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NOTE TO CONTRIBUTORS

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STATISTICAL TABLES

Abbreviations used

N.A. — Not Available.
N.Q. — Not Quoted.
N.T. — No Transactions.
N.S. — No Supply/No Stock.
R. — Revised.
M.C. — Market Closed.
N.R. — Not Reported.
Neg. — Negligible.
Kg. — Kilogram.
Q. — Quintal.
(P) — Provisional.
Plus (+) indicates surplus or increase.
Minus (–) indicates deficit or decrease.

Important Policy Decisions Taken during the Month of February, 2015: The 2nd Advance Estimates of production of major crops for 2014-15 and Final Estimates for 2013-14 have been released by the Department of Agriculture & Cooperation on 18th February, 2015. As per 2nd Advance Estimates, the production of major crops during 2014-15 are as under:

Foodgrains	—	257.07 million tonnes
• Rice	—	103.04 million tonnes
• Wheat	—	95.76 million tonnes
• Corarse Cereals	—	39.83 million tonnes
• Maize	—	22.97 million tonnes
• Pulses	—	18.43 million tonnes
• Tur	—	2.75 million tonnes
• Gram	—	8.28 million tonnes
Oilseeds	—	29.83 million tonnes
• Soyabean	—	11.64 million tonnes
• Groundnut	—	7.47 million tonnes
• Rapeseed & Mustard	—	7.36 million tonnes
Cotton	—	35.15 million bales (of 170 kg each)
Sugarcane	—	354.95 million tonnes

Important Policy Matters under Consideration or Held up: NIL

Important Events and Development of Public Matter:

Trends in Foodgrain Prices

During the month of January, 2015 the All India Index Number of Wholesale Price (2004-05=100) of Food grains declined by 1.11 percent from 234.8 in Dec., 2014 to 237.4 in Jan., 2015.

The Wholesale Price Index (WPI) Number of Cereals Increased by 0.26 percent from 233.1 to 233.7 and WPI of Pulses increased by 4.94 percent from 242.9 to 254.9 during the same period.

The Wholesale Price Index Number of Wheat increased by 0.98 percent from 214.5 to 216.6 while that of rice declined by 0.46 percent from 240.3 to 239.2 during the same period.

Weather, Rainfall and Reservoir situation during February, 2015: Cumulative Winter (January to February) Rainfall for the country as a whole during the period 01st January to 25th February, 2015 is 13% lower than LPA. Rainfall in the four broad geographical divisions of the country during the period was lower than LPA by (-) 4% in North West India, 56% in East& North East India, (-) 59% in South Peninsula and higher than LPA bhy 44% in Central India.

Out of a total of 36 meteorological subdivisions, 19 subdivisions received excess/normal rainfall and 17 subdivisions received deficient/scanty rainfall.

Central Water Commission monitors 85 major reservoirs in the country which have a total live capacity of 155.05 BCM at Full Reservoir Level (FRL). Current live storage in these reservoirs as on 26th February, 2015 was 64.35 BCM as against 78.21 BCM on 26.02.2014 (last year) and 63,90 BCM of normal storage (average storage of the last 10 years). Current year's storage in 82% of the last year's and 101% to the normal storage.

As per latest information available on sowing of crops, around 100.2% of the normal area under rabi crops have been sown upto 13.02.2015. Area sown under all rabi crops taken together has been reported to be 615.74 lakh hectares at All India level as compared to 656.89 lakh hectares the corresponding period of last year.

Area reported was higher by 7.8 lakh ha. under Wheat, 2.3 lakh ha. under Maize, 2.9 lakh ha. under Urad and 2.3 lakh ha. under Moong. Area coverage was lower by 2.5 lakh ha. under Rice, 5.7 lakh ha. under Jowar, 5.4 lakh ha. under Gram, 3.0 lakh ha. Under Rapeseed & Mustard, 1.5 lakh ha. under Groundnut, 1.1 lakh ha. under Safflower and 2.4 lakh ha. in Sunflower as compared to average area as on date.

Price Movement of Onion, Potato and Tomato during February, 2015

The All India average wholesale price of onion during February, 2015 was Rs. 1999/qtl compared to Rs. 1966/ qtl in January, 2015, showing a marginal rise of 1.67% over the last month. The average wholesale price during February, 2015 was in the range of Rs.874/qtl in Jaipur to Rs. 3760/qtl at Wayanad in Kerala. At the retail level, All India average price of onion remained at the same level at Rs. 25/Kg in February, 2015 as it was prevailing in January, 2015. The average retail price ranged from Rs. 12/Kg in Bhopal to Rs. 42/kg at Wayanad in Kerala. Total arrivals of onion during February (26/01/2015-25/02/2015) was 934118 tonnes which was 10.8% lower than the previous month's arrival and 19% lower than the previous year.

In case of potato, the All India average wholesale price during February, 2015 was Rs. 1313/qtl compared to Rs. 1433/qtl in January, 2015, showing a decrease of 9.1% over the last month. The average wholesale price during February, 2015 was in the range of Rs. 461/qtl in Agra to Rs. 3100/qtl in Thiruvananthapuram. At the retail level, All India average retail price of potato in February, 2015 was Rs. 18/Kg as compared to Rs.19Kg in January, 2015. The average retail price was in the range of Rs. 7/Kg in Bhatinda to Rs.33/Kg In Thiruvananthapuram and Wayanad. Total arrivals of potato during February (26/01/2015-25/02/2015) was 1208051 tonnes which was about 3.2% lower the previous month's arrival and 22.5% higher than the previous year.

In respect of tomato, the All India average wholesale price during February, 2015 was Rs. 1559/qtl compared to Rs. 1739/qtl in January, 2015, registering a decline of 11.5% over the previous month. The average wholesale price during February, 2015 was in the range of Rs. 653 qtl in Chennai to Rs. 2678/qtl in Shimla. At the retail level, All India average price to tomato in February, 2015 was Rs. 21/kg compared to Rs. 23/kg in January, 2015. The average retail price ranged between Rs. 10/kg in Ranchi to Rs. 35/kg in Chandigarh. Total arrivals of tomato during February (26/01/2015—25/02/2015) was 239086 tonnes which was about 10.6% lower than the previous months' arrival and 3.3% higher than the previous year.

Fall in Rabi Crops Sown Area

As per Rabi Crops data, released by Directorate of Economics and Statistics, Ministry of Agriculture, total area coverage under Rabi crops came down to 605.85 lakh hectares as compared to last year's sown area of 644.92 lakh hectare. Wheat's sown area at 306.35 lakh hectares too is lower as compared to last year's 315.32 lakh hectares. The area sown with coarse cereals at 56.89 lakh hectares too is lower as compared to that of the last year when it was 100.51 lakh hectares. Area covered under total pulses is at 142.92 lakh hectares as compared to the last year's covered are of 157.61 lakh hectares. Similarly area under oilseeds is at 80.14 hectares as compared to 88.61 lakh hectares last year.

Union Agriculture Minister Underlines Farm Developmental Link Between Technology and Markets

Shri Radha Mohan Singh, Union Agriculture Minister chaired the annual Board of Management and AGM of the Small Farmer's Agribusiness Consortium (SFAC) Society and exhorted officers to increase the pace of mobilization oif farmers into Farmer producer Organization or FPOs. He said this would help farmers to link effectively to investments, technology and markets. He directed SFAC to pay special attention to districts with high population of tribal and the entire northeast region for the formation of FPOs and assured that enough funds would be available to undertake this task. SFAC has so far registered 243 FPOs while another 451 are under formation. Over 6.72 lakh farmers have been benefitted through these bodies.

The meeting later approved the annual accounts of SFAC. MDE, SFAC Shri Pravesh Sharma made a presentation of various activies being implemented by the Consortium. Agriculture Secretary Shri Ashish Bahuguna and other senior officers, besides representative of various Ministries and banks also attended the Board of Management and Annual General Meeting.

Substantial Increase in Productivity is the Answer to Achieve Food Security in an Efficient and Sustainable Manner, says Radha Mohan Singh

Union Agriculture Minister Sh. Radha Mohan Singh emphasised that increase in farmers' incomes and quality food supply to consumers at affordable prices are closely linked to supply of quality seeds with all the required traits for substantial increase in productivity. Bt cotton in Gujarat and other states like Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu has clearly demonstrated what these new technologies can do to enhance farmers incomes with consequential effects on their well-being. Besides newer technologies like herbicide tolerance, drought tolerance, nitrogen use efficiency, healthy oils and feed, and nutrition enhancement, can, when introduced commercially in India, substantially increase productivity leading to greater farmer incomes and farmer well-being, he said.

Sh. Radha Mohan Singh was speaking on the occasion of inauguration of India Seed Congress-2015 held at Agra (UP). Sh. Singh said that apart from increased productivity to produce more from less input including water and land, the losses that occur due to droughts, floods, salinity, biotic and other abiotic stresses also need to be eliminated decisively through the adoption of appropriate technologies. In this context, genetic engineering holds great promise, he said.

Sh. Singh mentioned that international collaborations both in public and private sector are essential to introduce innovations and technologies to the farmers. However, such arrangements should benefit all the stakeholders and faster technology diffusion and adoption can happen only if there is a rational regime for technology pricing and licensing which enables a level playing field and also fosters healthy competition, he said.

Sh. Singh emphasized that the superior genetics encapsulated in seed combined with improved agronomies shall be the key strategy to break the yield barriers. He said that in this direction the private organized seed industry has significantly contributed and successfully complemented with the public sector. Government shall therefore support PPP initiatives for overall development of the sector, he said.

Sh Singh said that a substantial increase in productivity is the answer to achieve food security in an efficient and sustainable manner.

Speaking on the occasion, Sh. Radha Mohan Singh said that while agriculture feeds the nation, seeds feed agriculture. Seeds are a critical determinant of productivity in agriculture. By embedding various adverse climatic conditions, a seed is eminently suited to increase productivity. Thus, appropriate policy support for seed improvements through conventional and biotech methods, in combination with improved agronomic practices, would

greatly help in ensuring food and nutritional security of the country, he said.

Arrival of Onions in Mandis

The Government is keeping a close watch on the arrival of onions in the Mandis to see if there is need for policy intervention to check the rising prices of onions. Various agencies are involved in collection and dissemination of data on arrival and prices of onion. Directorate of Marketing and Inspection (DMI) under the Department of Agriculture & Cooperation (DAC) collects/hosts the data on Agmarknet Portal. The other agencies involved in the collection of arrival and price data are National Horticulture Board and Small Farmers' Agribusiness Consortium (SFAC) under DAC. Additionally, National Horticultural Reasearch and Development Foundation (NHRDF) collects information on onion arrival and prices on a daily basis from the major producing and consuming markets which is available on their website www.nhrdf.com.

Green Revolution in the Eastern India

Bringing Green Revolution to Eastern India (BGREI), a sub-scheme of Rashtriya Krishi Vikas Yojna (RKVY), is being implemented in seven eastern states, namely, Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, West Bengal and eastern Uttar Pradesh from 2010-2011 to address the constraints limiting the productivity of rice based cropping systems. Under this scheme, various activities like cluster demonstrations of improved package of practices, assets building, site specific activities and marketing support are being undertaken,

With implementation of this programme, the share of rice production of eastern states increased up to 53.75 percent of total all India rice production during 2013-14 (4th advance estimates) which was 48.95 percent during 2010-11.

Government takes decisions regarding various segments of agricultural sector from time to time. Recently, "Soil Health Card Scheme" has been launched for providing soil health cards to farmers in the country. This scheme will help in judicious use of fertilizers.

Gender Friendly Agricultural Equipments

Agricultural machines and implements including gender friendly agricultural equipments are manufactured in the private sector. The Indian Council of Agricultural Research (ICAR) provides funds for research and technological innovations in the field of gender friendly equipments and from 2011-2012 to 2014-15, Rs. 1026.71 lakhs have been provided to All India Coordinated Research Project on Ergonomics & Safety in Agriculture for this purpose.

The use of gender friendly equipments is promoted through training, demonstration and financial assistance under Sub-Mission on Agricultural Mechanization. Women beneficiaries are provided 10% additional financial assistance for purchases of various agricultural machines and equipments. State Goverments have also been directed to ensure flow of benefits to women farmers by way of earmaking at least 30% of allocation of this Sub-Mission.

Infrastructure for Online Trading

Department of Agriculture and Cooperation has approved a Central Sector Scheme on "Promotion of National Agricultural Market through Agri-Tech Infrastructure Fund (ATIF)' for Rs 200 crores to be implemented during 2014-15 to 2016-17. Under the scheme, the funds will be utilized for creating an appropriate e-market platform that would be deployable in 642 wholesale regulated markets across the States and Union Territories(UTs).

In order to effectuate the e-market platform, there is provision for assistance of Rs. 24.00 lakhs to Rs. 34.00 lakhs to the Agricultural Produce Marketing Committees (APMCs) for providing necessary infrastructure for grading and assaying, Information Technology (IT) infrastructure and other miscellaneous facilities. Further to increase market access, States must integrate warehouses with the platform to enable warehouse based sales and delivery, for which necessary reform in State APMC Act, if required, is to be made.

Online Agri Platforms for the Sale of Agricultural Produce

Department of Agriculture and Cooperation (DAC) has approved a Central Sector Scheme on 'Promotion of National Agricultural Market through Agri-Tech Infrastructure Fund (ATIF) for Rs. 200 crores to be implemented during 2014-15 to 2016-17. The scheme aims to create an appropriate e-market platform that would be deployable in wholesale regulated markets across States and Union Territories (UTs). The platform will enable development of an alternative marketing channel, enhance transparency in auction process and number of buyers, resolve information asymmetry, improve market access by integrating warehouse based sales and will facilitate migration towards a barrier free National Market. The scheme, would facilitate setting up of a competitive and transparent system, reduce the role of middlemen and unfair trade practices, in the marketing of agricultural produce and thereby enable farmers to get better prices for their produce. Guidelines are yet to be formulated.

Articles

Farmers' Income, Distress and Cost in Agriculture

Brajesh Jha*

Abstract

In India, farmers' distress is often related to a decrease in farmers' income. The decrease in income is easy to ascertain as more than 85 per cent of farmers are small and marginal land holders. Farmers cultivate different kinds of crops depending on their attitude towards risk-return trade off. Farmers prefer cultivation of Crops with more or less assured procurement, as fine cereals in North-west India. The study shows that down side risk is significant in many crops other than fine cereals. The yield-induced risk reported to have been decreasing in the 1980s, experienced no decrease during the reference period (1997-2012). The cost of cultivation of crops has increased during the reference period. The fixed cost now accounts for more than one half of total cost of cultivation of crops. Many agricultural crops were competitive as cultivation of the same was based on family labour. Of late, importance of hired labour in cultivation of the same crop has increased. Probably, on account of uncertainty in the availability of hired labour, the contribution of machines in the cost of cultivation of agricultural crop has increased.

Introduction

If rate of growth in agriculture is the problem at the macro level, at the micro-level, assured return on farm is the most important consideration for technological choices. This has strong implications for the status of natural resources in the regions. A lower level of farm return is not very difficult to understand if more than 85 percent of farmers are small and marginal. Interestingly, these farm holders (small and marginal) are now account for more than 40 percent of cultivable land in the country. Therefore productivity on these farms is important. Considering the average size of holding in agriculture, farm-level returns are often not sufficient; therefore, they depend on non-farm income for their livelihood (Jha 2011, NSSO 2005). But for farmers, to concentrate in agriculture, it is important that agriculture contributes adequately to the household income for farmers.

The experiences indicate that farm of such size are not viable on their own. Government support is therefore important, their is more so for a country like India where one of very two workers in economy are in agriculture. Government support can be in the farm of help to create institutions and also develop profitable agriculture on farm. Few government efforts primarily to increase farmers' return have counterfactual relations. The higher price of agricultural commodities for instance has a trade-off between the interest of farmers and consumers. The conterfactual relations can be understood from the fact that the increased expenditure by the government for farmers depletes other development expenditures for farmers (GOI 2013).[1] Government support at times is not WTO (World Trade Organisation) - compatible though such compatibility is important in the multilateral frame work.

In this backdrop support for farmers require proper diagnosis of their income and income induced distress in agriculture. The present paper is an attempt in the above direction. This has four sections, the next section illustrate important methood used in the paper. Results of study are discussed in Section III of the present papers, different sup-section present discussed of results related to the existing return and distress of farmers from crops. This section also discusses cost of agriculture that increases farmers return. Section IV concludes the paper.

II. Methodologies

The study is based in information from the Reports of commission for Agricultural Cost and Price (CACP) The CACP report has many advantages over the individual region and technology, specific studies.[2] The CACP report has been used to assess the distress of farmers since distress in the present study is related to income of farmers in agriculture.

Down Side Risk in Agriculture

Risk is another important determinant of a farmers's decision analysis. The down -side risk in return affects farmers the most (Jha 1995). The frequency of downside risk referred here as distress is measured by the probability of failure (PF). this is the probability of crop return and

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[1]Serveral issue of Economic Survey shows scissor kind of relationship betwen subsidies and investment in agriculture (GOI).

[2]There are many crop-specific studies, parameters for such individual studies are often different; these studies are not comparable in death of suitable meta-analysis. The crop-specific technology based study often related to primay infromation and such are often impressionnist, unlike the CACP report; it strengthens ideational conflicts.

crop yield falling 10 present or more below their respective trend value. In the absence of significant trends (R square less than 0.60) for many crops during this reference period, the probability of failure is calculated as 10 percent or more below their value in the previous year. The magnitude of distress or downside risk is calculated by estimating the average negative deviation from the expected return or yield. the expected return or yield is the trend value of return and yield for individual crop.

Expected annual negative deviation from trend = (Average absolute deviation in return/yield of individual crop)* (probability of shortfall in return/yield from trend)

Average absolute deviation = sum (XT-Xt)/N where, Xt is the actual value in t-th year, XT is the trend value in t-th year and N is the number of years in the period.

The Cost Concepts

While fixed and operational costs are relatively uniform throughout the relevant text, the CACP report presents various cost concepts specific to Indian farm conditions. The present study frequently uses costs and cost concepts as used in the CACP Report, and the same is presented below in appendices. The fixed cost in the report is rental value of owned land, rent paid for leased in land, land revenue, cess and taxes, depreciation in implements and farm building, interest in fixed capital. The operational costs consist of cost incurred in hiring casual labour, attached labour, family labour, hired bullock labour, hired machine labour. cost incurred in owned bullock labour and machine labour, also cost incurred in procuring seed, fertilizer, manure, insecticide, irrigation charges, working capital interest on working capital and miscellaneous cost paid out by farmers for the crop.

The cost C2 is often used to present total cost of cultivating the same commodities. The cost C2 consists of all actual expenses in cash and kind incurred in production by owners, interest on value of owned capital assets (excluding land), rental value of owned land (net of land revenue), rent paid for leased in land, and imputed value of family labour. The cost A2 often comparable to variable/ operational cost consist of including costs incurred in leasing land, land revenue, interest on fixed capital and depreciation and excluding imputed value of family labour over the operational cost.

III. Results and Discussions

The study assess farmer's return with the CACP report. The important trends in productivity and price of agricultural commodities having implications for farms-level return is presented in the first sub-section. The pattern of cost having implications for return of farmers in agriculture is discussed in the second sub-section. however the third sub-section discusses the reurn related distress of farmers.

III. I Farmers' Return from Principal Crops

Return on farm is investigated with the costs and return of crops in paddy, wheat, bajra, gram, rape-mustard, and cotton. These crops represent a wide range of crop groups like fine and coarse cereals, pulses, oilseeds and commercial crops which comprises significant area under crop, Table 1 compares yield (production per hectare of land), cost (as represented through C2 in the CACP report) and income (as represented through return over cost) of chosen crops in the selected states of India. The CACP data on costs and return aspect of a crop present different groups of states. The selected states present different kinds of situation for crops. Paddy, for example, is highly water-intensive and its cultivation in Northwest India is beyond the carrying capacity of the region but quite within that of Bihar which is situated in the humind/sub-humid region of the country. The concern for natural resource encourages cultivation of paddy in the latter kind of states. Similarly, the cost of cultivation data of wheat is available for states like Haryana, Rajasthan and Madhya Pradesh (MP). Most of these states, except MP, are known for growing mexican-wheat. The concern for diversity requires that non-mexican wheat may be continued to be cultivated in MP. the coarse cereals, believed tobe neglected crops in certain states, are becoming important in some other states. It may be that supporting institutions of specific coarse cereals exist in certain states to make these crops profitable.

Gram and urad are important pulse crops of India. In gram, inter-state variation in income is more on account of difference of gross return rather than cost in states during the reference period. As per the earlier trend in coarse cereals and pulses, return in rape-mustard was increasing across reference states. Interestingly, return in rape-msustard is increasing Rajasthan. It is reported that the National Research Centre for Rapeseed and Mustard at Bharatpur, Rajasthan has developed the country's first hybrid mustard called 'Shankar Sarson', which further increases the profitability of rapeseed and mustard by 20 percent. Cotton is an important commercial crop in many regions in India. It is now a recognized fact that the yield induced risk has started decreasing after adoption of Bt cotton in the early 2000s. The profitability of cotton has increased on the account of the adoption of Bt cotton. Price, another important component of gross return, fluctuates following the prevalence of distortions in the world cotton market (see tables 1A, 1B and IC in appendix).

The above discussions clearly show that the income referred here is return over cost (C2) in a crop varies across states; income of gram in Bihar and rape-mustard in Rajasthan was significant. The return from the same crop (gram, rape-mustard) has however decreased in Haryana. The differential profit of a crop across states provides reasons for growing specialization of crops in selected states of the country. Such profit may not necessarily be

due to the natural resource endowment of a region; favourable institutions play in important role in increasing the return to farmers. The natural resource base in a region can be made elastic by public investment. Considering the average size of agricultural holding, income from crops is not sufficient for farmers. The study in the next sub-section looks into the structure of cost, a study of same may indicate the area of cost that may increase farmers return from agricultural crops.

III. ii Structure of Agricultural Cost and Implications for Farmers Return in Agriculture

The cost of cultivation data shows significant variation across states in productivity and also cost of commodity. This variation has various factors; at times, it is because of bad weather and yield. The periodic downfall of yield in some commodities important for maintaining food security is often met with the practice of bonus above MSP in certain states. The bonus price above MSP is primarily to achieve the decentralized procurement of food grains in the referred states. Considering periodic variation in the yield and importance of decentralized procurement, the practice of bonus price aboveMSP is not unjust. If such bonus above MSP is the cause of price inflation of food grains for consumers, and the government is too concerned about its effect, the government should devise ways of subsidizing the price of food grains. The price of fine cereals is too subdued to that of other agricultural commodities.

The cost data shows that the share of human labour in the total cost of production has increased substantially during the reference period. In human labour, the share of casual worker has increased in the reference period and that of family labour has decreased significantly (See Figure 1 and 2). Many agricultural commodities in India were competitive despite its low productivity in world agriculture; the competitiveness in such commodities was on account of the low cost of family labour engaged in agriculture (Jha 2000).

The share of machines in the total cost of production of a commodity has increased during the reference period. This is true for all reference states and commodities considered in the study. The factor endowment suggests that India is rich in unskilled human labour. The cost of unskilled human labour, as reflected with the wage of casual worker engaged in agriculture, increased in the 2000s (Jha 2007); the wages are reported to have further increased after the initiation of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). The increased cost of labour, besides many factors, has caused increase of mechanization in agriculture (see Table 2 in appendix).

Again in mechanization, the share of hired component has increased and that of owned cost of machinery has decreased (See Fig 2). This reflects the dependence of farmers on hiring machines. Any assistance in reducing the cost of hiring the machine will be important. The government may assist individuals (person) or institutions (organization) interested in custom hiring, primarily to reduce its hiring cost for farmers. Jha (2011) suggested that individuals such as agricultural adviser or agri-clinics could encourage custom hiring, while Chahal et al. 2014 suggested the merits of cooperatives in the institutionalization of custom hiring services. These suggestions assume that encouraging custom hiring services will reduce the cost of hiring machines and increase farmers' income.

Cotton is generally referred to as a cash crop, since farmers used to cultivate this crop for earning the cash requirement of farme holding. This concept of cash crops appears to have diminished; now, any crop cereals, pulses, oilseeds wherein farmers are assured of a relatively good price are being cultivated to earn cash. Gram (in Bihar), rape-mustard (in Rajasthan) are examples of crops being cultivated as cash crops (see table 1 in appendix).

The age-old hypothesis of marginal land is still true in large parts of the country; productivity of gram in a prosperous state like Haryana is an example. The government must invest in such land to increase its quality. Such investments will improve the chances of increase in farmer's income. In this context, the present prime minister's gola of providing irrigation facility on every piece of land is important.

The constituent of fixed cost in total cost is substantial and this has increased during the reference period[3]. The increase in fixed cost is evident for the most of reference states barring Bihar. The increase in fixed costs in Tamilnadu, Gujarat and Haryana is more than other state (Bihar). The increase in fixed cost indicates that the rental value of land has increased, in other words, opportunity cost of land has increased in the earlier group of states. This also reflects that the cost of agriculture increased in at least Tamilnadu, Gujarat and Haryana. Considering the size of holding the fixed costs may be subsidized by the Government. This is also important considering the debate on price vis-a-vis income based support in agriculture. The subsidies to farmer amounting to increase in the cost of land may be ascribed to the opportunity cost of agriculture and this can be an important component of income support to farmers. But unfortunately land owners and land tillers are not the same in India. Investment on land increases return of farmers by increasing productivity of agriculture, investment policy thus increases objective of farmer and also Nation.

[3] The fixed costs, in addition to operational costs, consist of rental value of land, interest on fixed capital and depreciation on plants and building (Appendix.)

The statistics related to cost and return indicate that return over cost (C2) in any commodity (data for which is published by the CACP) is not sufficient for farmers to concentrate on the above crop activities only. [4] This is true in all reference states. To augment household income of farmers, they are increasingly investing in land saving enterprises like dairy. The growth of dairy activities, despite emerging constraints in the sub-sector, reveals this (Jha 2010). Of late. contribution of land based enterprises in the household income of farmers is decreasing and that off-farm source is increasing (Jha 2010, NSSO 2005).

III. iii Distress as Downside Risk to Farmers

The present sub-section studies farmers' distress as the downside risk in return from crops. The same has been studied by calculating the probability of failure (PF) in yield and return of crops. The down side risk is average deviation (AND) from expected return and yield of crops. The PF indicates frequency of shortfall in expected return and yield, whereas AND works out the magnitude of downfall in return and yield. Expected value (return and yield. Expected value (return or yield) is based on trend value (return and yield), and the study argues that expected value as observed through historical trend in value is the most important determinant of farmers' expectation. Many farm decisions are often based on their expectations. The downside risk in yield is indicative of production induced distress whereas the difference between yield and return indicates the magnitude of market induced stress for farmers. With the commercialization of agriculture, market induced risk has assumed importance. The downside risks have, therefore, been calculated separately for the reference periods; the first period is years between 1997-98 and 2004-05 while the second period is between the years 2004-05 and 2011-12. The downside risk is calculated for important crops separately in states (Bihar, Gujarat and Haryana) and the same is presented in Table 2.

A glace at these estimates indicates a general decline in downside risk in important crops; gram is an exception. The decline was in terms of frequency (PF) and also magnitude (AND) of downside risk. Irrigation appears to be an important factor of the amelioration of production-induced risk. Caution needs to be exercised in estimating the risk for paddy, as it is not exactly a commodity, but a commodity group in a state like Haryana. Rice, for instance, consists of basmati and non-basmati rice in Haryana. The production and price estimates for these commodities vary depending on their proportion to the commodity aggregate (rice). In other words, the price and the yield of rice (commodity aggregate) varies every year. A significant decline in the downside risk of cotton is owed to the arrival of Bt cotton in the study area. Technology (Bt) is thus an important factor of reduction in the risk of crops (*see* table 3 in appendix).

The estimates of downside risk in gross return present a different picture. The down-side risk in the selected coarse cereals (maize), pulses (gram) and oilseeds (rape-mustard seed) has increased over the reference period. The role of market-induced risk in the latter reference period is also evident. A careful analysis of these estimates indicates that production induced risk in the late 1990s was marginally lower than in between 2004 and 2012. The down-wide risk in return has increased susbtantially in the latter peiod. The data for return is generated from yield and price, and in a multiplicative model a high downside risk in return is possible if the risk in one variable (market, productivity) is very high. Downside risk in return is high in the latter reference period as the difference in prices was very high during the reference periods. Downside risk is particularly high for cotton, followed by oilseed (rape-mustard), pulse (gram), coarse cereal (maize) and fine cereal (wheat).

The estimates of downside risk show that farmers cultivating crops other than fine cereals are liable to greater down-side risk. Besides the effctiveness of minimum support price (MSP) for fine cereals, production-induced risk is also less in fine cereals since these are not cultivated as neglected crops (as gram in Haryana). wheat is also cultivated significantly in the assured irrigated area. With increase in assured irrigation production induced risk has decreased, though market induced risk has emerged important during the reference period.

IV. Conclusions and Recommendations

Indian agriculture is widely referred to as smallholder agriculture, and the household income of small farmers depends on multiple sources. In spite of the multiple sources of household income, farm level growth in agriculture is important. The costs and return date from the CACP shows that the cultivation of traditional crops with the existing method of agricultural practices cannot lift farmers out of poverty, since a considerable percentage of land holdings are less than one hectare in size. The study, therefore, argues for a flexible land market that lets interested farmers increase their land size. Flexibility in the land market also provides the certainty of land tenure to farmers interested increasing productivity in agriculture. A computerized land record is pre-condition fro effective land market.

The study indicated that may crops in a region can become remunerative, if supportive institution that reduce the cost of agriculture and increase farmer's share in consumer's expenditure for that commodity. The suitable incentive for number of crops may increase return of farmers, and also improve agricultural environment of the region. There should be a diversity of crops at the regional level, while individual farm may continue to specialize in certain crops, as it can reduce may extrenalities of resource-intensive agriculture.

[4]The return over cost (C2) from crops with the national average of agricultural holding of farmer is less than salary of the lowest paid employee in the organized sector. Return of marginal and sub-marginal farmers is often less than the minimum wage based salary of unskilled casual workers in organized sector

The study shows that Government incentives for farmers are essential to improve viability of farmers and also health and natural resources in the region. The support to provide assured price for number of crops is important for farmers; though price unlike income is not very compatible with the WTO Agreement on Agriculture. The investment policy of government has potential to convert marginal into productive land in agriculture. Investment policy thus not only increases farmer's income but also improve health of natural resources in the region. The government policy for subsidies may also be relooked by incorporating health of natural resource in the region with the earlier objective in agriculture.

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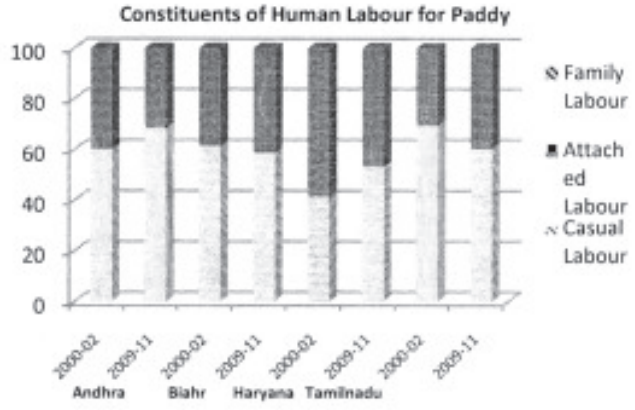
APPENDIX

Fig. 1: Constituents of Human Labour (family, attached, casual) in Paddy and Cotton



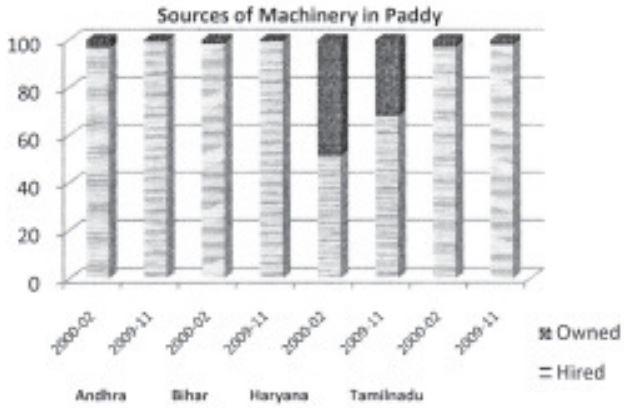
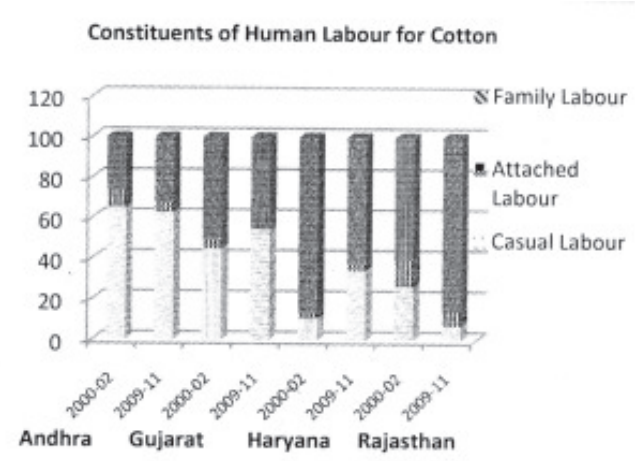


Fig. 2: Sources of Machines (owned & hired) in Paddy and Cotton



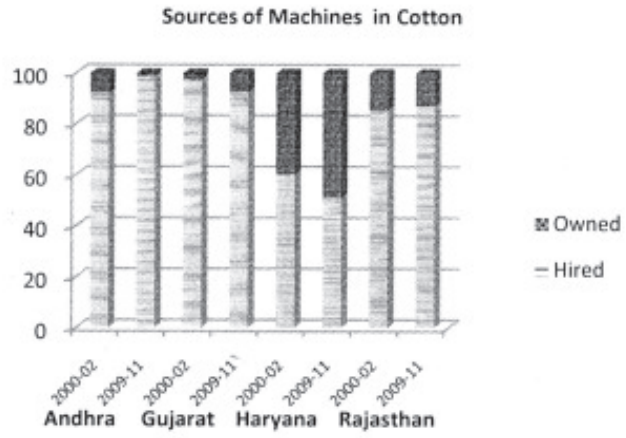


TABLE 1A: PRODUCTIVITY, COST AND RETURN OF PADDY (P) AND WHEAT (W) IN THE SELECTED STATES

	Productivity, Cost and Return of Paddy						Productivity, Cost and Return of Wheat (W)									
	Andhra Pradesh (P)		Bihar(P)		Haryana(P)		Tamilnadu(P)		Bihar(W)		Haryana(W)		Rajasthan(W)		Madhya Pradesh(W)	
Parameters on the basis of per hectare	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2010-12	2000 02	2010-12	2000-02	2010-12	2000-02	2010-12
Productivity (yield in quintals)	48	54	24	19	39	41	47	50	48	54	24	19	39	41	18	31
Cost(C2) (Operational Cost+Fixed Cost)	26608	52854	11937	20362	22755	50293	28305	48796	26608	52854	11937	20362	22755	50293	12368	30464
Operational Cost (A2+Family Labour)	17844	35098	8192	14991	14831	28195	20848	36428	17844	35098	8192	14991	14831	28195	7845	16688
Returns over Cost C2 (in INR)	380	7229	-1140	91	5674	22550	1195	6210	380	7229	-1140	91	5674	22550	820	16033

TABLE 1B: PRODUCTIVITY, COST AND RETURN OF MAIZE (M) AND URAD (U) IN THE SELECTED STATES

	Productivity, Cost and Return of Maize						Productivity, Cost and Return of Urad							
	Andhra Pradesh (P)		Bihar(M)		Rajasthan(M)		Andhra Pradesh(U)		Maharashtra(U)		Odisha(U)		Rajasthan(U)	
Parameters on the basis of per hectare	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11
Productivity (yield in quanitals)	22	48	23	36	12	17	7	7	4	5	4	4	3	4
Cost (C2) (Operational Cost+Fixed Cost)	11686	42397	13220	22490	13330	25257	9094	23107	8445	20298	6110	12299	7203	13912
Operational Cost (A2+Family Labour)	8140	28908	9532	16695	10661	19275	4887	13592	6599	14913	3915	7412	5796	9962
Returns over Cost C2 (in INR)	-1430	4677	-1336	26141	-4240	-996	4075	10954	347	1052	-1966	5769	207	4522

TABLE 1C: PRODUCTIVITY, COST AND RETURN OF COTTON (C) AND REPESSEDS AND MUSTARD (R &M) IN THE SELECTED STATES

	Productivity, Cost and Return of Cotton								Productivity, Cost and Return of Rapeseeds & Mustard					
	Andhra Pradesh (C)		Gujarat(C)		Haryana(C)		Rajasthan(C)		Haryana (R&M)		Madhya Pradesh (R&M)		Rajasthan (R&M)	
Parameters on the basis of per hectare	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2010-12	2000-02	2010-02	2000-02	2010-12
Productivity (yield in qunitals)	13	16	4	20	7	18	11	20	17	20	13	14	13	15
Cost (C2) (Operational Cost + Fixed Cost)	22317	46160	13730	48511	17004	47868	13149	40211	16763	35759	11556	24435	13011	25771
Operational Cost (A2+Family Labour)	14745	28033	11038	32056	12347	30620	8602	24118	9638	16280	15470	14307	13355	12820
Returns over Cost C2 (in INR)	2569	10784	-2061	33718	-2834	18879	6518	39611	3218	26435	4423	17505	3553	17103

TABLE 2: CONSTITUENTS (IN PERCENT) OF TOTAL COST (C2) OF PADDY AND COTTON

	Andhra Pradesh		Bihar		Haryana		Tamilnadu		Andhra Pradesh		Gujarat		Haryana		Rajasthan	
Parameters	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2009-11	2000-02	2010-12	2000-02	2010-12
Human Labour	33.31	34.15	38.82	41.10	26.04	29.79	32.04	30.19	26.04	29.79	32.04	30.19	40.19	34.09	36.16	35.69
Machinery Labour	6.34	10.21	6.89	8.60	2.45	4.82	8.26	3.90	2.45	4.82	8.26	3.90	5.35	5.73	3.26	4.43
Seeds	3.01	4.46	6.19	6.28	6.20	4.84	5.68	5.03	6.20	4.84	5.68	5.03	2.25	7.41	3.79	5.95
Fertilizers & Manure	10.35	6.62	6.68	5.68	9.29	9.29	11.56	9.12	9.29	9.29	11.56	9.12	4.16	4.34	7.79	6.30
Miscellaneous cost	12.78	7.49	7.26	10.75	18.29	9.49	22.05	17.77	18.29	9.49	22.05	17.77	18.17	11.84	12.92	6.86
Fixed Cost	34.22	37.06	34.17	25.79	37.73	41.77	21.14	33.99	37.73	41.77	21.14	33.99	29.88	36.60	36.09	40.76
Operational Cost	65.78	62.94	65.83	72.41	62.27	58.23	78.86	66.01	62.27	58.23	78.86	66.01	70.12	63.40	63.91	59.24

TABLE 3: DOWNSIDE RISK (DR) IN YIELD AND RETURN OF THE SELECTED CROPS, STATES AND PERIODS

	Bihar				Gujarat				Haryana				Tamil Nadu			
	DR in Yield (in kg.)		DR in Return (in INR)		DR in Yield (in kg.)		DR in Return (in INR)		DR in Yield (in kg.)		DR in Return (in INR)		DR in Yield (in kg.)		DR in Return) (in INR)	
Crops	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12	1997-98 to 2004-05	2004-05 to 2011-12
Paddy	153.0 (0.13)	329.5 (0.25)	487.5 (0.13)	2992.4 (0.13)	243.9 (0.25)	89.5 (0.13)	1843.8 (0.25)	3473.5 0	177.8 (0.13)	153.8 (0.0)	5721.1 (0.25)	10043.1 (0.13)	444.6 (0.25)	329.3 (0.13)	2459.33 (0.25)	7140.0 0
Wheat	167.0 (0.13)	161.3 0	4039.1 0.25	3887.6 0	240.7 (0.25)	219.0 (0.13)	6890.1 (0.13)	6407.8 (0.13)	286.7 (0.25)	194.6 0	9419.2 0	8934.9 0				
Maize	132.5 (0.13)	262.5 (0.13)	503.7 (0.-13)	3556.9 (0.13)	362.7 (0.25)	269.9 (0.38)	2008.2 (0.5)	3378.7 -(0.25)	255.0 (0.13)	215.2 (0.38)	1834.4 (0.13)	3997.4 (0.25)	54.7 (0.13)	1091.3 (0.25)	492.4 (0.25)	1586.6 (0.13)
Gram	80.6 (0.38)	128.8 0.0	1754.5 0.13	5243.2 (0.0)	157.7 (0.13)	99 0	2029.2 (0.25)	4482.8 (0.13)	88.1 (0.25)	153.0 (0.38)	1598.3 (0.25)	4227.1 (0.38)	19.9 0	18.0 0	1086.7 (0.25)	3021.5 (0)
Rapeseed & Mustard	54.8 (0.25)	57.0 (0.13)	1010.4 0.25	4987.3 0	159.7 (0.13)	134.9 (0.13)	2797.5 (0.38)	7219.9 (0.13)	189.4 (0.25)	237.9 (0.25)	2488.8 (0.25)	9030.8 (0.13)				
Cotton					95.2 (0.25)	64.3 (0.13)	1269.7 (0.25)	6963.3 (0.13)	95.2 (0.25)	64.3 (0.13)	1269.7 (0.25)	6963.2 (0.13)	40.9 (0.13)	108.0 (0.13)	609.7 (0.38)	4813.5 (0)

Note to Contributors

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Inequalities in Land Holdings in the State of Himachal Pradesh

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Abstract

In this paper, the inequality in operational land holdings in respect of number of holdings, in the state of Himachal Pradesh has been investigated using various inequality indices, namely Gini index, entropy based Theil's index, traditional as well as decomposable, and welfare based measure of inequality known as Atkinson's index. The duration of the analysis is considered from 1970-71 to 2005-06 at the interval of five years, as census years. The secondary data for this period become available in five categories namely marginal, small, semi-medium, medium and large, from the Agricultural Census Department of the Government of Himachal Pradesh. The main findings of this paper is that in all the districts and the state of Himachal Pradesh, the inequality through Gini index was found to show an overall decline trend over these eight census years. It was found consistent with trends represented by Atkinson's index manifesting an improvement of pattern in Social Welfare Function. Although the traditional Simple Theil's measure, separately, for both the distributions exhibited an increase in inequality, the decomposable Theil index was found to reveal a more realistic declining trend in inequality. On the other hand, the inter-group inequality was found to be more than that of the intra-group. The Gini index shows the similar trend, with an exception in Kinnaur district. The sudden changes in each of the indices in some year, are supposed to be due to the socio-economic and climatic dynamics across various districts in the state. Overall decline in various indices over the span of 35 years indicates a definite economic growth of the state on the agricultural front.

Introduction

In developing economies, the central activity of the rural populace is based on agriculture and operational land holdings, where the pattern of operational holdings has important consequences towards the agricultural production and distribution of income. Earlier studies have shown that widespread inequality of income in rural areas has its origin in the unequal distribution of land holdings and the assets, which shows a cumulative effect over time. In particular, and increase in the marginal and small holdings is uneconomical so far as the use of the technology and the related inputs are concerned. As a result, the potential worker and farmer are being further marginalized due to being unemployed, and they are being seen migrating towards different towns and cities to seek satisfactory employment.

Skewed distribution of land leads to lower per capita income, stagnant growth, and those influencing socio-economic factors, which further lead to unequal access to the decision making process, institutional facilities and developmental activities driven by Government. It also fastens the advancement of landlessness by promoting competition among rural laborers due to onrush of landless peasants in the labor market, resulting in the fall of their wages. So far as the employment is concerned, it is a decreasing function of the size lf land holdings.

The structure of land holdings over the years reveal its reveal its progressive disaggregation and enhanced fragmentation at scattered locations. The inequality in land distribution affects productivity. Typically, majority of farmers with marginal holdings would not go for cultivation of conventional crops, which are highly uneconomical for them. Nevertheless, these marginal land holdings are being used to produce cash crops, vegetables etc. It may be further mentioned that, with the new land reforms on one hand and operation of the forces induced by technology, technical know-how, on the other, along with the state intervention in this direction have played a vital role in breaking the hegemony of large farmers. The pattern of inequality and growth was beautifully described by famous Nobel Laureate economist Professor Kuznets (1955), in the form of an inverted U-shaped curve, known as 'Kuznets curve'. Kuznets ratio represents the ratio of income going to the highest-earning households (usually defined by the upper 20%) and the income going to the lowest-earning households (measured by the lowest 20%). According to the Kuznets curve hypothesis, economic inequality use to increase at the beginning of the process of economic development, the inequality starts to fall after reaching at a certain level of per capita income. This historical phenomenon was understood by Kuznets in

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terms of workers migrating form agriculture to industry; and/or rural workers moved to urban jobs. The reasoning was simple that in order to experience growth, countries/ states had to shift its orientation from agriculture to industry. While there was little variation in the agricultural income, industrialization leads to large differences in income. Additionally, as economies experienced growth, mass education provided greater opportunities, which decreased the inequality and the lower income portion of the population gained political power to change governmental policies in favour of them.

A few interesting observations were made by Ali (2008) from Asian development bank, in the context of Asia, as follows:

- The Asian continent has experienced significant growth, but, at the same time, it has experienced increased inequality.
- "Between country' inequality is the main driver of increase in inequality.
- Inequality in land holdings, education, health public services infrastructure and capital market has largely contributed to the lack of economic opportunities and decline in social cohesion.
- Poorer households have benefited less from the growth than the richer lot.

These observations are equally relevant in the Indian context, particularly, in respect of land holdings (Kaushik 1999, Ericsson and Vollrath 2004), education (Bhalla 2011) and capital market (rotheli 2011). Under such scenario, without touching the debate on the issue of farm size vs productivity, triggered the present study of Inequality pattern of land holdings and their consequences' in the state of Himachal Pradesh.

The objective of the present study is to find out the inequality in distribution of operational holdings and respective operational area through different inequality measures, in different districts of the state of Himachal Pradesh.

Mathodology

This study is essentially based on secondary data of distribution of operational land holdings as per their size class, The data was collected from the Directorate of Land Record, Government of Himachal Pradesh, from its various publications and Agricultural Census of Himachal Pradesh for the period from 1970-81 to 2005-06 at the interval of five years, for different districts of the state.

The operational land holdings in different eight census years (at the interval of five years) and their distribution are represented as percentage of land holdings in each size class, viz. Class I (marginal), class II (small), class III (semi-medium), class IV (medium) and class V (large) respectively correspond to the area below one hectare, between 1-2 hectare, 2-4 hectare, 4-10 hectare and above 10 hectare, respectively.

Measures of Inequalities

There are variety of measures to find out the inequality, but in this paper, we used the following three relevant inequality measures, namely Gini's, Theil's and Atkinson's measures' for their respective advantages. The details are given below:

1. Gini Coefficient: Gini coefficient is a measure of statistical dispersion or inequality in a distribution (Gini 1912). It is found applicable in all the fields of science, social sciences and economics, basic sciences, agriculture and engineering. It varies between 0 and one. It is commonly used as a measure of inequality of income/ wealth over time. It has several advantages and few disadvantages. The advantage is that, it measures the inequality by means of ratio analysis and is easily interpretable. It can be used to compare income distribution over time, independent of the absolute income. It is directly related to differences, in each class size, between every pair of the size distribution of holdings. Concentration of land can be measured by calculating Gini's coefficient. It satisfies all the four important characteristics of a good index, namely anonymity, scale & size independence, population independence and transfer principles. The disadvantages are hidden in its inherent nature of the relative ratio analysis. It does not address (Atkinson 1970, Subramanyam 1990) issues related to causes, opportunities, capabilities and differential efficiency of skills related to household income.

The Gini Coefficient may be defined with respect to the well know Lorenz curve between two distributions given by P_i and Q_i as

$$GC=1-\sum (P_i-Pi-1)\ (Q_i+Qi-1) \qquad (1)$$

Where P_i and Q_i refer to the cumulative percentage of the number of operational holdings and the operational area respectively in the ith group.

2. Theil's Measure: Gini's coefficient is unable to reflect inter-fram (Between groups) and intra-garm (Within group) inequality in lahd holdings, for which Theil's measure (1967) is the natural choice and always preferred over Gini coefficient. Theil's index, in some sense, a dual measure, provides an entropy based measure, which is almost in the form of utilitarian social welfare function, also utilized by Foster and Sen (1996).

Theil's inequality measure may be obtained in the form of Simple Theil Index (STI) and alternatively, Decomposable Theil Index (DTI), which may be defined as follows:

a. **Simple Theil Index (STI):** It may be expressed as

$Th(p)=\log(n)-H(p)$

$Th(q)=\log(n)-H(q)$

Where p and q stand respectively for the relative (may be in percentage) number of operational holdings and the relative operational area, n represents the number of groups/size-classes. The functions H(p) and H(q) signify the respective entropies as

$$H(p)=\sum p_i.\ \log(1/pi),\ \text{and}\ H(q)=\sum q_i.\ \log(1/q_i),\ (3)$$

p_i and q_i represent the respective ratio's $p_i = x_i / \sum x_i$ and $q_i = y_{i/} \sum y_{i,}$ with x as the number of operatioal holdings and y as the operational area respectively.

b. Decomposable Theil Index (DTI): The Decomposable Theil Index (Bourguignon 1988) is expressed as

$$DTI=\sum q_{i.}\ T_{i,} + \sum q_{i,}\ \log\left(\sum q_{i/}\ \log q_{i,}/p_i\right) \qquad (4)$$

$$\text{with}\ T_{i,} + \sum q_{ij,}\ \log\left(q_{ij,}/p_{ij).}\right) \qquad (5)$$

Howere in q_{ij} and p_{ij} the subscripts ('i') represents the group (with elements varying over 1, 2,....,n) and 'j' represents the number of subgroups (containing 1, 2,....,m elements). The two terms on the right hand side of equation (4) represent the decomposition of the Theil index respectively as 'within group' (intra-group) and 'betweens group' (inter-group) theil indices.

3. Atkinson's index (Al): atkinson Index (1970) also falls in the general entropy class of inequality measure. This is the most popular Welfare based measure of inequality in terms of an explicit social welfare specifications. The cornerstone of the Atkinson's Index is Equally Distributed Equivalent (EDE) income. It is used in operational context to derive welfare implications of alternative policy options, which allows the policy analysts to have a normative content for their analysis. Therefore, it targets the analysts to enhance their capabilities in assessing the impact of development policies on welfare.

The use of Atkinson's Measure provides an index of potential gains from redistribution of operated area equally among the farmers. In this measure, a distributional feature has been introduced through an explicit parameter E, 'inequality aversion parameter', which represents the weight attached by society to the inequality in the distribution. A zero value of E implies that the society is indifferent to inequality, and its higher value indicates that the society is more and more averse to inequality. The value of E may lie, inprinciple, between zero and infinity. Atkinson's index has a natural interpretation for welfare losses due to unequal distribution of land. To be more explicit, suppose at some particular value of E, the value of A1 is 0.40. It means that the same level of social welfare can be obtained with 60 percent of the total operated land or alternatively the gain from redistribution to bring about equality is equivalent to raising operated land by 40 percent.

The Atkinson's index may be defined as

$$A1= 1-\left[\sum q_{i/\mu}^{(1-E)}\ p_i\ \right] 1/^{(1-E)}$$

Where μ is the mean operated area per holding and E is effectively an arbitrary parameter representing the degree of inequality aversion.Though it can very from zero to infinity, however, for realistic situation it may lie somewhere between 1 to 2.5.

Results and Discussion

All the three categories of inequality indices are calculated and presented in this paper. The basic inputs for the calculation of different inequality indices remain x_i, y_i (the actual values of number of operational land holdings and operated area) or $p_{i,}\ q_i$ (relative respective values). the subscript i (1, 2,... n) denotes the number of size - classes or groups, corresponding to the size of holdings. In case of Atkinson's Index, two more parameters, μ and E, representing respectively the mean area (income or wealth) and the inequality aversion parameter which has been carefully chosen (due to its arbitrariness) to be 1.5. Higher is the value of E, lower becomes the value of Atkinson's measure.

As expected, the percentage number of holdings and the area under the size-class 1 along with the average land holding, has been increasing consistently, respectively upto 30 percent and 100 percent, over the years in all the districts of the state. In size-class II, the increase was upto about 25 percent. In all the other size-classes, both the number as well average area per holding has been decreasing gradually.

From the secondary date of the number of holdings and the operational area for eight census years over a period of 35 years, the three inequality indices, namely Gini, Atkinson Index, Theil (Simple Theil Index, separately for operational holdings and for operational area) along with Decomposable Theil Indices in respect of Between (DTI B) and Within (DTI W), were computed for all the districts of the state of Himachal Pradesh. These are presented in Table I, Table II, Table III and Table IV respectively. The trend of different inequality indices are described as follows.

Gini Coefficient: From **Table I** it became immediately obvious that an overall trend of Gini coefficients over the years from 1970-71 to 2005-06, has been a decline in inequality.

TABLE 1: GINI INDEX

District/Yrs	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Bilaspur	0.4742	0.4369	0.446	0.3447	0.4056	0.4085	0.3917	0.418
Chamba	0.4459	0.4041	0.3957	0.3867	0.3856	0.3677	0.3684	0.2262
Hamirpur	0.5521	0.5298	0.527	0.6824	0.4819	0.4488	0.4572	0.4529
Kangra	0.6457	0.6304	0.5975	0.5344	0.5604	0.523	0.5171	0.5141
Kinnaur	0.507	0.4749	0.4859	0.4943	0.4832	0.5191	0.5086	0.5535
Kullu	0.507	0.4439	0.437	0.4155	0.4217	0.4061	0.3733	0.3636
Lahaul Spiti	0.4461	0.4632	0.4291	0.457	0.4129	0.4154	0.4098	0.4466
Mandi	0.4908	0.2233	0.4568	0.4372	0.4259	0.4368	0.396	0.3894
Shimla	0.5507	0.468	0.6973	0.4969	0.4834	0.474	0.4624	0.4746
Sirmaur	0.5628	0.5593	0.5503	0.5606	0.5586	0.5517	0.5742	0.571
Solan	0.5558	0.4911	0.4848	0.4683	0.4832	0.4842	0.4675	0.4647
Una	0.6636	0.6372	0.6289	0.5968	0.601	0.5803	0.6956	0.5314
H.P.	0.5786	0.5145	0.5076	0.5493	0.5215	0.5046	0.5426	0.4866

However, some strange behaviour was also noticed, like a minimum (~.34) in the year 1985-86 in the district of Bilaspur, sudden decrease in inequality (~.30) after 2000-01 in Chamba, a maximum (~.68) in the year 1985-86 in Hamirpur, a minimum (~.53) in 1985-86 in Kangra, a minimum (~.22) in Mandi in year 1975-76, a maximum (~.70) in 1980-81 in Shimla, a minimum (~.70) in 2000-01 in Una. At the level of the H.P. state, in revealed mild fluctuation in the year 1980-81 and 1995-96 with an overall decline in inequality.

Atkinson's Index (AI): While calculating Atkinson Index, inequality aversion parameter E was carefully chosen to be 1.5. The results are presented in **Table II**, as given below.

TABLE II: ATKINSON'S INDEX

District/Yrs	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Bilaspur	0.7889	0.7563	0.75	0.679	0.6481	0.6267	0.4661	0.5349
Chamba	0.6606	0.6258	0.6082	0.5387	0.4992	0.4631	0.4124	0.3912
Hamirpur	0.8214	0.8275	0.8065	0.9708	0.6945	0.6588	0.6207	0.6094
Kangra	0.8556	0.8275	0.794	0.6936	0.6753	0.623	0.5968	0.5843
Kinnaur	0.8651	0.8233	8174	0.7684	0.766	0/7926	0.7736	0.7803
Kullu	0.5296	0.7033	0.6745	0.5283	0.4544	0.4079	0.2608	0.1774
Lahaul Spiti	0.8621	0.8153	0.8295	0.7964	0.7817	0.7952	0.7703	0.7946
Mandi	0.7371	0.6303	0.7438	0.637	0.5183	0.5469	0.4897	0.4739
Shimla	0.873	0.872	0.8505	0.805	0.7799	0.7621	0.6978	0.6775
Sirmaur	0.9141	0.9351	0.9298	0.9159	0.9095	0.9038	0.9013	0.8945
Solan	0.9133	0.9063	0.8955	0.8633	0.869	0.835	0.8303	0.8945
Una	0.8609	0.8826	0.8656	0.8099	0.83	0.8016	0.9693	0.8195
H.P.	0.8339	0.8244	0.4087	0.8067	0.7283	0.704	0.7353	0.6421

The Table depicts an overall decrease in AI over the eight census years from 1970-71 to 2005-06, differently in different districts. The typical exception was a minimum (~.47) for Bilaspur in the year 2000-01, a minimum (~.97) in Hamirpur for the year 1985-86, a minimum (~.70) in the year 1975-76 for Kullu, a maximum (~.74) in 1980-81 and minimum (~.49) in 2000-01 for Mandi, and finally a maximum (~.97) in 2000-01 for Una. At the state level

an decrease in ineqality was noticed similar to that of Gini coefficient.

Atkinson's Index also reflects the Social Welfare Function (SWF) which can not be achieved by either of the indices. It suggests that the decrease in AI, over the years, same level of social welfare can be obtained with (1-AI)* 100 percent for the total operated land. (Or alternatively, the gains from redistribution to bring about equality is equivalent to raising operational land by (1-AI)* 100 percent. In this way, Atkinson measure provides an index of the potential gains from redistribution.

Theil Index: Theil indices were computed in two diferent ways, as follows:

a. **Simple Theil Index (STI):** Simple Theil Index is obtained separately for the number of holdings and operational area separately for eight census years and given in Table **III.**

TABLE III: SIMPLE THEIL INDICES, THEIL (P) AND THEIL (Q)

Disitrict/Yrs		1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Bilaspur	Theil p	0.1818	0.1879	0.1972	0.2238	0.2482	0.2551	0.2875	0.3217
	Theil q	0.0707	0.0733	0.0758	0.0835	0.0976	0.1011	0.1046	0.1196
Chamba	Theil p	0.2578	0.2575	0.2695	0.3045	0.3259	0.3356	0.3612	0.3736
	Theil q	0.0814	0.1143	0.1247	0.1282	0.1261	0.1433	0.1501	0.2758
Hamirpur	Theil p	0.1764	0.183	0.1916	0.2437	0.2597	0.2613	0.2934	0.2986
	Theil q	0.0296	0.0312	0.034	0.3633	0.0422	0.0529	0.0646	0.069
Kangra	Theil p	0.2434	0.2617	0.2646	0.3061	0.3344	0.342	0.3484	0.3534
	Theil q	0.0142	0.0069	0.0011	0.0114	0.0079	0.0247	0.0315	0.0324
Kinnaur	Theil p	0.1283	0.1468	0.1611	0.2106	0.2044	0.2015	0.2137	0.2224
	Theil q	0.0425	0.037	0.0418	0.0365	0.0466	0.0181	0.0276	0.0173
Kullu	Theil p	0.3584	0.2373	0.2423	0.3176	0.3616	0.3778	0.4219	0.4376
	Theil q	0.0797	0.0773	0.0911	0.1038	0.123	0.1356	0.1633	0.1568
Lahau Spiti	Theil p	0.1294	0.1708	0.1386	0.1759	0.1661	0.1629	0.1726	0.1686
	Theil q	0.0965	0.0817	0.08	0.08	0.0914	0.0932	0.0924	0.0876
Mandi	Theil p	0.2303	0.2031	0.2061	0.2692	0.2952	0.3321	0.332	0.3361
	Theil q	0.071	0.0808	0.0875	0.0988	0.103	0.1158	0.1335	0.1411
Shimla	Theil p	0.1492	0.1045	0.2944	0.182	0.1812	0.2008	0.2445	0.2581
	Theil q	0.047	0.053	0.0577	0.0417	0.0415	0.0465	0.0607	0.0453
Sirmaur	Theil p	0.0946	0.0667	0.072	0.0928	0.1	0.1025	0.1169	0.1279
	Theil q	0.038	0.059	0.0542	0.0415	0.0396	0.371.	0.0371	0.0329
Solan	Theil p	0.1006	0.0788	0.0881	0.1122	0.1183	0.1251	0.1383	0.1487
	Theil q	0.0481	0.0622	0.0609	0.0463	0.0494	0.0502	0.0471	0.049
Una	Theil p	0.254	0.1975	0.2114	0.2491	0.2305	0.2434	0.252	0.2477
	Theil q	0.0233	0.0237	0.0159	0.0028	0.0048	0.0035	0.3054	0.0161
H.P.	Theil p	0.2047	0.1648	0.1749	0.2367	0.254	0.2638	0.2857	0.29
	Theil q	0.0096	0.0119	0.0786	0.047	0.0179	0.0268	0.0574	0.0368

Note: p is the number of holdings and q is the operational area

The above Table suggests on overall increase reflecting a greater concentration in the number of holdings represented by p than those in the area operated represented by q.. the extent of concentration was found enhanced in the former case and declined for the latter. However, a typical behavior was noticed for the district of Kullu in the year 1975-76, with a deep maximum of about, 24 in p, and a glaring maximum, of about. 29 in p, for Shimla in the year 1980-81. In case of opeational area, a sudden increase in q in the district of Chamba was noticed in 2005-06, a maximum of about. 36, for Hamirpur in the year 1985-86, a maximum (-30) for Una in the Year

2000-01 were noted. The results in case of number of holdings are not found in conformity with the Gini coefficients.

b. Decomposable Theil Index (DTI): The values of Decomposable Theil Index corresponding to DTI (Between) and DTI (within) I are presented in Table IV, given below.

TABLE IV: DECOMPOSABLE THEIL INDICES, DTI (BETWEEN) AND DTI (WITHIN)

Districts/Yrs		1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Bilaspur	DTI B	0.1801	0.153	0.1596	0.1029	0.1378	0.1404	0.1462	0.1581
	DTI W	0.1052	0.041	0.043	0.0126	0.0285	0.0289	0.0196	0.0257
Chamba	DTI B	0.1818	0.136	0.1287	0.1325	0.1414	0.1274	0.1387	0.0931
	DTI W	0.0352	0.0312	0.0315	0.021	0.0164	0.0131	0.0101	0.0178
Hamirpur	DTI B	0.2271	0.2345	0.2318	0.553	0.2126	0.1804	0.1911	0.1882
	DTI W	0.0559	0.0586	0.0583	0.4963	0.0357	0.0381	0.082	0.0271
Kangra	DTI B	0.4745	0.4382	0.3638	0.2937	0.3489	0.2832	0.2796	0.281
	DTI W	0.1412	0.1155	0.0771	0.0424	0.0508	0.0362	0.0337	0.0318
Kinnaur	DTI B	0.2117	0.1849	0.196	0.2132	0.1986	0.2656	0.2445	0.291
	DTI W	0.0568	0.0463	0.0484	0.0444	0.044	0.05	0.0463	0.0526
Kullu	DTI B	0.2442	0.1663	0.1586	0.1599	0.1724	0.1654	0.1552	0.1659
	DTI W	0.0416	0.0359	0.0374	0.0227	0.0201	0.0144	0.0006	0.007
Lahaul Spiti	DTI B	0.1595	0.17	0.1467	0.1644	0.1356	0.1358	0.1324	0.1572
	DTI W	0.0534	0.0543	0.0451	0.0518	0.0424	0.0447	0.0414	0499
Mandi	DTI B	0.1995	0.1451	0.1665	0.1618	0.1672	0.2373	0.1439	0.1393
	DTI W	0.0521	0.0247	0.0478	0.0349	0.0309	0.0336	0.0197	0.0193
Shimla	DTI B	0.2466	0.1754	0.4396	0.203	0.1914	0.1876	0.1829	0.2089
	DTI W	0.0771	0.053	0.1313	0.0517	0.0475	0.0429	0.0371	0.0341
Sirmaur	DTI B	0.2731	0.2555	0.2454	0.2585	0.2532	0.2474	0.2745	0.2735
	DTI W	0.0865	0.0943	0.086	0.0864	0.0827	0.0792	0.0864	0.0829
Solan	DTI B	0.251	0.18888	0.1835	0.1734	0.1868	0.1899	0.1763	0.1763
	DTI W	0.0793	0.0645	0.0625	0.0519	0.0559	0.0563	0.0485	0.0471
Una	DTI B	0.4444	0.377	0.3685	0.3417	0.3383	0.3173	0.574	0.2559
	DTI W	0.1415	0.1199	0.1073	0.0789	0.0823	0.0696	0.4686	0.0502
H.P.	DTI B	0.3144	0.2592	0.2136	0.2639	0.2552	0.2373	0.2702	0.2303
	DTI W	0.071	0.0564	0.0716	0.0743	0.0438	0.0386	0.0718	0.03

The results are found consistent with the Gini's indices. Further, the decomposition of the inequality measure revealed that Inter-group (or Between) inequality is much greater than that obtained for the Intra-group (or Within) inequality. Both the types of inequality showed a declining trend, with some exceptions which are in Kinnaur and Solan in the year 2005-06. It is bound to suggest that inequality showed a declining trend, with some exceptions which are in Kinnaur and Solan in the year 2005-06. It is bound to suggest that inequality in the distribution among five class sizes has become less inequitous.

It may be pointed out that the sudden variations increase or decrease (maxima or minima) in the inequality index, in a particular year, in different districts is supposed to be due to some socio-economic dynamic phenomena affecting the operational holdings in that year. The sudden variation may be understood within the framework of Kuznets (1955) between inequality and growth which tells about the phenomenon of workers migrating from agriculture to industry; and/or rural workers moved to urban jobs so as to exhibit large growth in income due to of the fragmentation of the land holdings and hardly any variation in the agricultural income. Obviously, as economies experienced growth, it gets reflected in mass education providing greater opportunities and thus decreasing the inequality and the lower income portion of the population gaining political power to change governmental policies.

It may be pertinent to point out that district-wise inequality should be judged year wise. The inequalities in different districts in any of the years are found to be different. As such, one has to be cautious while arriving at some definite conclusion in respect of comparison of inequalities belong to differnet districts, as their geographical and socio-economic (benefits and subsidies) and topological (hilly terrian) conditions were supposed to be altogether different.

Conclusions

The main conclusions of the paper are given below:

- All the three types of measures obtained in this paper indicated more or less similar trend in inequality in land holdings with different values. However, the entropy based indices are found to be more reliable in predicting the inequality.
- The pattern of variation in the operational holdings and the area, over the eight census years, has been increased only under marginal holdings in all the districts and overall in the state. It may be attributed to implementation of the land reforms legislation, subdivision of large holdings as a result of inheritance. However, the increase in operational area is comparatively more than that for operational holdings, which may be attributed to some extent to marginal farmers leaving their marginal holdings while migrating to towns/cities, to get engaged in better occupation.
- All the indices effectively show a declining trend in the degree of inequality over the period of eight census years, suggesting an improvement in the distribution of operational holdings, reflecting overall growth of the state on the agricultural front.
- Sudden increase/decrease in inequality measures around a particular year seems directly related with the land reforms in respect of land distribution brought out by the Government from time to time, and further motivation to undertake the cultivation of cash crops of vegetables/fruits, forces induced by technical knowhow and technology and also industrialization (in the context of Kuznet's observation). However, it may be difficult to visualize it at the quantitative level. But certainly, the state intervention has played a definite role in bringing the decline in inequalities in all the districts, generating additional employment in agriculture directly/indirectly, improving the social efficiency in respect of agriculturists. Not only that, small farms (marginal and small farms) started to appear more productive per unit of land and capital by maximizing returns to appear more productive per unit of land and capital by maximizing returns to scarce resources.
- The above results suggest that the distribution of operational holdings in the state of Himachal Pradesh is inequitous and skewed.
- Interestingly, the state of Himachal Pradesh is in a better shape as compared to others, mainly due to better education (status is number one in the country) irrespective of any biases (cast and gender) and successful welfare schemes implemented by the government and their better management.
- Nevertheless, one should strive for an inclusive growth of the state and the country, by focusing on the rapid expansion of opportunities and ensuring equitous access. At the same time the Government should also ensure, as a matter of policy, that subdivision of the land beyond a particular limit is not allowed in view of the sustainability of a family.

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Agro-economic Research

Spread of New Varieties of Hybrid Rice and its Impact on the Overall Production and Productivity in Tamil Nadu*

Introduction

Food production plays a crucial role in the economic development as well as human development of the nation. It is one of the important ingredients of food security mission. Focus on food security has been consistently growing during the last three decades. Nowadays, food security is one of the main themes and it is abundantly recognized in the world. Rapid economic growth of a nation should be concerned with food security and its impact on human welfare and socio-political stability. Despite some success in addressing food production shortfalls in South Asian countries, India continues to have the largest number of people suffering from poverty and malnutrition. Food production in the region is just enough for the increasing population. Foodgrain availability in India covered 170 kilograms per person in 1960s and it has witnessed therefold increase in most of the 21st century (DES, 2011).

The technological innovation in agricultural production plays pivotal role in ensuring food security in the world. Many challenges are faced by agriculture due to land and water scarcity and pressure on natural resources. In India, the government is facing great challenges in ensuring food security for its people in the near future. The Intergovernmental Panel on Climate Change Report estimated that the agricultural yield will be reduced by 30-40 percent in 2050 due to weather conditions in the world. India has been identified as a major risk zone with increase in drought prone area due to adverse impact of climate change (Hindustan Times, 2008). Therefore, India needs to find new varieties for human survival. Indian agricultural scientists have introduced a number of hybrid varieties of different crops in the last two decades. If India had not to adopted hybrid varieties, it would have faced food crisis now and in future.

Hybrid rice is one of the important varieties for the food security and agriculture development in the World and India. Hybrid rice varieties have not reached most of the poorest households in India even after two decades of their introduction. There is slow development in the area and production of hybrid rice among various states in India. There are challenges regarding development of hybrid rice seeds in terms of ensuring the production of adequate quantity of high quality hybrid rice seeds that are resistant to pests, diseases and tolerant against abiotic stresses and aesthetic consideration of consumers. In terms of adoption of hybrid rice technology, regions that are traditional rice growing regions have not showed interest in hybrid rice technology preferring to continue the HYV rice varieties for a variety of reasons including lack of demand from consumers because of their cultural preferences regarding the qualities associated with cooked rice.

1.1. Background of the Study

Hybrid rice technology is likely to play a key role in increasing the rice production. During the year 2008, hybrid rice with planted in an area of 1.4 m.ha. and an additional rice production of 1.5 to 2.5 million tonnes was added to our food basket through this technology. More than 80 percent of the total hybrid rice area is in eastern Indian states like Uttar Pradesh, Jharkhand, Bihar, Chhattisgarh, with some little area in states like Madhya Pradesh, Assam, Punjab and Haryana. As rice is a key source of livelihood in eastern India, a considerable increase in yield through this technology has a major impact on household food and nutritional security, income generation , besides an economic impact in the region. In view of this, hybrid rice has been identified as one of the components under the National Food Security Mission (NFSM) launched by the Government of India (GOI). The approach is to bridge the yield gap in respect of rice through dissemination of improved technology and farm management practices.

1.2 Objectives of the Study

- To indicate the extent of adoption and the level of participation by the different categories of farmers in the cultivation of hybrid rice.
- To assesses of overall impact of hybrid rice cultivation on rice production and productivity in Tamil Nadu.
- To study the economics of cultivation of hybrid rice varieties versus HYVs in Tamil Nadu.
- To identify factors determining the adoption of hybrid rice varieties in Tamil Nadu.
- To address various constraints and outline the prospects for increasing hybrid rice cultivation; and

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- To suggest policy measures for expansion of hybrid rice cultivation.

1.3 Data base and Research Methodology

Primary data has been collected from two districts namely Nagapattinam and Tiruvarur of Tamil Nadu. In each of the districts of Nagapattinam and Tiruvarur, two representative blocks namely Kuttalam, Mayladuthurai, Needamangalam and Valangaiman are taken respectively and within each block two villages are selected. In each district, 40 hybrid rice growers from the list of hybrid rice growing cultivators are drawn at random from household farmers on the basis of their proportion in the universe. In addition to the above sample, conventional 10 HYV rice growers but non-adopters of hybrid rice are selected randomly from households with different land sizes amongst HYV rice growing cultivators following the same method. Thus, altogether, 50 rice growing cultivators are selected from each district (Tiruvarur and Nagapattinam). In all, 100 rice growing cultivators among two districts from the selected sample size in the study.

For the primary survey, the reference years are 2009-10 and 2010-11. Accordingly, two kharif seasons and two rabi seasons for the rice crop are covered in the study. It can be observed that the majority of the farmers fall in the small farmers' category (35 percent) and large farmers (29 percent). The percentage of farmers in medium and marginal size is 23 percent and 13 percent respectively. About 100 sample households have been chosen from eight villages in the four blocks of Nagapattinam and Thiruvarur districts of Tamil Nadu at the rate of two villages in a block and two blocks from each district on the basis of official list. From each village, 20 sample farmers and 5 sample farmers are selected based on hybrid adopters and non-adopters basis respectively based on the official list in a particular village.

1.4 Major Findings

2. Growth of Rice Cultivation in Tamil Nadu

The area under rice cultivation expanded from 16.96 lakh ha (74.91 percent) to 17.55 lakh ha (76.12 percent) during pre-hybrid rice period for winter season. It increased to 14.44 lakh ha during second post-hybrid period upto 2011-12. The area declined to 2.52 lakh ha during thre decades due to urbanization, real estate and non-cultivable area in Tamil Nadu. The production of rice increased from 38.91 lakh tonnes to 50.14 lakh tonnes during pre-hybrid period. During post-hybrid period, it declined to 36.28 lakh tonnes but increased to 83.88 lakh tonnes in 2011-12. Production of rice increased by 44.97 lakh tonnes during three decades due to increase in yield of rice, advanced technology used in the cultivation and favourable monsoon.

A comparative analysis of the three seasons in Tamil Nadu shows that, the winter season makes the most predominant contribution in area and production of rice during three decades. The majority of the farmers cultivated rice during the winter season due to favourable climatic conditions. The autumn season contributed more than the summer season. The average yield rate of rice per hectare during autumn season is more than in winter summer seasons in all the pre-and post-hybrid periods. During the autumn season, yield rate increased from 2741 kg./ha. to 3440 kg./ha. during pre-hybrid period, but it first declined to 3240 kg./ha. and again increased to 6186 kg./ha. during post-hybrid rice period. During summer season, the average yield rate increased from 2462 kg./ha. to 2809 kg./ha. during pre-hybrid rice period, whereas in post-hybrid rice period, the yield increased further to 3071 kg./ha. during the first phase and 5836 kg./ha. during the second phase.

2.1 Trend and Composition of Hybrid Rice in Tamil Nadu

The area under hybrid rice cultivation in total area of rice in Tamil Nadu increased to 0.59 percent in 2011-12 against 0.06 percent in 2006-07. It is expanded by 0.53 percent between 2006-07 to 2011-12. It also means in a way that the state has not evinced much interest in hybrid rice technology. Tamil Nadu had only less than one percent of total area under hybrid rice cultivation compared to all-India percentage of 3.5 percent. The state could not adopt the hybrid rice technology even after two decades. The technology did not spread to many districts of Tamil Nadu in a big way.

The area expanded under hybrid rice cultivation was only 0.01 percent: Thiruvarur (266 ha.), Kancheepuram (248 ha.), Theni (173 ha.), Thanjavur (116 ha.) and Perambalur (100 ha.). The percentage share of hybrid rice in total area under rice recorded the highest percentage (0.28 percent) in Thiruvarur (5330 ha.), followed by Theni (1618 ha.) with 0.08 percent and Pudukkottai (1494 ha.) with 0.08 percent, Cuddalore (1250 ha.) with 0.07 percent during 2011-12.

The lowest share was recorded by Erode (4.38 ha.) at 0.0002 percent. Districts like Kancheepuram, Perambalur and Thanjavur stopped cultivating hybrid rice during 2011-12. Many districts adopted hybrid rice varieties only to a small extent. Even today some of the districts in Tamil Nadu like Thiruvallur, Karur, Dindugal, and Kanniyakumari did not adopt the hybrid rice technology, mainly because of lack of awareness among the farmers, small amount of availability hybrid seeds, technical problems, and high cost of cultivation and absence of enthusiasm from government.

2.2 Growth and Instability of Rice Production in Tamil Nadu

It is observed that the growth trends in rice production were significantly higher in second post-introduction period of hybrid rice than in the pre-introduction period of hybrid rice. Rice production during second post-hybrid rice period

was the highest at 10.55 percent than the yield in the pre-introduction period (2.57 percent). The average highest yield of rice was 10.32 percent during second post-hybrid rice period and 2.36 percent during pre-introduction period. The area, production and productivity were exhibiting negative trends during first post-hybrid rice period largely due to *Tsunami, Thana effect* and drought.

At the aggregate level, the area increased marginally from 0.20 percent in pre-introduction phase to 0.21 percent during the second post-introduction period, but declined to –4.57 percent during the first post-introduction period. Production increased to 10.55 percent during 2004-05 to 2011-12 against 2.57 percent during 1985-86 to 2003-04, but it declined to –8.17 percent during 1993-94 to 2003-04. The yield of rice increased to 10.32 percent during second post-introduction period from 2.36 percent during pre-introduction period. But during the first phase of post-introduction period, it witnessed a negative trend (–3.78 percent).

A comparative study of the three seasons (autumn, winter and summer) shows that the area under rice cultivation witnessed a declining trend from 0.58 percent during autumn to –0.59 percent in winter and –2.99 percent in summer. Production, however, witnessed a positive but declining trend with3.66 percent, 2.89 percent and 0.16 percent during autumn, winter and summer seasons respectively. The average yield rate of rice was 3.06 percent, 3.50 percent and 3.25 percent, respectively during those three seasons.

2.3 Growth of High Yielding Varieties of Rice (HYVs) in Tamil Nadu

The majority of the farmers have adopted the HYV technology but the hybrid rice technology did not spread to even one percent level in Tamil Nadu. Farmers in many districts are ignorant about the hybrid rice technology even after two decades. Area under the HYV seeds are negatively related with almost all the seasons like autumn, winter and summer during both the study periods of 1995-96 to 2003-04 and 2004-05 to 2009-10. The area under cultivation has declined due to urbanization and industrialization and become non-cultivable land in Tamil Nadu during the past two decades.

The winter season witnessed a better growth than during autumn and summer seasons. Within the winter season, the second post-hybrid rice period witnessed a constant growth of 5.25 percent than the first post-hybrid rice period of 1995-96 to 2003-04 (13.74 percent). When we look at the post-hybrid rice period, the area under HYV rice for winter and autumn seasons is more stable with co-efficient of variation of 5.25 and 9.45 respectively during 2004-05 to 2009-10 than the co-efficient of variation of 13.72 and 23.38 respectively during 1995-96 to 2003-04 period. The area under winter season witnessed steady growth with a co-efficient of variation of 11.16 during 1995-96 to 2009-10 when compared with autumn (20.03 co-efficient of variation) and summer season (32.47 co-efficient of variation).

3. Status of Adoption of Hybrid Rice at the Farm Level

3.1 Sample Farmers and their Distribution According to Farm Size

Among the hybrid adopters, the small (33.75 percent) and large landholders (32.50 percent) are very much interested to adopt hybrid rice cultivation techniques. Both types of farmers have occupied two-thirds of hybrid rice cultivation area. On the contrary, the marginal farmers represent only 9.0 percent. It is observed that small and large farmers are adopting hybrid rice technology as their land size is quite enough to implement the technology. Further, the small and large farmers are able to cope with new technology, which involves high cost of operation, whereas, significant proportion of marginal farmers are unable to emulate the technology because of high cost and small landholdings. In the case of non-adopters, they prefer to adopt HYV rice cultivation as it requires low cost of cultivation. Further, they are continuously cultivating with the same traditional technology given their knowhow in the HYV cultivation technique.

3.2 Socio-economic Characteristics

About 92.50 percent of the sample hybrid rice cultivators fall in the age group of 19-60 years, whereas 85 percent of non-adopters are found in the same category. Only 5 percent of the hybrid farmers are found in the age group of above 60 years, while 10 percent of the non-adopters are in the same category. About 85 percent are having primary to graduate level of education among hybrid adopters and non-adopters. The education levels of the sample farmers helped them adopt the hybrid rice cultivation technology. Even though, the numbers of educated farmers are high, they could not adopt the hybrid rice technology frequently due to constraints like inadequate supply of seeds in the study area and lack of adequate government support.

It is found that nearly 88 percent of hybrid adopters and 95 percent of non-adopters belonged to Other Backward Castes (OBC). A meagre percentage of SC farmers were hybrid adopters (12.50 percent) and non-adopters (5 percent). In the study area, the majority of the lands are held by Vanniyar, Kallar and Thever communities who belonged to the OBC category.

The total gross cropped area declined from 698.85 ha. in 2009-10 to 609.68 ha. in 2010-11 among hybrid rice adopters and it has increased from 76.43 ha. to 78.85 ha. for the non-adopters. During the kharif season, the share of hybrid rice cultivation in the gross cropped area has increased from 2.43 percent in 2009-10 to 3.58 percent in 2010-11, whereas it has increased from 1.74 percent to

3.78 percent during rabi season. During rabi season, the share of HYV rice in the gross cropped area increased from 35.59 percent to 38.60 percent.

The share of cultivated area of HYV rice declined due to excessive utilization of land. It indicates that hybrid rice was mainly cultivated in the study area during kharif and rabi seasons alone and not during the summer season due to lack of availability of seeds and diversification of cropping pattern from paddy to pulses in the study area. The highest share of pulses in gross cropped area declined to 11.04 percent in 2010-11 from 16.35 percent in 2009-10 during summer season.

Among non-adopters, the percentage share of HYV rice increased from 2.65 percent in 2009-10 to 5.13 percent in 2010-11 during summer season. A majority of them were cultivating the HYV rice instead of hybrid rice varieties due to unawareness of the scheme and high intensive technology needed. It indicates that the majority of the sample farmers cultivated hybrid rice varieties within a variation ranging from 2 percent to 4 percent during reference period of study.

3.4 Area Coverage of Adoption of Hybrid Rice by the Farm Households

The average area for paddy cultivation has declined marginally from 3.19 ha. in 2009-10 to 2.88 ha. in 2010-11. Similarly, the HYV rice cultivation area has also declined from 89.34 percent (2.85 ha.) in 2009-10 to 85.42 percent (2.46 ha.) in 2010-11. On the contrary, the area under hybrid rice cultivation has increased from 10.66 percent (0.34 ha.) to 14.58 percent (0.42 ha.) between the two reference periods. The hybrid rice cultivation area had increased marginally (4 percent). It has ranged from 0.24 ha. to 0.42 ha. across the different sizes of the farm holdings during 2009-10 and the same has ranged between 0.37 ha. and 0.52 ha. during 2010-11 marking a slight increase.

There is a considerable change observed among the small, medium and large farmers with respect to the area under cultivation. The shift is sharp in the case of small farmers recording an increase from 14.28 percent to 23.53 percent of the area. The farmers are ready to diversify farm lands for the cultivation of HYV rice than hybrid rice varieties due to easy availability of seeds, well known technology and conventional farming technique. But, the hybrid rice cultivation involves high cost of operation, inadequate seed supply and one-time seed usage and unknown technology.

3.5 Access to Hybrid Rice Technology

About 86.25 percent reported that they have participated in the frontline demonstration programme conducted by the government. About 82.50 percent reported that they have participated in training programme organized by the government; 77.50 percent farmers came to know about hybrid rice technology through extension workers. The farmers are informed about the technology by the agricultural department officers who visited the villages. The agriculture officer coud not solve the problems relating to distribution of hybrid rice seeds due to limited material available.

About 63 percent of the hybrid rice adopters have gathered information through the training programme conducted by the government; 62 percent have reported that they received information from the extension workers of the agriculture department, state government and demonstration programme conducted by the government of Tamil Nadu. The number of beneficiaries of hybrid rice seeds received from the government has declined from 100 percent in 2009-10 to 98.63 percent in 2010-11 on full subsidy basis. Regarding hybrid rice seed sales, government has the monopoly in the study area. The government officials provide hybrid seeds to selected farmers based on their socio-economic status and land holding status.

3.6 Determinants of Participation in Hybrid Rice Cultivation

The coefficient results indicate that the farm size (medium size) is an important variable in adopting the hybrid rice technology, which is significant at 10 percent level. Age factors and household size of the hybrid rice adopters are also positively related but the results were insignificant. On the contrary, education and size of workers are negatively related with participation in hybrid rice adoption. The family and hired labour are inadequate in the field because of government schemes (MGNREGS) and due to the relatively higher wage rates in the urban areas. Educated youth are not entering into the farm cultivation, because they think that it is beneath their dignity.

4. Impact of Hybrid Rice Cultivation on Overall Production

Even after two decades from the introduction of the hybrid rice cultivation in 1994, it had not spread widely in all states of India due to various constraints such as technological unawareness among the farmers, high cost of cultivation, high seed cost and one time use of seed. However, the area of hybrid rice to total rice area has increased from 0.39 percent in 2000 to 3.2 percent in 2008. It indicates that the hybrid rice technology has not reached the core farmers as compared to other commercial crops. The majority of farmers are dropping out of the hybrid rice cultivation because of low market price, high cost of cultivation, high cropping time, hybrid rice not being accepted by the traders, low seed quality, one time usage of seed.

4.1 Productivity Performance of Hybrid Rice and HYV Rice

The average yield rate of hybrid rice adopters is better than HYV rice cultivators during 2009-10 and 2010-11. It is

found to be 7021 kg/ha. And for HYV rice adopters, it is 5615 kg/ha. This shows that the hybrid rice adopters have achieved 25.04 percent additional yield rate over the high yielding rice adopters during 2009-10. During 2010-11, the hybrid rice adopters have recorded high yield of 7133 kg/ha. than high yielding rice cultivators (5872 kg/ha). The average hybrid rice yield rate had increased (21.48 percent) significantly over the high yielding rice varieties during 2010-11. But, the average yield rate of hybrid rice has declined marginally from 25.04 percent to 21.48 percent.

The yield performance of hybrid rice improved from 7021 kg/ha. in 2009-10 to 7133 kg/ha. in 2010-11. Yield performance of HYV rice also increased from 5615 kg/ha to 5872 kg/ha. Among different farm households, hybrid rice yield was better than high yielding rice varieties in both the years. The small and large size of sample farmers has obtained the highest yield among hybrid rice adopters in both the years. The large and the marginal farmers obtained the highest yield among high yielding rice cultivators in both the years.

4.2 Factors Affecting Productivity

There is a significant relationship between manure, seeds, human and mechanized labour and they are positively related with productivity of hybrid rice cultivation. The variables like seed, manure, human labour and mechanized labour are very supportive to the farmers for cultivation of hybrid rice in the study area. Seeds are one of the main deciding factors in the hybrid rice production. Supplying seeds at zero cost is very effective and welcomed by the farmers in both the study areas.Ironically, other variables such as fertilizers, irrigation, and pesticides are negatively related to the production of hybrid rice cultivation. Irrigation is also one of the main factors in determining the production and scarcity of water affects the agricultural production severely due to salt content. Therefore, the production of paddy is badly affected, and declined. The authorities may have to take measures to rectify the problems.

There exists a positive relationship between production and manure and human labour. The natural manure and human labour are among the most important determinat factors in the adoption of HYV rice cultivation. Since seeds are available at zero cost, the farmers are happy to use them as required for cultivation. On the contrary, there is a negative relationship between production and fertilisers, irrigation, machanized labour and plant protection.

There is a positive relationship between production and fertilizers among hybrid adopters and non-adopters. The fitted model explained 90 percent of the variation in the yield of high yielding varieties of rice in the study area. On the contrary, a majority of farmers are using the manure with high cost; irrigation is a major problem faced by the farmers as they rely on river water rather than ground water. It is found that the seeds are having germination problem to the high yielding rice cultivators; as they are available at zero cost, they have been used continuously. The price of pesticides is higher in the study area and not only that, sometimes, the pesticides are hoarded for speculative motive and artificial scarcity is created in order to increase the price and to make abnormal profits. Therefore, the price and paucity in the supply of pesticides affect the production of paddy in the study area.

5. Comparative Economics of Hybrid Rice and HYV Rice Cultivation

5.1 Input Use Pattern for Cultivation of Hybrid and HYV Rice

Seeds utilized by HYV and hybrid adopters are 82.68 kg/ha and 12.78 kg/ha. respectively. HYV rice adopters utilized more seeds than the hybrid adopters due to non-availability of hybrid seeds and the cost of seeds also inhibited them to procure more hybrid seeds. The majority of the hybrid rice adopters used more pesticides (6.35 time of spray) than HYV rice cultivators. The human labour utilized by hybrid rice adopters was higher than that of HYV rice adopters.

The hubrid adopters used more chemical fertilizers (535 kg/ha) than HYV rice cultivators (279.37 kg/ha). It may be noted that the majority of hybrid rice adopters used more inputs than HYV rice cultivators except seeds; the hybrid adopters are supposed to pay more surveillance than the HYV adopters which cost more human days as well as money. It could be observed that wide variations are there in the inputs like seeds, manure, fertilizers, pesticides, irrigation and human labour among hybrid rice adopters and non-adopters. The farmers are having lack of technical knowledge to adopt the hybrid rice technology in the farm. Therefore, the hybrid rice adopters hesitate to cultivate the hybrid seeds.

The average number of sprays used by hybrid rice adopters (165.7 days) is higher than HYV rice cultivators (129.08 days). The total inputs required for the hybrid rice adopters are significantly higher than high yielding rice cultivators except seeds. The hybrid rice adopters have invested more in organic manures, chemical fertilizers, plant protection, and machinery than high yielding variety rice cultivators.

5.2 Operation-wise Labour Absorption in Hybrid Rice and HYV Rice Cultivation

The hybrid rice adopters used more human labour (165.70 days/ha) while HYV rice adopters used lesser amount of labour (129.08 days/ha). More man- days of human labour are used for uprooting of seedlings, harvesting, and post-harvesting by hybrid rice adopters than by HYV rice adopters. The average total man-days for hybrid rice adopters is higher than those for HYV rice cultivation. Specificially higher man-days of labour are used for

uprooting of seeds, harvesting and post-harvesting by hybrid rice adopters than higher yielding rice cultivators.

The average man-days of female labour used by high yielding rice adopters is 59 days, whereas the hybrid rice adopters used 47 days of female labour. The number of man-days of female labour used for uprooting of seedling by hybrid rice adaptors was higher than that of the high yielding rice cultivators. The man-days used for harvesting and post-harvesting by high yielding rice cultivators (24 days) are more than those used by hybrid rice adopters (21 days). The majority of female labour could not participate in the work of manuring, application of chemical fertilizers and spraying plant protection chemicals.

5.3 Cost of Inputs for Hybrid and HYV Rice Cultivation

The labour cost alone accounted for about 45.56 percent and 50.84 percent of the total cost for hybrid frice adopters and HYV rice cultivators, respectively. The cost of machinery charges is 15.96 percent and 15.08 percent of total cost, respectively for hyhbrid and HYV rice adopters. The costs of chemical fertilizers are 10.33 percent and 10.64 percent, respetively. The cost of cultivation per hectare of hybrid rice adopters and HYV rice cultivators are more or less the same (48-50 percent).

The highest average cost of cultivation for hybrid rice adopters worked out to Rsl. 30,298/- per ha, while for HYV rice it was Rs. 27,550/- per ha during 2009-10. The farmers growing hybrid rice realized a gross return of Rs. 70,523/- per ha.

While the gross return realized for HYV rice varieties was Rs. 61,403/- per ha. As a result, the gross return received by hybrid rice cultivators is 12.94 percent higher than that of the HYV rice cultivators. The average yield of hybrid rice is 70.20 quintal/ha, while that of high yielding rice is 56.62 quintal/ha during 2009-10. It is observed that the there was signifcant yield gain from hybrid rice than high yielding rice in the study area. It is reported that the hybrid rice cultivation had a yield advantage of 13 percent among hybrid rice adopters over that of HYV rice adopters.

The average market price received by the hybrid rice adopters and HYV rice cultivators is about Rs. 935.61/- and Rs. 939.13/- per quitnal. There is no significant variation in price received by the farmers who cultivate hybrid rice and high yielding rice. This is attributed to the traders, who did not favour the product of hybrid rice variety. The traders do not quote a separate price for hybrid rice adopters, because, both the hybrid rice and the HYV rice varietities are getting the same market price from the Government Procurement Centres and private agents. Hybrid rice adopters could not received higher price at the Government Procurement Centre.

The cost of cultivation for hybrid rice adopters is Rs. 30,275 per ha, which is higher than that of HYV cultivators at Rs. 27,049 per ha. It is noted that the hybrid rice adopters have spent more money during the cultivation due to the higher cost of seeds, machinery and labour compared to HYV rice cultivators. The labour cost alone accounted for about 45.29 percent and 53.64 percent of total cost respectively for hybrid and HYV rice cultivators. The cost of machinery charges are 15.0 percent and 12.19 percent of the total cost respectively for hybridf and high yielding rice adopters. The cost of chemical fertilizers is about 12.43 percent for hybrid rice adopters and 11.82 percent for non-adopters.

The farmers growing hybrid rice realized a gross return of Rs. 75,985/- per ha, while the gross return realized in HYV rice varieties is Rs. 62,698/- per ha. Thus, the gross return received from hybrid rice is 17.48 percent higher than that of the high yielding rice. The results indicate that the average yield of hybrid rice is 71.33 quintal/ha, while that of HYV rice is 58.29 quintal/ha during 2010.11.

During 2010-11, the average market price received by the hybrid rice adopters and HYV cultivators is about Rs. 994/- and Rs. 997/- per quintal, respectively. The there is no significant variation in price received by the farmers for hybrid and HYV rice in 2010-11. As noted already, both the public Procurement Centre and private marketing agents perceive that there is no variation among the hybrid and HYV in terms of quality. Therefore, they pay more or less the same price for both the varieties.

6. Grain Quality and Marketing Aspects

6.1 The Volume of Marketing

The hybrid rice output was 93.79 percent; it was 95.64 percent for HYV rice cultivators during 2009-10. The average market price received by the sample farmers is about Rs. 890 per quintal for HYV rice cultivators. Price for HYV rice received by the sample farmers is about Rs. 892/- per quintal. It was about to Rs. 972/- per quintal for hybrid rice adopters.

The hybrid rice adopters have sold 93.79 percent of their output in 2009-10 and it has increased to 94.15 percent in 2010-11, whereas the output sold by HYV rice cultivators has slightly declined from 95.64 percent to 94.78 percent between 2009-10 and 2010-11. Among non-adopters, the average HYV rice output sold declined from 95.68 percent in 2009-10 to 95.36 percent in 2010-11. The output of HYV rice sold has varied from 93 percent to 96 percent among different farm size holdings. A majority of the farmers in the study area sell almost 95 percent of their output due to urgent need for money and settlement of loans borrowed.

The average price received for hybrid paddy increased from Rs. 972 per quintal in 2009-10 to Rs. 1060.52 per quintal in 2010-11, whereas for HYV rice variety, the average market price increased from Rs. 892 per quintal to Rs. 1048 per quintal during the same period. The demand

for paddy increased during those periods due to inflationary trends and bad economic conditions. Among non-adopting sample farmers, the average market price for HYV rice increased from Rs. 890 to Rs. 986 per quintal.

6.2 Seasonal Flow of Marketing

Hybrid adopters sold relatively greater proportion of paddy output immediately after the harvest in the months of August and September, During 2009-10, the highest proportion of paddy sold was in the month of January during Kharif season (21.04 percent) and October during Rabi season (22.65 percent) by hybrid-adopters. Among the hybrid rice adopters, the highest proportion of sale for HYVs is in the month of March during Kharif season (24.65 percent) and October for Rabi season (23.15 percent).

A majority of the farmers' hybrid rice adopters and HYV rice cultivators sell their produce in the month of August and September during kharif season. A majority of them sell their produce immediately after harvest not only due to urgent need for money but also to avoid weight loss if the produce is kept for a longer period and majority of the Government Procurement Centres during these months work for the welfare of the farmers.

During 2010-11, the highest proportion of sale was in the month March for Kharif season (20.71 percent) and October for Rabi season (19.51 percent) for HYV rice. A majority of them reported that they sell their paddy during kharif and rabi seasons and they also reported that they cultivate alternative crops during summer season. Among non-adopters, the highest proportion of sale of HYV rice is in the months of March (25.89 percent) and October (22.74 percent) for kharif and rabi seasons, respectively. It is noted that the majority of the sample farmers sell their paddy immediately after the harvest. They sell their produce both in the Government Procurement Centres and to the private agencies.

7. Problems and Prospects for Increasing Hybrid Rice Cultivation

7.1 Farmers' Awareness about Adoption of Hybrid Rice Technology

In Tamil Nadu, farmers were aware of hybrid rice technology, but they were hesitant to adopt the same as resources were inadequate. Nearly 99 percent got the information from the training programmes, around 45 percent stated that frontline demonstration technique is a better format and 98 percent reported that the training programmes were considered as vital and had close proximity towards generating awareness about the hybrid rice cultivation technique among the farmers in the study area.

With respect to the popular varieties of hybrid rice, about 80 percent reported that KRH-2 is a popular variety in the study area in which 80 percent reported hybrid rice got more yield over HYV rice. KRH was popular among 20 percent of the samle farmers with 70 percent of yield advantage over HYV rice. A major chunk of the respondents have got awareness about the adoption of hybrid rice technology through government training programmes organized in the study area.

7.2 Problems Faced by the Sample Farmers Relating to Input use, Production and Marketing

About 65 percent reported that they get hybrid seeds in time during planting season. About 35 percent reported that they received the hybrid seeds at reasonable price. It is noteworthy to highlight that cost of HYV seeds is much less than the cost of hybrid seeds in the market.

In the case of quality of hybrid seeds, majority of the respondents (71 percent) expressed dissatisfaction over the quality of hybrid seeds provided by the government. The majority of them reported that poor germination of the seed is an important factor affecting yield gain to the farmers. The majority of the hybrid seed producing companies are in the private sector. They do not care about preservation of quality or seed germination. Availability and accessibility of the seeds at the right time is another constraint as 66 percent of the sample farmers reported that accessibility is the major constraint due to inadequate possession of the seeds by the agricultural department. As far as yield advantage is concerned, a majority of respondents (76.20 percent) reported that the yield gain of hybrid rice is better than HYV rice. This shows that they have better experience, and better yield gain than HYV rice and they feel satisfied with adoption of hybrid rice technology. About 34.40 percent and 33 percent of the sample farmers reported that they receive more yield gain of 10-15 percent and 15-20 percent over HYV rice. Regarding the frequency of replacing hybrid seed, 79 percent of hybrid adopters indicate that they replace hybrid seed every year, while 21 percent reported replacing seeds variety every alternate year.

Hybrid seed can be used only one time, while HYV seeds can be used from the produce after each harvest. The agriculture department is providing the hybrid seed only to the select farmers in a village due to inadequate supply. The sample farmers reported that yield gain of hybrid rice was better than HYV rice. The average yield of hybrid rice is 12-15 percent higher tham that of the HYV rice. The majority of them feel that the hybrid seed cost is very high in the market.

Nearly 97.5 percent used chemical fertilizers, 67.5 percent received the assistance from institutional bodies about the usage of fertilizers out of which 62.5 percent followed the recommendations and 37.5 percent didn't follow due to lack of awareness and the financial constraints. With regard to the source of availability of the fertilizers, around 55 percent accessed through government agency and 45 percent brought them from private market.

The proportional usage of fertilizers among hybrid and HYV rice cultivators show that generally hybrid rice adopters use more fertilizers than HYV rice cultivators. A majority of them (73 percent) reported that hybrid rice adopters utilized additional fertilizers than that of HYV rice cultivators. It is noted that the hybrid rice adopters used more fertilizers than the farmers using HYV rice varieties due to superior yield and minimal damage to crop because of pests and diseases.

About 83 percent reported that their crops have been directly attacked by pests and diseases. A majority of them (83 percent) reported that they have applied pesticides to control pests and diseases. Regarding the easy availability of pesticides, 80 percent reported that they easily get the pesticides in the market. About 96 percent reported that they have used pesticides in correct doses for the plant protection. A majority of them (95 percent) reported that hybrid rice varieties are more susceptible to pests and diseases and they spread through air from neighbouring farms.

HYV rice adopters were more aware about the use of pesticides than hybrid rice adopters due to new arrival in the farm. About 76 percent noted that their ideas about hybrid rice cultivation are highly sensitive to crop management practices-use of key inputs and time bound operations. Thus, the hybrid rice adopters should follow the recommendations of the agricultural scientists and agricultural officials of the Government.

About 31.20 percent are in need of more credit for using hybrid seeds. About 38 percent obtain credit from commercial banks or co-operative banks. The majority of sample farmers (58 percent) receive credit from co-operative banks as they are located nearby and also easily accessible. A majority (71.20 percent) of the farmers have reported that banking institutions take a long-time for providing credit facilities. It is noted that hybrid rice adopters need more money than HYV rice cultivators as the cost of cultivation of hybrid rice is relatively higher than that of the HYV rice.

About 98 percent reported that they face problems relating to marketing of hybrid rice. Traders did not accept the hybrid rice on par with HYV rice in the market. Demand for the hybrid rice is relatively low in the market and they discourage these varieties by offering low price. Lower price is the major challenge the farmers are facing in selling the hybrid variety. The other perceptions prevailing about the hybrid varieties include lack of consumer demand for these varieties, poor cooking and preservation and getting broken the milling stage. All these together push the price of hybrid varieties southward.

7.3 Farmers' Perceptions Relating to Hybrid Rice Cultivation

About 83 percent reported that they have more yield gain from hybrid rice cultivation over HYV rice due to advanced technology used. About 58 percent reported that they enjoyed more profits due to adoption of hybrid rice cultivation.

Hybrid rice is considered to the inferior in terms of quality than HYV rice. About 36 percent reported that grain quality of hybrid rice is poorer than HYV rice.

The hybrid rice is poor in quality due to lack of seed quality and poor germination. More than half of the sample farmers (56.40 percent) have reported that hybrid rice is not tastier. About 68 percent reported that hybrid rice is poor in terms of cooking quality.

About 91.20 percent respondents have reported that the traders and millers did not generally accept the hybrid rice grain. Hybrid rice grain quality is very poor in comparison with the grain quality of HYV rice. Traders and millers could not sell their hybrid grain in the open market. A majority of the people rejected hybrid rice grain in the market due to the low quality of grain, poor taste, broken rice and it does not align well with the south Indian taste buds.

Regarding the economic viability of hybrid rice cultivation 69 percent responded that they are convinced about it and 31 percent gave a negative answer. About 60 percent reported about the non-availability of seeds and felt that the cost of cultivation for hybrid rice is very high. The others (32 percent) reported that hybrid rice cultivation is more susceptible and vulnerable to pests and diseases.

About 57.50 percent have reported that they did not intend to continue growing the hybrid rice in future. The others (42.50 percent) reported that they were willing to continue the hybrid rice cultivation given the fact that the hybrid seeds are free of cost and technical advice is given by the agriculture department, Government of Tamil Nadu. A majority of the sample respondents (85 percent) reported that they will get high yield from hybrid rice cultivation by continuing the cultivation.

7.4 Reasons for Non-adoption of Hybrid Rice Cultivation in the Farm Field

About 60 percent have not heard of any of the new hybrid rice varieties in the study area. Hence, they have no reason to shift to a new variety with all the accompanying risks. This is also evident from the fact that about 40 percent of the non-adopters fully know about the hybrid varieties but preferred to continue with HYVs. Further, two thirds of the farmers (65 percent) feel that the profitability is lower even with higher yield. And all the respondents find that hybrid rice varieties command lower price and about 20 percent felt that it required more fertilizers which mean high cost. The sample farmers (55 percent) have known two hybrid rice varieties (KRH, KRH-2).

About 45 percent reported that they have heard of the Government hybrid rice promotion programme. The remaining 55 percent do not know about the hybrid rice

promotion scheme. A majority of the farmers are using HYV rice and they have been getting adequate yield and profit. The agricultural officials of that district could not spread the hybrid rice cultivation through all those households, under these circumstances.

More than half of them (55 percent) have received suggestions from village level workers and agricultural officers. A total 55 percent of non-adopters had expressed their willingness to grow the hybrid rice varieties in the next year. The main reason for the non-adoption is that the farmers have not heard of the availability of government assistance.

About 93 percent of the non-adopters have reported that they have not heard about the assistance for adoption of hybrid rice seeds. According to non-adopters, the lower price for hybrid rice compared to HYV rice is yet another major reason for not adopting the hybrid varieties. About 65 percent of the non-adopting sample farmers have not witnessed the hybrid rice varieties in the nearby area.

About 35 percent of the non-adopting farmers reported that they could not get pure quality of hybrid seeds in the study area. The Government provides hybrid seeds bought from the private sector. Half of the non-adopters (50 percent) reported that they are ready to accept new hybrid rice varieties in future considering higher yield gain. A majority of the sample farmers have known about hybrid rice yield gain and profitability. Many of them do not know about the support and assistance of the government. Therefore they are ready to accept hybrid rice varieties because of higher yield and free seeds issued by the Government with other technical support to the farmers.

The farmers face many constraints in the marketing of the hybrid rice. Both the private traders and the Government procurement centre in the study area are not trading the hybrid rice varieties on par with other varieties. In addition, Government Procurement Centre could not fix higher price for the hybrid rice due to poor grain quality and broken condition. Therefore, the hybrid rice cultivators are getting lower price for their produce in the private market as well as in the Government procurement centre.

Agricultural Prices in India

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

Commodity Reviews

Foodgrains

During the month of February, 2015 the Wholesale Price Index (Base 2004-05=100) of pulses, cereals and foodgrains increased by 0.78% , 0.17% and 0.29% respectively over the previous month.

All India Index Number of Wholesale Prices

(Base: 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of February 2015	WPI for the Month of January 2015	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	240.3	239.2	231.5	0.46	3.80
Wheat	1.116	215.6	216.6	220.9	-0.46	-2.40
Jowar	0.096	285.5	283.1	259.1	0.85	10.19
Bajra	0.115	240.2	241.1	252.9	-0.37	-5.02
Maize	0.217	243.0	241.2	245.7	0.75	-1.10
Barley	0.017	242.4	243.8	221.6	-0.57	9.39
Ragi	0.019	322.6	328.7	317.7	-1.86	1.54
Cereals	3.373	234.1	233.7	230.9	0.17	1.39
Pulses	0.717	256.9	254.9	224.2	0.78	14.59
Foodgrains	4.09	238.1	237.4	229.7	0.29	3.66

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

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

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

Procurement of Wheat

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

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

	Marketing Season		Corresponding Period of last Year		Marketing Year (April-March)			
State	2014-15 (upto 30.06.2014)		2013-14		2013-14		2012-13	
	Procure-ment	Percen-tage to Total	Procure-ment	Percen-tage to Total	Procure-ment	Percen-tage to to Total	Procure-ment	Percen-tage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	6495	23.20	5873	23.45	5873	23.41	8665	22.71
Madhya Pradesh	7094	25.34	6325	25.26	6355	25.33	8493	22.26
Punjab	11641	41.58	10878	43.44	10897	43.43	12834	33.64
Rajasthan	2159	7.71	1268	5.06	1268	5.06	1964	5.15
Uttar Pradesh	599	2.14	683	2.73	683	2.72	5063	13.27
Others	6	0.02	13	0.05	16	0.06	1129	2.96
Total	27994	100.00	25040	100.00	25092	100.00	38148	100.00

Source: Department of Food & Public Distribution.

Procurement of Rice

2.14 million tonnes of Rice (including paddy converted into rice) was procured during February, 2015 as against 2.32 million tonnes of rice (including paddy converted into rice) procured during February, 2014. The total procurement of Rice in the current marketing season *i.e.*2014-2015, up to 27.02.2015 stood at 21.57 million tones, as against 23.28 million tonnes of rice procured, during the corresponding period of last year. The details are given the following table.

PROCUREMENT OF RICE

(In Thousnad Tonnes)

	Marketing Season		Corresponding Period of last Year		Marketing Year (October-September)			
State	2014-15 (upto 27.02.2015)		2013-14		2013-14		2012-13	
	Procure-ment	Percen-tage to Total	Procure-ment	Percen-tage to Total	Procure-ment	Percen-tage to to Total	Procure-ment	Percen-tage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	1501	6.96	3027	13.00	3722	11.76	6464	19.00
Chhatisgrarh	3354	15.54	5337	22.92	4290	13.56	4804	14.12
Haryana	1996	9.25	2403	10.32	2406	7.60	2609	7.67
Maharashtra	120	0.56	112	0.48	161	0.51	192	0.56
Punjab	7781	36.06	8106	34.82	8106	25.62	8558	25.16
Tamil Nadu	4	0.01	55	0.24	684	2.16	481	1.41
Uttar Pradesh	1418	6.57	934	4.01	1127	3.56	2286	6.72
Uttarakhand	429	1.99	305	1.31	463	1.46	497	1.46
Others	4970	23.04	3004	12.90	10678	33.75	8129	23.89
Total	**21573**	100.00	**23283**	100.00	**31637**	100.00	**34020**	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 203.1 in February, 2015 showing a decrease of 0.4 percent over the previous month. However, it is higher by 0.5% over the previous year. The WPI of Niger Seed (4.0 percent), Groundnut seed (3.8 percent) and Sunflower Seed (1.5 percent) increased over the previous month. However, the WPI of Gingelly seed (2.8 percent), Cotton Seed (2.3 percent), Soyabean (1.9 percent), Copra (1.8 percent) and Rape & Mustard Seed (0.2 percent) decreased over the previous month. The WPI of Sanflower seed remained unchanged during the month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood at 145.7 in February, 2015 showing a decrease of 0.1 percent and 0.7 percent over the previous month and year, respectively. The WPI of Copra Oil (3.6 percent), Groundnut Oil (1.5 percent) and Cotton seed (0.6 percent) increased over the previous month. However, the WPI of Gingelly Oil (3.2 percent), Mustard Oil (1.0 percent) and Soyabean Oil (0.6 percent) decreased over the previous month. WPI of Sunflower Oil remained unchanged during the month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of Fruits and Vegetable as a group stood at 235.2 in February, 2015 showing a decrease of 4.9 percent over the previous month. However, it is higher by 22.3 percent over the previous year.

Potato

The Wholesale Price Index (WPI) of Potato stood at 165.2 in February, 2015 showing a decrease of 18.5 percent over the previous month. However, it is higher by 18.4 percent over the previous year.

Onion

The Wholesale Price Index (WPI) of Onion stood 346.7 in February, 2015 showing an increase of 3.5 percent and 22.3 percent over the previous month and year, respectively.

Condiments & Spices

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 314.4 in February, 2015 showing an increase of 1.4 percent and 16.8 percent over the previous month and year, respectively. The WPI of Black Pepper and Chillies (Dry) decreased by 3.0 percent and 1.5 percent over the previous month, respectively. However, WPI of Turmeric increased by 2.3 percent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 176.3 in February, 2015 showing a decrease of 4.9 percent and 24.1 percent over the previous month and year, respectively.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 308.0 in February, 2015 showing an increase of 3.3 percent and 12.9 percent over the previous month and year, respectively.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

Commodity	Latest	Month	Year	% Variation Over	
	February, 2015	January, 2015	February, 2014	Month	Year
1	2	3	4	5	6
OIL SEEDS	203.1	204.0	203.0	-0.4	0.5
Groundnut Seed	215.0	207.1	195.5	3.8	5.9
Rape & Mustard Seed	201.8	202.2	186.9	-0.2	8.2
Cotton Seed	158.1	161.8	175.7	-2.3	-7.9
Copra (Coconut)	176.8	180.1	143.9	-1.8	25.2
Gingelly Seed (Sesamum)	392.9	404.1	464.1	-2.8	12.9
Niger Seed	222.6	214.1	171.7	4.0	24.7
Safflower (Kardi Seed)	121.8	121.8	151.2	0.0	19.4
Sunflower	180.0	177.4	191.8	1.5	-7.5
Soyabean	199.4	203.2	228.9	-1.9	11.2
EDIBLE OILS	145.7	145.8	146.8	-0.1	-0.7
Groundnut Oil	179.0	176.3	170.2	1.5	3.6
Cotton Seed Oil	173.0	171.9	185.4	0.6	-7.3
Mustard & Rapeseed Oil	160.9	162.6	157.2	-1.0	3.4
Soyabean Oil	152.9	153.8	158.4	-0.6	-2.9
Copra Oil	153.3	148.0	123.3	3.6	20.0
Sunflower Oil	124.4	124.4	127.1	0.0	-2.1
Gingelly Oil	171.4	177.1	185.7	-3.2	-4.6
FRUITS VEGETABLES	235.2	247.3	202.2	-4.9	22.3
Potato	165.2	202.8	171.3	-18.5	18.4
Onion	346.7	335.1	273.9	3.5	22.3
CONDIMENTS & SPICES	314.4	310.1	265.5	1.4	16.8
Black Pepper	725.1	747.4	610.6	-3.0	22.4
Chillies (Dry)	314.5	319.3	293.8	-1.5	8.7
Turmeric	254.8	249.0	215.6	2.3	15.5
Raw Cotton	176.3	185.4	244.2	-4.9	24.1
Raw Jute	308.0	298.1	272.9	3.3	12.9

Statistical Tables

Wages

1. DAILY AGRICULTURAL WAGES IN SOME STATES (CATEGORY-WISE)

(In Rs.)

State	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	Nov, 14	8	237.5	125	500	NA	250	NA	300	350	250
	Guntur	Tadikonda	Nov, 14	8	275	200	300	NA	250	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	Nov, 14	8	275	250	250	NA	NA	NA	275	250	NA
Karnataka	Bangalore	Harisandra	Aug, 14	8	250	200	300	225	300	225	350	350	NA
	Tumkur	Gidlahali	Aug, 14	8	250	200	300	200	300	200	300	250	NA
Maharashtra	Nagpur	Mauda	Feb, 12	8	100	100	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Feb, 12	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	April, 12	8	100	100	NA	90	90	NA	58	58	NA

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

(In Rs.)

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

AVERAGE DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE) Contd.

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Car-penter	Black Smith	Cobbler
Odisha	Bhadrak	Chandbali	June, 14	M	8	250	250	NA	250	262.5	250	300	250	250
				W	8	NA	NA	NA	200	212.5	200	NA	NA	NA
	Ganjam	Aska	June, 14	M	8	250	200	NA	250	270	200	400	300	200
				W	8	NA	100	100	150	110	100	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	June, 13	M	8	265	270	270	270	260	NA	325	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	Oct, 14	M	8	NA	NA	300	300	NA	300	700	500	NA
				W	8	NA	NA	200	200	NA	200	NA	300	NA
	Jalore	Sarnau	Oct, 14	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu*	Thanjavur	Pulvarnatham	Dec, 14	M	8	NA	300	NA	300	301.23	NA	NA	NA	NA
				W	8	NA	110	108.75	125	117	NA	NA	NA	NA
				M	8	NA	300	NA	NA	417.65	NA	NA	NA	NA
	Tirunelveli	Malayakulam	Dec, 14	W	8	NA	300	203	300	321.23	NA	NA	NA	NA
Tripura	State Average		March, 12	M	8	238	201	152	NA	207	199	253	235	240
				W	8	NA	154	152	154	154	149	NA	NA	NA
Uttar Pradesh*	Meerut	Ganeshpur	Apr, 14	M	8	250	231	213	NA	234	NA	365	NA	NA
				W	8	NA	181	196	181	191	NA	NA	NA	NA
	Aurraiya	Aurraiya	Apr, 14	M	8	NA	NA	NA	NA	150	NA	250	NA	NA
				W	8	NA	NA	NA	150	150	NA	NA	NA	NA
	Chandauli	Chandauli	Apr, 14	M	8	NA	NA	200	200	200	NA	350	NA	NA
				W	8	NA	NA	200	200	200	NA	NA	NA	NA

M-Man W-Woman NA-Not Available

NR-Not Reported *States reported district average daily wages

Prices

2. Wholesale Prices of certain Agricultural Commodities and Animal Husbandry Products at selected Centres in India

(Month end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Feb-15	Jan-15	Feb-14
Wheat	PBW 343	Quintal	Punjab	Amritsar	1500	1500	NA
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1620	1590	1645
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1664	1698	1755
Jowar	—	Quintal	Maharashtra	Mumbai	2350	2300	2650
Gram	No III	Quintal	Madhya Pradesh	Sehore	3111	2850	2531
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1515	1420	1360
Gram Split	—	Quintal	Bihar	Patna	4590	4500	4570
Gram Split	—	Quintal	Maharashtra	Mumbai	4100	4000	4800
Arhar Split	—	Quintal	Bihar	Patna	7090	7010	6640
Arhar Split	—	Quintal	Maharashtra	Mumbai	7200	7000	7000
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6340	6350	6345
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	8600	8200	6330
Gur	—	Quintal	Maharashtra	Mumbai	3200	3300	3500
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4650	4650	4200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2300	2300	2320
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3350	3350	3260
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3850	3900	3600
Mustard Seed	—	Quintal	West Bengal	Kolkata	4200	4300	3500
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4210	4200	4070
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	—	—	3700
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1350	1100	1700
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2000	2000	1550
Castor Seed	—	Quintal	Andhra Pradesh	Hyderabad	3600	3775	3500
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	13550	—	5770
Copra	FAQ	Quintal	Kerala	Alleppey	9300	9650	8450
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	4500	4500	3800
Groundnut	—	Quintal	Maharashtra	Mumbai	5500	5500	6200
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1222	1223	1218
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1260	1380	1230
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1425	1470	1140
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1335	1320	1230
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1395	1457	1349
Castor Oil	—	15 Kg.	Andhra Pradesh	Hyderabad	1185	1298	1215
Sesamum Oil	—	15 Kg.	NCT of Delhi	Delhi	1860	1900	1350
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2700	2775	2850
Coconut Oil	—	15 Kg.	Kerala	Cochin	1995	2085	1800
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1820	1840	1900
Groundnut Cake	—	Quintal	Andhra Pradesh	Hyderabad	3143	3143	2714
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	3550	3750	4500
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	3300	2906	4156

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

(Month end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Feb-15	Jan-15	Feb-14
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	3305	3200	2800
Jute Raw	W 5	Quintal	West Bengal	Kolkata	3255	3150	2750
Oranges	—	100 No	NCT of Delhi	Delhi	433	417	417
Oranges	Big	100 No	Tamil Nadu	Chennai	360	355	530
Oranges	Nagpuri	100 No	West Bengal	Kolkata	750	700	500
Banana	—	100 No	NCT of Delhi	Delhi	333	333	292
Banana	Medium	100 No	Tamil Nadu	Kodaikkanal	496	501	448
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	64000	63000	56000
Almonds	-	Quintal	Maharashtra	Mumbai	72000	72000	62000
Walnuts	-	Quintal	Maharashtra	Mumbai	68000	68000	63000
Kishmish	-	Quintal	Maharashtra	Mumbai	24000	24000	11500
Peas Green	-	Quintal	Maharashtra	Mumbai	4100	4500	4400
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1150	1350	740
Ladyfinger	-	Quintal	Tamil nadu	Chennai	1300	2500	2400
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1000	1500	1350
Potatoes	Red	Quintal	Bihar	Patna	700	800	810
Potatoes	Desi	Quintal	West Bengal	Kolkata	520	600	810
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayaml	-	2348	-
Onions	Pole	Quintal	Maharashtra	Nashik	1300	1300	800
Turmeric	Nadan	Quintal	Kerala	Cochin	13000	11500	11500
Turneric	Salam	Quintal	Tamil Nadu	Chennai	8200	8200	9600
Chillies	-	Quintal	Bihar	Patna	9170	9200	9200
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	54000	60000	50000
Ginger	Dry	Quintal	Kerala	Cochin	24000	20000	23000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	104000	105000	125000
Cardamom	Small	Quintal	West Bengal	Kolkata	120000	120000	95000
Milk	Buffalo	100 Liters	West Bengal	Lolkata	3600	3600	3600
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	30015	26680	28681
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	40000	40000	32000
Ghee Deshi		Quintal	Uttar Pradesh	Kanpur	35000	35600	30440
Fish	Rohu	Quintal	NCT of Delhi	Delhi	8200	7600	10500
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	32000	31700	33000
Eggs	Madras	1000 No.	West Bengal	Kolkata	3850	4300	4500
Tea	-	Quintal	Bihar	Patna	21000	21000	20000
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	34000	34000	13000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	29500	30200	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	15000	15600	14000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	4910	4870	2900
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3600	3600	2800
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3900	3900	3700
Rubber	-	Quintal	Kerala	Kottayam	10400	10000	14300
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29900	29800	29700

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year 2015

Commodity	Variety	Country		Centre	Jan	Feb
Cardamom	Guatmala Bold Green	U.K.	-	Dollar.M.T.	12000.00	12000.00
				Rs./Qtl	74160.00	74604.00
Cashew Kernels	Spot U.K. 320s	U.K.	-	Dollar/lbs	3.60	3.60
				Rs./Qtl	49034.59	49328.16
	Spot U.K. 320s	U.K.	-	Dollar/M.T.	7877.32	8013.05
				Rs./Qtl	48681.84	49817.13
Castor Oil	Any Origin ex tank	Netherlands	-	Dollar/M.T.	1700.00	1600.00
	Reotterdam			Rs./Qtl	10506.00	9947.20
Chillies	Birds eye 2005 crop	Africa	-	Dollar/M.T.	4100.00	4100.00
				Rs./Qtl	25338.00	25489.70
Cloves	Singapore	Madagascar	-	Dollar/M.T.	10500.00	10500.00
				Rs./Qtl	64890.00	65278.50
Coconut Oil	Crude	Netherlands	-	Dollar/M.T.	1080.00	1140.00
	Phillipine/Indonesia,			Rs.qtl	6674.40	7087.38
Copra	Phillipines cif	Phillipine	-	Dollar/M.T.	679.50	784.00
	Rotterdam			Rs./Qtl	4199.31	4874.13
Corriander		India	-	Dollar/M.T.	2000.00	2000.00
				Rs./Qtl	12360.00	12434.00
Cummin Seed		India	-	Dollar/M.T.	2250.00	2250.00
Ginger	Split			Rs./Qtl	13905.00	13988.25
Groundnut	US 2005, 40/50	European	-	Dollar/M.T.	1350.00	1350.00
kernels		Ports		Rs./Qtl	8343.00	8392.95
Groundnut Oil	Crude Any Origin eif	U.K.	-	Dollar/M.T.	1200.00	1200.00
	Rotterdam			Rs./Qtl	7416.00	7460.40
Maize		U.S.A.	Chicago	C/56 lbs	373.25	385.75
				Rs.Qtl	906.53	942.50
Oats		Canada	Winnipeg	Dollar/M.T.	365.75	344.00
				Rs./Qtl	2260.34	2138.65
Palm Kernal Oil	Crude	Netherlands	-	Dollar/M.T.	945.00	1070.00
	Malaysia/Indonesia,			Rs./Qtl	5440.10	6652.19
Palm Oil	Crude	Netherlands	-	Dollar/M.T.	630.00	675.00
	Malaysian/Sumatra,			Rs./Qtl	3893.40	4196.48
Pepper (Black)	Sarawak Black	Malaysia	-	Dollar/M.T.	10000.00	11000.00
	Lable			Rs./Qtl	61800.6887.00	
Rapeseed	Canola	Canada	Winnipeg	Can	449.80	461.60
		U.K.		Dollar/M.T.	2204.02	2294.15
	delivered rapeseed,	U.K.		Pound/M.T.	242.00	240.00
	delivered			Rs./Qtl	2254.96	2296.56
Rapeseed Oil	Refined bleached	U.K.	-	Pound/M.T.	577.00	582.00
	and deodorised			Rs./Qtl	5376.49	5569.16

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year 2015—*Contd.*

Commodity	Variety	Country		Centre	Jan	Feb
Soyabean Meal	U.K. produced49% oil & protein	U.K.	-	Pound/M.T.	334.00	315.00
				Rs./Qtl	3112.21	3014.24
Soyabean Oil		U.S.A.	-	C/lbs Rs./Qtl	30.34	31.75
					4132.53	4350.47
Soyabean Oil	Refined bleached and deodorised	U.K.	-	Pound/M.T.	756.00	607.00
				Rs./Qtl	7044.41	5808.38
Soyabeans	US No. 2 yellow	Netherlands	Chicago	Dollar/M.T.	420.90	423.40
				Rs./Qtl	2601.16	2632.28
		U.S.A.	-	C/60 lbs	970.25	977.75
				Rs./Qtl	2200.59	2230.87
Sunflower Seed Oil	Refined bleached deodorised	U.K.	-	Pound/M.T.	664.00	667.00
				Rs./Qtl	6187.15	6382.52
Tallow	High grade delivered	U.K.	London	Pound/M.T.	295.00	295.00
				Rs./Qtl	2748.81	2822.86
Wheat		U.S.A.	Chicago	C/60 lbs	505.25	525.75
				Rs./Qtl	1145.94	1199.57

Source : Public Ledger

Exchange Rate

	Jan	Feb
US Dollar	61.80	62.17
CAN Dollar	49.00	49.70
UK Pound	93.18	95.69

4. Sowing and Harvesting Operations Normally in Progress during April, 2015

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

(K)-Kharif (R)-Rabi.:

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