement became weaker during 2000/01-2010/11 with the coefficient of correlation (r) of 0.443. May be this was the time when MSP could not redeem the costs of production and instead farmers sold paddy at farm gate price which in turned decreased the market arrivals for procurement. But, on the basis of the overall coefficients in both cases, it can be concluded that, MSP has induced farmers to increase production as well as to bring their paddy to the market for procurement.

Table 4.4.6: Correlation of coefficient (r) between MSP and production as well as MSP procurement of paddy in Punjab, 1980/81-2010/11

	1980/81-1989/90	**1990/91-1999/00**	**2000/01-2010/11**	**1980/81-2010/11**
MSP and production (r)	0.908	0.877	0.813	0.924
MSP and procurement (r)	0.807	0.654	0.443	0.89

Source: Own computations from Statistical Abstract of Punjab data

CHAPTER – V

SUMMARY

Agriculture is one of the most important activities in both developed and developing countries which provide basic raw materials to human beings and various agro-based industries. It continues to be the mainstay of the Indian economy contributing 14.1 per cent of GDP and the largest employment providing sector (58.2 percent).

In 1965 India initiated Minimum Support Price (MSP) programme as one of the key instrument for agricultural price policy. MSP is a form of market intervention by the Government of India to ensure agricultural producers against any sharp fall in form of prices. The minimum support prices are announced by the government of India at the beginning of the sowing season for certain crops on the basis of the recommendations of the Commission for Agricultural Costs and prices (CACP). Minimum Support Price is viewed as being in the nature of long term guarantee to the producers that any glut in the market which may be caused by excess production will not be able to depress their incomes to unduly low levels. Minimum support prices are fixed at incentive level, so as to induce the farmers to make capital investment for the improvement of their farm and to motivate them to adopt improved technologies to step up their production and thereby their net income. In the absence of such a guaranteed price, there is a concerned that farmers may shift to other crops causing shortage in the commodities (e.g. rice and wheat) which are highly needed by the government.

The present study aimed at examining the impact of price incentives on production and procurement of paddy in Punjab. The specific objectives were to examine the growth performance of paddy, to examine the market arrivals and procurement patterns, to study the contribution of rice to the central pool by Punjab vis-à-vis other states and to examine the relative movement patterns of minimum support prices of paddy vis-à-vis other competing crops.

The study was entirely based on secondary data. The time series data required for the analysis were collected from Statistical Abstract of Punjab, Agricultural Statistics At A Glance and www.indiastat.com. An exponential function was fitted to compute the compound growth rates of area, production, yield, market arrivals and procurement of paddy. Additive scheme of decomposition was used to find out the effect of area, yield and interaction effect on the growth of production of rice. The variability in area, production and productivity for rice over period of time was computed by using Cuddy Della Valle Index.

In addition to this, descriptive statistical techniques were used to determine the patterns in individual shares of public and private procuring agencies to the total market arrivals in the state. Also, in order to examine the contribution of Punjab's rice into Central

Pool, the shares of the major rice producing states were worked out. On the other hand, ratio was employed to examine the relative movement patterns of minimum support prices of paddy vis-à-vis its competing crops while Index numbers which were computed by un-weighted simple aggregate method were used to determine the relationship between MSP and the area under paddy over long period of time. Finally, the coefficient of correlation was computed to measure the degree of relationship between MSP and Production as well as MSP and procurement of paddy.

The results pertaining to the growth performance of paddy in Punjab indicated positive growth rate for all variables, that is, area, production and yield. The highest growth rates were observed in Period-II that is during the Green Revolution Period whereby area, production and yield of rice grew at the rate of 10.59, 16.35 and 5.21 percent respectively. The major factors for high growth rate in area under paddy were the high and stable yield as compared to other kharif crops, assured price and public procurement. Also, it can be said that, net returns to the farmers from paddy crop are high vis-à-vis its competing crops. These factors influenced farmers' behavior in shifting away some of the area from coarse cereals to rice. On the other hand significant growth in yield was largely attributed to the introduction of high yielding varieties associated with the use of fertilizer and irrigation.

The results pertaining to the decomposition of rice production indicated that during Pre-Green Revolution yield was the major contributor to the increased rice production whereas the interaction influence of both area and yield was the major source of production growth during Green Revolution. It was noticed that area was the major contributor to the growth of production during Post-Green Revolution while the interaction effect again was the major source of production growth in the overall period. In this case, if more area is brought under high yielding varieties associated with other yield-improving technologies then there is high possibility of increasing more production of rice in the state.

The variability in area and production declined, while it has increased in the case of yield of rice from 8.27 percent in Period I to 9.52 percent in Period-II which again decreased to 5.18 percent in Period-III. An increased variability in yield of rice probably was because of the new seed-fertilizer technology adopted during Green Revolution and/or other factors such as drought, pests and diseases.

The findings in the case of market arrivals of paddy indicated that in absolute term market arrivals have increased consistently from 846 thousand tonnes in 1970-71 to 13136 thousand tonnes in 2010-11, which is an increase of 15.53 times whereas their shares to total production have slightly decreased from 81.98 to 81.35 percent in the same period. During some years like 1972-73, 1974-75, 1980-81, 1982-83, the share of market arrivals to its total production declined despite increased production. It may be because farmers might have

either sold paddy directly outside the state or built up stocks in expectation of higher prices than minimum support prices. Or the inadequate expansion in the marketing infrastructural facilities might also have influenced farmers to sell part of the produce at the farm gate. However, the compound growth rates for both absolute market arrivals and their shares to total production have been positive and significant statistically except during 1970-71 to 1990-91 when the share of market arrivals became negative.

The year to year percentage share of paddy procurement by public agencies showed an erratic trend. The lowest share of procurement by public agencies was observed during period 1988-89 when it was worked out to be 1.63 percent. This might be due to the reason that public procurement agencies rejected most of the arrivals as may be they were not meeting the prescribed specifications of the Government. On the other hand private agencies became more active and might have decided to purchase all those quantities of paddy rejected by Government agencies by offering price much below the support price fixed by the Government. However, the general trend in procurement by public agencies showed upward movement with significant statistically growth rate of 8.70 percent per annum contrary to the private agencies which showed a declining role in procurement of paddy over years. The percentage share of the private agencies to total market arrivals of paddy declined from 41.87 to 1.59 percent during 1980-81 to 2010-11 periods, respectively with statistically significant growth rate of -4.76 percent per annum. This observation is in agreement with the results of Chand (2003). In the recent years private trade played much reduced role in grain trade. The reason for this could be the huge build up of buffer stock. The private sector had a feeling that government would be required to reduce the level of excessive stock, which would dampen the domestic prices and might cause losses to the private sector. This means that the level of procurement by the government agencies always directly influences on the market price of paddy which in turn can cause losses to private traders.

Punjab continues to be the rice leading contributor to the Central Pool. In average Punjab contributed 34.41 percent for period 1985-86 to 2010-11. Next to Punjab was Andhra Pradesh which contributed 23.46 percent in the same period. Rice is not a staple food in Punjab that is the reason Punjab contributes the highest to the Central Pool. Other factors may include high yield, increased cropping and irrigation facilities which together work to the advantage of Punjab. However, the contribution of Punjab to the Central Pool has been decreasing over time. This might be due to the increased contribution to the Central Pool from other states such as Uttar Pradesh, Orissa and Chhatisgarh.

The results pertaining to the movement pattern of MSP for paddy has shown a relative higher compound growth rate as compared to its competing crops. The price ratio between paddy and maize crops ranged from 1.04 to 1.24 during the study period.

Exceptional case appeared during 1975-76 and 1979-80 when paddy and maize crops received same MSP, while in 1981-82 maize received higher MSP than paddy. The different case was observed when comparison was made between MSP of paddy and Cotton. The ratio between paddy and cotton (paddy/cotton) ranged from 0.31 to 0.41. This means that paddy had been receiving less MSP than that of cotton for the entire period of study. In spite of high MSP for cotton over years, the rate of increase in MSP for paddy outpaced that of cotton. The compound growth rates for paddy and cotton were 7.89 and 7.39 percent per annum respectively during this period.

The MSP and assured procurement of paddy were important incentives to bring positive changes in area under paddy as well as gross returns from paddy over time. Also, MSP was found to have a positive relationship with procurement of paddy in the state. In addition, the subsidized price of electricity in agriculture was another important incentive which motivated farmers to increase the area under paddy and hence increases in production of the crop. While electricity consumption increased from 1860.07 million kWh during 1981-82 to 10116.90 million kWh during 2010-11, area under paddy increased from 1269 thousand hectares to 2831 thousand hectares during the same period.

Therefore, in view of the above, the study concluded that, MSP as incentive price had contributed to the increase in production and procurement of paddy in the state. Therefore, the study calls for adequate infrastructures to implement MSP in the state as the price is one of the most important determinants of the area allocation which in turn affects the production of a related crop. Also, in order to save ground water which is depleted by the rice crop, much effort should be directed towards researching rice varieties which require low water for irrigation. Parallel to this, suitable control measures should be devised by the Government to minimize the over use of water for irrigation by farmers which is due to subsidized price of electricity in agriculture.

REFERENCES

Acharya S S and Agarwal N L (2011) *Agricultural Marketing in India.* Pp. 341-42. Oxford & IBH Publishing Company Pvt. Ltd. New Delhi.

ADRT (2003) Impact of minimum support prices on agricultural economy (consolidated report). *Agric Situ India* **60** (9): 598-614.

Ali S Z, Sidhu R S and Kamal V (2012) Effectiveness of Minimum Support Price Policy for Paddy in India with a Case of Punjab. *Agril Econ Rs Rev,* **25** (2): 231-42.

Anonymous (2011) *Agricultural Statistics At A Glance*, Government of India

Basavaraja H, Mahajanashetti S B and Sivanagaraju P (2008) Technological change in paddy production: A comparative analysis of traditional and system rice intensification method of cultivation. *Ind J Agril Econ* **63** (4): 629-40.

Bhatnagar S (1995) Growth Performance of Rice Crop in Haryana. *HAU J of Research* **25** (1&2): 41-46.

Chahal S S, Harika R S and Singh S (2003) A study into growth analysis of production and acreage response of cotton in Punjab. *Agric Situ India* **61** (1): 1-9.

Chahal S S and Kataria P (2004) Agricultural Price Policy: Implications for Punjab Agriculture. *Ind J Agril Mktg* **18** (2): 77-86.

Chahal S S, Kataria P and Harpreet K (2001) Impact Analysis of Incentives on Market Arrivals in Punjab. *Ind J Agril Mktg* **15** (3): 26-34.

Chand R (2003) Government Intervention in Foodgrain Markets in the New Context, Policy Paper 19. *www.ncap.res.in/upload*.

Chand R and Pal S (2003) policy and technological options to deal with India's food surpluses and shortages. *Current Science* **84** (3): 388-98.

Chary S and Upender M (1996) An Analysis of Market Arrivals and Prices of Paddy in Regulated Agricultural Markets. *The Bihar J Agril Mktg* **4**(1): 14-24.

De U K (1999) Nature and causes of inter-district variations in yield of rice in West Bengal. *Ind J Agril Econ* **59**(4): 554-565.

Deka N and Sarmah A K (2004) Growth trends in area, production and productivity of banana in Assam. *Agric Situ India* **61**(3): 131-35.

Deshpande R S and Naika R T (2002) Impact of Minimum Support Prices on Agricultural Economy: A Study in Karnataka. *www.isec.ac.in*

Deshpande R S and Raveendra T (2004) Moon in the mirror: Farmers and minimum support prices in Karnataka. *www.isec.ac.in.*

Erda H, Erda G and Esengun K (2009) Analysis of production and price relationship for potato in Turkey: A distributed lag model application. *Bulg.J Agric Sci* **15** (3): 243-250. *www.agrojournal.org*

Gopal N (1999) Procurement and marketing of wheat and wheat products. *Agric Situ India* **56** (9): 521- 26.

Grover D.K, Singh J and Singh S (2012) Assessment of Marketable and Marketed Surplus of Major Foodgrains in Punjab from *www.aercpau.com*

Gulati A, Ganesh K and Ralph Cummings Jr (2007) Foodgrains policy and management in India: responding to Today's challenges and opportunities**.** *htt//pdf.usaid.gov/pdf/ docs/PNADK225*

Gupta S and Bawa R S (2004) Productivity Trends in Agriculture: Future Strategy. *Productivity* **44**(4): 661-68.

Hazra C R (2001) Rice production scenario in India and central intervention.*Agric Situ India* **58**(1**)**: 3-8.

Jahanmohan K R, Sundaravaradarajan K R, Swaminathan L P, Padmarani S and saravanan S P (2005) Growth performance of agriculture in agro-climatic zones of Tamil Nadu. *Agric Situ India* **61**(10): 679-86.

Jha S and Srinivasan P V (2006) India- Reforming farm support policies for grains.*www.igi. dr.ac.in*

Jain K K and Garg B R (1995) Potential and competitiveness of India rice in Asia. *Productivity* **36** (1): 148-159.

Jain K K and Karam S (2000) Is minimum support policy equitable in progressive agriculture? The case study paddy and wheat in Punjab. *Agric Situ in India* **57**(1): 3-15.

Job E and Nandamohan V (2004) Rice Production in Kerala-trend and Instability Analysis. *Agric Situ India* **61**(3): 135-39.

Kaur A and Kaur P (2012) Shift in cropping pattern vis-à-vis stress on water resources in Punjab. *Indian J Econ Dev* **8**(3): 91-98.

Kumar P and Badal P S (2004) Growth and instability of horticultural crops in north-eastern India. *Agric Situ India* **61** (7): 499-504.

Kumar P, Badal P S and Singh R P (2005a) Relative variability in yields of food grains across regions and over time. *Productivity* **46**(2-3): 224-29.

Kumar R, Singh R P, Singh N P and Vasisht (2005b) Production performance of maize crop in northern India: A district-wise exploration. *Agric Situ India* **61**(11): 765-71.

Kumar S and Jain K K (2004) Growth Performance of Food grain Production and Resource use in India. *Agric Situ India* **61**(6): 409-23.

Kunal L B, Gadd G M and Olekar J B (2003) Econometric analysis of effects of modern technology in paddy production in Karnataka. *Ind J Agril Mktg* **17**(1): 183-93.

Mahajan G, Singh K and Gill M S (2012) Scope for enhancing and sustaining rice productivity in Punjab (Food bowl of India). *African J Agric Res* **7**(42): 5611-20.

Mehra S (1981) Instability in Indian Agriculture in the context of the new technology. Research report. Washington: International Food Policy Research Institute.

Mythili G and Shanmugam K R (2000) Technical efficiency of rice growers in Tamil Nadu: a based on a panel data. *Ind J Agril Econ* **55**(1): 15-25.

Nampoothiry M M (2003) Trends in cropping pattern vi-a-vis price trends. *Agric Situ India* **60**(5): 297-305.

Narayanamoorthy A and Suresh R (2012) Agricultural price policy in India: Has it benefited paddy farmers? *Ind J Agril Mktg* **26**(3): 87-106.

Navadkar D S, Birari K S and Kasar D V (2004) Factors influencing the yield gap for sugarcane and cotton in Maharashtra. *Agric Situ India* **61**(4): 185-87.

Panda R (2003) Trends in prices and production of agricultural commodities in Orissa in the post liberalization period-Some thoughts for policy. *Ind J Agril Econ* **58**(3): 404.

Pandey (1998) Response of farmers to minimum support price changes in respect of acreage under wheat crop in India. *Ind J Agril Mktg* **12**(3): 102.

Patel G N and Shiyani R L (1997) Agricultural price policy and its impact on farm income: A case of foodgrain crops. *Agric Situ India* **53**(12): 841-44.

Pitta D N and Singh S (2012) Procurement of rice in India. *www.saarj.com/images*

Prasoon M, Chaurasia S P R and Gauraha A K (2001) Technology adoption, yield gaps and production constraints in rice and wheat in the plains of North-western Uttar Pradesh. *The Bihar J Agril Mktg* **9**(3): 330-35.

Rai K N, Grover R K, Karwasa J C and Singh S N (1986) Agricultural price policy- an analysis. *Ind J Agril Econ* **41**(4): 617.

Rathi D and Awasthi P K (2003) Impact of domestic price policy on agricultural production, cropping pattern and productivity of cotton in Madhya Pradesh. *Ind J Agril Econ* **58**(3): 404

Reddy A R and Sen C (2004) Technical inefficiency in rice production and its relationship with farm-specific socio-economic characteristics. *Ind J Agril Econ* **59**(2): 260-67.

Roy D and Jain K K (2004) A study into cost efficient yield levels for paddy and wheat in India. *Agric Situ India* **61**(8): 531-36.

Saran K S. P Kataria and Arjinder Kaur (2013) An electricity energy usage and energy subsidy in Punjab agriculture *Indian J Econ Dev* **9**(3): 199-206.

Sharma H R, Singh K and Kumari S (2006) Extent and source of instability in foodgrains production in India. *Ind J Agril Econ* **61**(4): 647-66.

Sharma J L (1988) Production Performance of Punjab Agriculture- District wise Analysis. *Agric Situ India* **43** (8): 675-78.

Sharma J L and Singh J (1986) Growth of crop output in Punjab. *Agric Situ India* **41** (7): 551-53.

Sharma V P and Joshi P K (1995) Performance of rice production and factors affecting acreage under rice in coastal regions of India. *Ind J Agril Econ* **50**(2): 153-59.

Shripad V, Naik A D, Kunnal L B and Hiremath G M (2000) Growth trend in area, production and productivity of different crops in Karnataka. *The Bihar J Agril Mktg* **8**(1): 88-93

Shroff S and Kajale J (2012) Role of Minimum Support Price- How Far are Farmers protected (Case of Maharashtra). *Ind J Agril Mktg* **26**(3): 136-47.

Shukla N D, Sharma S K and Murari K (2003) Determination of inter-state disparities in rice productivity. *Agric Situ India* **60**(9): 565-69.

Sidhu J S and Sidhu D S (1985) Price support versus fertilizer subsidy: An evaluation. *Economic Political Weekly* **20**(13): A-17 - A-22.

Sidhu M S and Gaganjot Singh (2010) A study on staggered public procurement system of paddy in Punjab. *Ind J Agril Mktg* **24**(2): 122-34.

Siju T and Kombairaju S (2001) Rice Production in Tamil Nadu: A trend and decomposition analysis. *Agric Situ India* **58**(4): 143-46.

Singh A J and Byrlee D (1990) Relative variability in wheat yields across countries and over time. *J Agril Econ* **41**(1): 21-32.

Singh A J and Kumar N (1998) A study into technical efficiency in rice cultivation in Punjab. *Agric Situ India* **54**(12): 747-750.

Singh G and Chandra H (2000) Analytical approach to growth dynamics of agricultural inputs and their effect in increasing productivity in Madhya Pradesh. *Agric Situ India* **56**(12): 723-731.

Singh K, Vatta K and Kumar S (2000) Effectiveness of price policy for cotton in Punjab. *Ind J Agril Mktg* **16**(3): 65-72.

Singh I P, Bal H S, Singh B and Kumar N (1986a) Price policy for wheat and paddy vi-a-vis equity in Punjab. *Ind J Agril Econ* **41**(4): 611-16.

Singh I R, Prasad V, Dingar S M and Gupta B K (1986b) Price policy in relation of resource allocation in agriculture. *Ind J Agril Econ **41*** **(**4): 618-19.

Singh N P, Ranjit K, Singh R P and Jain P K (2005) Rice economy in India: Development and trade and prospects. *Agric Situ India* **62** (6): 427-35.

Sinha H K and Sen C (2000) Supply response of paddy in Uttar Pradesh. *The Bihar J Agril Mktg* **8**(3): 336-39.

Sinha R K and Kumar A (2003) Impact of agricultural price policy on production, productivity and cropping pattern of Bihar. *Ind J Agril Econ* **58** (3): 405.

Sinha S K (2000) Education for agriculture in India. Time for a change. *Curr Sci* **79** (3): 302-10

Sulemain A, Oliver M and Tony R (2004 Crop-level supply response by agro-climatic region in Ethiopia. *J Agril Econ* **55** (2): 289-311.

Sushila K, Ghasi R and Sanjeev P (2006) Economic analysisof productivity and profitability in rice production in India. *Agric Situ India* **63**(5): 295-99.

Swain H and Bhakar R R (2006) Trends and variability of some cereals, pulses and commercial crops in Rajasthan. *Agric Situ India* **63**(6): 377-85.

Thomas K J and Sundareasan R (2000) Economic efficiency of rice production in Kerala. *Bihar J Agril Mktg* **8**(3): 310-15.

Appendix I

Production and market arrivals of paddy in Punjab

Year	Production (000 tonnes)	Market arrivals (000 tonnes)
1970-71	1032	846
1971-72	1380	1255
1972-73	1432	1198
1973-74	1710	1463
1974-75	1768	1475
1975-76	2175	1836
1976-77	2664	2342
1977-78	3736	3435
1978-79	4615	4325
1979-80	4555	4294
1980-81	4850	4432
1981-82	5625	5166
1982-83	6234	5644
1983-84	6804	5777
1984-85	7581	6950
1985-86	8225	7106
1986-87	8877	7565
1987-88	8122	7122
1988-89	7347	5650
1989-90	9985	8337
1990-91	9710	7882
1991-92	10108	7902
1992-93	10539	8066
1993-94	11467	9063
1994-95	11493	9432
1995-96	10264	6863
1996-97	11007	7925
1997-98	11845	9843
1998-99	11989	9377
1999-00	13074	10977
2000-01	13735	11057
2001-02	13236	11066
2002-03	13320	12715
2003-04	14484	13438
2004-05	15655	14004
2005-06	15290	13794
2006-07	15131	12577
2007-08	15651	12802
2008-09	16418	13234
2009-10	16770	14237
2010-11	16148	13136

Source: Statistical Abstracts of Punjab

VITA

Name of the student	:	Sikitu Anyosisye
Father's name	:	Angindile Mwakyeja
Mother's name	:	Roida Kajileke
Nationality	:	Tanzanian
Date of birth	:	20/03/1979
Permanent home address	:	Makwale Primary School, P.O. Box 34, Mbeya Tanzania mwakyejaaloyce@yahoo.com

EDUCATIONAL QUALIFICATION

Bachelor degree	:	B.Sc. (Agricultural Education & Extension)
University	:	Sokoine University of Agriculture, Morogoro, Tanzania
Year of award	:	2005
GPA	:	3.90/5.00
Master's degree	:	M.Sc. (Agricultural Economics)
OCPA	:	/10.00
Title of the Master's thesis	:	Impact of price incentives on production and procurement of paddy in Punjab
Award/Scholarship	:	Indian Council of Agricultural Research (ICAR)