

ESTIMATION OF SEED, FEED AND WASTAGE RATIOS FOR MAJOR FOODGRAINS IN INDIA

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October 2007

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PREFACE

Production of foodgrains is arrived with the help of yield rates obtained through crop estimation surveys with the help of crop cutting experiments. The seed, feed and wastage ratios were determined during sixties with the help of data from Farm Management Surveys and during mid-eighties a committee of experts was appointed to arrive at these ratios. The Committee provided the ratios for computing seed, feed and wastages in the crop production. These were being used in the National Accounts Statistics and for other indicators. The Ministry of Agriculture felt that these could be arrived at with the help of Agro-Economic Research Centres/Units. Accordingly, a project was initiated and the sampling design was prepared by Professor H.V.L. Bathla of Indian Agricultural Statistics Research Institute, New Delhi. The work was benefited considerably from the advice by Prof. H.V.L. Bathla in coordination. The study was coordinated by Prof. H.V.L. Bathla and the Agricultural Development and Rural Transformation Centre (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore. Thirteen States participated in the project. This was a scientifically drawn sample and data were collected for two seasons and for two crops: one cereal and one pulse crop from each region. But finally, at the time of consolidation, we got results from 11 States and the remaining two states are expected to send the data. Pending the results from these two states, we have finalised the writing of the report. Our estimates are crop and region specific and probably will be of great use as they have been arrived with the help of a scientific statistical survey design. We are sure that these will be useful for the policy makers.

While working on this project, we have derived significant help from Mr. Rajendra B. Desai and Mr. Khalil Shaha. The field work was conducted with the help of the field staff working on PMRY project. The results were tabulated by Mr. Rajendra Desai and some notes were prepared by Mr. Neelakantha and Mr. Khalil Shah. We once again hope that the results would be of use to academic fraternity and to the policy makers.

Date: October 18, 2007

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CHAPTER I

INTRODUCTION

1.1 Introduction

The rate of increase in production of foodgrains and major commercial crops in India predicted is much higher than that accomplished in the past. Hence, it is necessary to spell out, in some details, the strategy for realizing the production targets. This strategy places very little reliance in bringing additional land under cultivation. Area in the country is estimated approximately at 175 million hectares. Of this, nearly 85 per cent is under cultivation. Thus, there is a virtual exhaustion of uncommitted land resources. In this context, the strategy of production is primarily dependent on intensive agriculture like improvement in the utilization of existing irrigation, potential through special programmes, expansion in the supply of fertilisers, plant protection material, farm machinery and credit; intensive efforts in suitable areas selected for raising the yield levels of major commercial crops; improvement in the agricultural marketing system and infrastructure facilities. Keeping in view the rapidly increasing food requirement of ever increasing population, every effort need to be made to push up the availability of foodgrains both by raising production as well as by minimising the losses at various stages of handling. Such losses at the farmer's level not only adversely affect their income but also curtail the availability of the foodgrains to the nation.

1.2: A Brief History of Methods of Estimation Followed in the Indian Income Accounting Process

The estimation of national income is the most accepted significant single measure of macro economic indicator of any economy. The importance of national income estimates, however, critically hinges on the reliability of data collected from different sources. It may be stated that an elaborate income accounting method was initiated in India after independence as per guidelines prepared by the Government of India. However, the difficulties of national income accounting seemed to be associated with two specific problems, namely, conceptual and statistical. Therefore, in August 1949, the Government of India constituted National Income Estimate Committee under the Chairmanship of Prof. Mahalanobis with Prof. D.R.Gadgil and Dr. V.K.R.V. Rao as its

members. The committee was required to suggest and work out a report on National Income Estimates on a scientific basis. The Committee in collaboration with the National Income Unit of Central Statistical Organization and the assistance of international experts like Prof. Simon Kuznets, provided an authoritative estimate of India's National Income for 1948-49. The estimates of national income so derived were published in 1951 which pertain to the year 1948-49. The total national income estimated was Rs.8,830 crores and the per capita income Rs. 265 at current prices. The work of the Committee continued for another 3 years and the final report of the Committee was submitted in February 1954 which provided a scientific method of estimation of national income and that was followed with timely modifications thereafter.

The Committee employed three methods for estimation of national income, namely; i) production method, ii) income method and iii) expenditure method. The Committee divided the entire economy into 13 sectors. Income from six sectors viz. 1. agriculture, 2. animal husbandry, 3. forestry, 4. fishery, 5. mining and quarrying, 6. factory establishments, was estimated by the output method i.e. production method. In this method net output is multiplied by the prevailing prices per unit. But income from the remaining seven sectors consisting of a) small enterprises, b) trade, commerce, transport and communications, c) banking and insurance, d) professions, e) liberal arts, f) domestic services, house property, g) public authorities and income from abroad was estimated by the income method. Expenditure method of State Income Accounting was applied for estimation of the income from construction sector only.

Thereafter, the National Income Estimate Committee entrusted the work to the National Income Unit of Central Statistical Organisation (CSO). Since then the states have been following the guidelines provided by the CSO for estimation of their respective State income. After the CSO revised the series of national income data for the period of 1960-61 to 1975-76, it constructed a new series of estimates with 1970-71 as base year. Again the National Income Unit of CSO revised the series for estimating National Account by shifting the base year from 1970-71 to 1980-81. After 13 years the need to change the base year arose and the CSO shifted the base year from 1980-81 to 1993-94. Recently, the CSO has decided to revise the series of the National account statistics

by shifting base year from 1993-94 to 1999-2000. It is felt that mere revision of National Accounts Statistics would not reflect actual picture of income of the state as well as the nation, if the database is not reliable, authentic and dependable. Therefore, while attempting the correction, CSO also undertook revision of same.

1.2.1: Understanding the Income Accounting Method at State Level

Like National Income estimates, the State income also represents total amount of income originated within the territory of a particular State during a particular period. The estimates of State income provide the most comprehensive single indicator of development of the state. The State Domestic Product Estimates assume a great deal of importance in decision-making process and formulation of strategies directed towards achieving general or specific goals of the economic development of the society. There should be no doubt that such decisions require as much data as on various aspects for acquaintance with relative contributions and directions of different sectors and sub-sectors in the economy. Sub-sector wise estimation of national income helps us in providing a clear understanding of the streams of expenditure on consumption and investment going to various sectors for generating income and employment. It also helps us to form the strategies towards strengthening the economy and smoothening the business cycles for maintaining sustainability in economic growth and development.

As we have stated above that, for preparing the estimates of State Domestic Product, guidelines are obtained from the Central Statistical Organisation, Government of India, from time to time to keep uniformity and reliability in the estimates across the states. In each State, the Department incharge of State income, estimates the total value of state produce at factor cost of goods and services within its geographical jurisdiction. Each state includes all factor income originating within its geographical boundaries irrespective of the fact that whether the state resources are owned by persons living inside or outside the state. In other words, it excludes income originating in other States even though it may accrue to the residents of the state. Other forms of income which cannot be imputed to the current services or to the production known as 'Transfer Income' are not included by the states in their GDP.

The estimation of state income bears the significance for the Central Government for determining the inter- state disparities with regard to total income as well as per capita income to highlights various problems and constraints attached with state(s)/ region and thereby to take appropriate steps at right place and at the right time. This not only helps the economically backward states/areas/regions at par with the advanced states/regions/areas, but also for understanding input-output relationship prevailing across the sectors and states.

In recent years, estimates of national income at constant prices have been revised by shifting the base year from time to time. But no significant methodological changes have been made in estimation of State Domestic Products at current prices across the states. State Departments, mainly, the Directorate of Economics and Statistics of each State, provide the estimates of Gross State Domestic Product along with Net Domestic Product at current as well as constant prices under the CSO guidelines every year.

1.3: Seed, Feed and Wastage Ratios and State Income Accounting Methodology

In view of ever rising population, there arises the need for producing more food grains in the country. There is no doubt that the production of food grains in India increased manifold as compared to situation obtained at the time of independence mainly due to the initiatives taken by the Central as well as State Governments: thereby India is also known for her tremendous success in transforming the food deficit economy to a food surplus country. However, due to continuous rising of population and opening up of the economy, the demand for food production is likely to surpass the supply, which might in turn insert more pressure on economic agents such as government (s) and suppliers to meet and adjust with changing situations. This requires not only producing more by increasing crop intensity and adopting scientific methods of production, but also minimisation of losses of food-grains at various stages of handling. At micro level, losses of foodgrain in handling have wider implications on farmers' income and availability of food grains for consumption purpose whereas; at macro level, it adversely affects investment and price stability for the agricultural goods and services.

It is obvious that besides domestic consumption, farmers have to use a part of their food grain production as seed and feed. Therefore, it is required to have information on how much of grains are used for seed and feed purpose and also the losses incurred during the process of handling. This helps in greater understanding of the predictability of food production behavior and looking for methods to reduce losses. As a first step towards this, a pilot study was conducted by the Techno-Economic Research Institute on seed, feed and wastage rates in food grains on behalf of the Planning Commission in some of the districts of Punjab, Haryana and Western Uttar Pradesh in 1986-87 (Govt. of India, 1989). The study revealed that 10.32 per cent of the total production of food grains accounted for seed, feed and wastage in these areas. The corresponding figures for Western Uttar Pradesh, Punjab and Haryana were 12.01 per cent, 8.22 per cent and 10.84 per cent respectively. This study has clearly pointed out the necessity of undertaking similar studies in other regions. It was felt that such kind of studies should be undertaken across all the major food grain producing states.

In view of changing domestic and international scenario, issues of food security and utilising comparative advantages for various commodities in international trade, have been gaining momentum over the period and hence, reduction of food grain wastages by whatever means. It is clear beyond doubt that losses in foodgrains output at different stages of handling have been recorded at around 10 per cent. Such losses of food grains have directly affected the market surplus of food grains and also affected adversely the income of the farmers ("Post Harvest Technology of Food Crops, Problems and Prospective." A Study presented in a Seminar of FCI held in New Delhi, Dec. 21-23, 1972). In another study it was revealed that losses occur during cleaning of the produce and handling in the market yards. Grewal estimated losses at the farm level from production till produce was sold (S.S.Grewal, 1978). The limitations of his estimates were confined to Punjab and further the sample was not spread sufficiently to conclude.

From the available studies, it can be easily inferred that there is a need to understand the seed, feed and wastage ratios on a wider scale on the basis of primary level data and with a view to know the present scenario of losses suffered by the farmers in handling the food crops. These ratios will help in correcting the estimates of

marketable surplus as well as net availability besides helping in refining the State income estimates.

1.4: Probable Impact of Study on the State Income Accounting

Poverty alleviation continued to be the prime concern in the country since independence. Though we have witnessed a significant decline in poverty ratios through poverty alleviation programmes and agricultural growth performance, still more than 26 per cent of her population is estimated to be living below the poverty line. Beside, the number of poor below poverty line is growing fast. For the formulation of appropriate strategies, the income accounting is considered to be good indicator for measuring the State performance with respect to aggregate welfare. The income accounting process in this respect provides a great help for understanding the pattern of consumption, per capita income growth, sources of growth across regions and occupations. It is also considered to be essential for comparison of one State's economic well-being with another state and region so as to find out the problems and constraints hindering the economic development of the States or region. A comparative study of estimation of seed, feed and wastage ratio of major foodgrains across the states would be of great help in ascertaining areas of critical problems so as to set appropriate strategies for smoothening and improving the condition or at least preventing the situation from further deterioration.

Moreover, in the India, the estimation of seed, feed wastages of major foodgrains are applied to the total production of foodgrains. This procedure is limited in its scope since it fails to incorporate seed, feed and wastages ratios at disaggregated level. Beside, these ratios differ across crops and the aggregation hides the crop level specificities. These limitations also cause bias in the estimation of state domestic income. The study on the estimation of seed, feed and wastages should therefore be comprehensive in nature with respect to its regional spread and depth at dominant individual crop level. The improved estimates would certainly be of great help in the estimation of State domestic product. Furthermore, improved estimates of seed, feed wastages ratio would also be of help in research and planning for the utilisation of

resources efficiently and to decide on future policy options for the economic development of the society.

1.5: Need for the Present Study

One of the great successes of India during the twentieth century has been the achievement of self-sufficiency in the food production after the humiliating events of acute shortage during sixties. After launching a number of policies and programmes to boost the production of crops, India witnessed remarkable growth in food production. Today, India contributes around 31 per cent and 11 per cent respectively of rice and wheat in the global production. Even then, the country is likely to face insufficiency in food grains in years to come because of higher growth of population and slow growth of food production. It has been estimated that demand of cereals would be 254 to 374 million tonnes by the year 2020 (Dyson Tim & Hanchate,2000). Such demand probably could be met through the second green revolution and to some extent by preventing losses of foodgrains at different stages. The two basic factors of production namely land and water, are diminishing return in nature, and hence the quantum of production of crops would be required to meet the food demand in the decades to come through improvement of productivity of foodgrains and technical efficiency. It is generally observed that farmers in India do assign significant importance on actual requirement of seed for a particular crop to be used in a particular agricultural year. It has also been observed in a few studies that farmers over estimate keeping of seeds just after harvest. Besides, a sizeable quantity of production is utilised by the farmers as feed of the animals. But how much of crops are utilised as feed of the animals is generally not taken into account (Govt. of Karnataka, 2001).

It is clear from above that a significant percentage of produce is also lost due to handling of produce by the farmers starting from harvesting till the marketing of the products. Hence, it is essential to estimate the proportion of seed, feed and wastage from the total food crops. The present study is undertaken with a view to arrive at estimates of seed, feed and wastage ratios for major food grain crops to ascertain the availability of foodgrains for human consumption.

1.6: Objective of the Study

1. To estimate the total quantity of food grains used as seed and feed.
2. To estimate wastages during various stages of production and the net availability of food grains for human consumptions.

1.7: Organizations Responsible for the Study

The study was undertaken as a joint work of 13 Agro Economic Research Centres coordinated by Agricultural Development and Rural Transformation Centre, Institute for Social and Economic Change, Bangalore. The project design was prepared jointly with Professor H V L Bathla of Indian Agricultural Statistics Research Institute, New Delhi and monitored along with him continuously. Initially a proposal was prepared and comments were obtained from the participating centers. A detailed schedule of the study was prepared and a sampling design given by Prof Bathla was circulated for expert comments. There were a few difficulties expressed by a few centers and these were sorted out with the help from Professor Bathla. After the fieldwork a design for tabulation of data was provided and this was used by most of the centers.

The participating centers were 1. AERC, Allahabad, 2. AERC, Waltair, 3. AERC, Jorhat. 4. AERC, Jabalpur, 5. AERC, Ludhiana. 6. AERC, Vallbh Vidya Nagar for Rajasthan, 7. AERC, Shimla, 8. ADRTC, Bangalore, 9. AERC, Pune, Maharashtra. 10. AERC, Bhagalpur, Bihar, 11. AERC, Delhi, Haryana. 12. AERC, Chennai. 13. AERC, Shanti Niketan.

CHAPTER II

PROFILE OF THE SELECTED STATES

2.1: Introduction

This chapter is designed to understand the basic trends in crop economy of the selected states. This attempt is directed more towards building a background for the estimation in the subsequent chapters. Over the years some of the states have done well in their crop economy but in other states the trends are disturbing. Placing the States in proper perspective for the purpose of future estimation is quite essential.

2.2: Profile of the States

Andhra Pradesh

Andhra Pradesh is one of the most populous and fifth largest state of India. According to Census 2001, over 75 million population resides in the state of which nearly three quarters live in rural areas. The State is physically divided into three regions viz., - Coastal Andhra, Rayalaseema and Telengana based on their political, socio-economic characteristics. Besides this, the state has five-agro-climatic regions depending upon cropping pattern, irrigation type of soils, rainfall, productivity and climatic conditions. The state is drained by three major perennial rivers: Godavari, Krishna and Pennar, as well as several other rivers of lesser significance. Despite this, the State falls under the semi-arid region and from view of employment generation, it is still predominantly agrarian in nature. The State agriculture sector accounts for 31.41 per cent of its NSDP and provides employment to more than 70 per cent state population.

Though Andhra Pradesh is known for its large geographical size in the India, only 37 per cent of the total state's geographical area was under the net sown area in 2003-04 of which, only 43.34 per of the gross cropped area was under irrigation in 1999-00. The distribution of holdings is also skewed in the State. Marginal holdings form more than 50 per cent of total holdings with less than 20 per cent of area operated. The marginal and small holdings account for around 80 percent of the total

holdings. The average size of holding declined from 1.9 hectares in 1971 to 1.25 hectares in 2000-01.

The details of cropping pattern of Andhra Pradesh have been presented in table 2.2.1. It shows that the rice, jowar, maize, tur, gram and groundnut are dominant crops in the cropping pattern of the State, which altogether accounted for nearly 60 per cent of the gross cropped area during the years 1968-69 to 1998-99. Though share of rice and jowar accounted for almost 55 percent of the total gross cropped area in the year 1968-69, the share of jowar rapidly declined from 20.5 percent to 6.1 percent, and that of bajra and ragi came down from 4.8 per to 0.9 per cent and 2.6 per cent to 0.8 percent respectively. At the same time, the share of rice increased from 25.2 per cent to 30.5 percent during the same period albeit it remained at the same level during nineties.

Table 2.2.1: Changing Cropping Pattern of Andhra Pradesh

(Percent to GCA)

Crops	1968-69	1988-89	1998-99	2002-03
Rice	25.2	30.4	30.5	24.41
Jowar	20.5	13.1	6.1	5.40
Bajra	4.8	2.6	0.9	0.75
Maize	1.8	2.5	3.0	4.55
Ragi	2.6	1.5	0.8	0.62
Cereals	55	50.2	41.2	35.03
Tur	1.4	2.6	2.7	3.74
Gram	0.6	0.4	1.0	3.37
Pulses	10.5	12.0	12.0	18.17
Total foodgrains	65.5	62.2	53.20	53.20
Groundnut	10.0	16.2	15.3	12.71
Ginger	1.9	1.4	1.3	1.89
Castor	2.2	2.6	1.6	2.01
Sunflower	--	0.7	2.6	3.60
Oilseeds	14.1	20.8	20.7	19.98
Sugarcane	1.0	1.2	1.6	2.01
Cotton	2.5	4.5	8.2	6.95
Tobacco	1.7	1.1	1.4	1.01
Chillies	1.5	1.6	1.7	1.93
Onion	0.1	0.2	0.2	0.23

Source: computations are based on data collected from www.indiastat.com

It is obvious that the cropping pattern in the Andhra Pradesh shifted from cereals to the pulses during 1990s and this change is conspicuous especially after 1998-99. The area under cereals has come down from 50.2 percent to 35.03 during year 1988-89 to

2002-03, whereas, area under pulse increased from 12 percent to 18.17 per cent during the same period. Overall, the area under total foodgrains showed a rapid decline in the era of economic liberalization from 62.2 per cent to 53.2 percent and greater diversified choice towards commercial crops like sugarcane and cotton whereas, area under oilseed remained stagnant, accounting for one fifth of the total cropped area.

The behavior of aggregate agricultural output in the Andhra Pradesh indicates that the State has managed 3.5 per cent per annum growth in the first and second phase of green revolution. Though during nineties, there was deceleration in the growth of aggregate output from 3.4 per cent in the 1980s to 2.3 per cent per annum. However, the sources of deceleration in aggregate output can be seen from table 2.2.2, which clearly shows that the decadal rate of output growth of rice decelerated from 4.18 per annum in 1980s to 3.6 percent per annum in 1990s. Whereas, output growth of groundnut also turned to be negative in the latter period from a high of 9.24 per cent per annum to dismal negative growth of 0.56 against the former period of 1980s. Their performance in terms of output and yield growth shows further deterioration during the period of 1998-99 to 2002-03.

Table 2.2.2: Growth Rates of Output and Yield in Andhra Pradesh

(In Per cent)

Crop	1980-81 to 1989-90		1990-91 to 1998-99		1999 to 2002-03	
	Output	Yield	Output	Yield	Output	Yield
Rice	4.18	1.99	2.33	3.6	-8.90	-0.51
Jowar	-1.86	6.74	-5.27	-0.7	3.19	16.12
Bajra	-6.07	1.51	-3.74	5.7	-12.34	-5.70
Maize	-0.80	-0.20	8.83	13.5	21.96	-3.24
Ragi	-1.66	5.87	-4.86	0.4	-8.68	-1.43
Red gram	5.82	3.53	9.71	19.2	-0.72	-0.71
Bengal gram	10.50	19.51	9.62	8.4	41.55	13.79
Groundnut	9.24	8.42	-0.56	3.4	-6.83	-2.08
Castor	11.96	24.52	-7.03	-3.1	10.41	14.06

Source: computation is based on data collected from www.indiastat.com

The growth rate of output of jowar, bajra and ragi crops also showed decline in growth rates with large variation in the last two decades, whereas on other hand, yield growth of these crops were found to be positive. In the case of jowar, the output and yield growth in the last few years of nineties showed spectacular recovery in the yield as well as output growth. It grew by 3.19 per cent and 16.12 per cent per annum

respectively in terms of output and yield for the years 1999-00 to 2002-03. The output and yield growth of maize also showed recovery in the 1990s against its negative growth performance in the 1980s. The output grew at 8.83 per cent and yield by 13.5 per cent per annum during 1990s. The rate of output growth in the next phase almost doubled due to increase in area under the crop even though the rate of yield growth showed an absolute decline. However, bengalgram emerged as one of the prominent crops, showing remarkable growth in term of yield and output since 1980s. The annual average output grew by 10.50 per cent in the 1980s, 9.62 per cent in the 1990s and 41.55 per cent in the period 1999-2000 to 2002-03, whereas its annual average yield grew by 19.51, 8.4 and 13.79 per cent.

Assam

Assam is characterised as one of the major states endowed with abundant natural resources in the North-eastern region. The State economy is predominantly agricultural in nature, which accounts for 32.1 per cent in State domestic income. More than 70 per cent of the State's population is directly dependent on agriculture as a source of income and another 15 per cent on allied activities for its living. The State is divided into three physiographic divisions – the Brahmaputra Valley, Barak Valley and the Hills region covering 72.0 per cent, 9.0 per cent and 19.0 per cent of the total state geographical area respectively. The State has eight agro-climatic zones based on three parameters such as physiography, rainfall, temperature and soils. The legacy of occurrence of flood has been a major concerning factor in the economic development of the State due to its wide spread flood-prone area (around 31.06 hectares land), which has frequently paralysed the State economy. Though the per capita income of the State at current prices increased significantly from Rs. 782.06 to Rs. 10,467 during the period of 1974-75 to 2000-01, the share of agriculture in GSDP witnessed a decline from 52.59 per cent to 34.19 per cent in the same period.

The net cropped area (excluding plantation crops) accounted for 24.90 Lakh hectares against gross cropped area of 38.43 lakh hectares. Whereas only 13.93 per cent of the gross cropped area is under irrigation. The land holdings in Assam are skewedly distributed. Marginal holdings form more than 62 per cent of total holdings

with less than 20 per cent of area operated in the year 1995-96. The marginal and small holdings (less than 2 hectare of land) account for around 84 per cent of the total holdings with 44 per cent of area operated. The average size of holding declined from 1.47 hectares to 1.15 hectares during period of 1970-71 to 2000-01.

The cropping pattern of the State presented in the table 2.2.3 shows that the rice, rapeseed & mustard and tea have largely been dominating the cropping pattern of the State. All these three covered more than three fourth of total cropped area. Rice has been the single dominating crop accounting for more than 90 per cent of the total foodgrains, 95 per cent of cereals and around two thirds of total cropped area. Tea and rapeseed and mustard constitute more than thirteen percent of the total area. The general production conditions are favourable for plantation crops in the region, especially for the cultivation of tea, rubber and coffee, which are very commercially significant. The tea and coffee account for around 3 per cent (2.34 lakh ha) of total geographical area of the state. Foodgrains takes second place in the decision process.

Table 2.2.3: Changing Cropping Pattern of Assam

Crops	1985-86	1995-96	1999-00	2000-01
Rice	67.69	68.64	64.65	64.08
Wheat	2.55	2.35	1.86	1.74
Total cereals	71.05	71.83	67.26	69.37
Total Pulses	3.86	2.93	2.83	0.00
Total Foodgrains	74.91	74.76	70.1	69.37
Rapeseed & Mustard	7.99	7.65	6.99	6.58
Total Oilseeds	8.72	8.39	7.87	7.49
Jute & Mesta	3.59	2.25	1.92	1.72
Tea	5.94	6.2	5.64	6.82
Sugarcane	1.31	0.98	0.71	0.66
Potato	1.48	2.03	1.87	1.90
Banana	0.81	1.11	1.02	1.07
Papaya	0.11	0.2	0.18	0.17
Arecanuts	1.39	1.98	1.8	1.85
Chillies	0.3	0.39	0.35	0.38
Turmeric	0.25	0.26	0.27	0.31

Source: Area and Production of Principal Crops, Govt. of India and Fertilizer Statistics or Assam Development Report, Planning Commission of India

Considering overall cropping pattern during the two phases 1985-86 to 1995-96 and 1995-96 to 2000-01, it is noticeable that the area under foodgrains and oilseed was almost stagnant in the first period. Whereas, in the second phase, the area under foodgrains and pulses decreased from 74.36 per cent to 69.37 per cent and from 2.93 to almost zero, respectively, due to the decline in the area of rice, wheat and pulses. The share of rice came down from 68.65 per cent to 64.08 per cent and that of wheat from 2.35 to 1.74 per cent. In the new environment of economic reforms, decrease in the share of rice and wheat could be attributed to the initiatives of the State government towards diversifying cropping pattern of the State. Hence, horticulture and some other non-foodgrains commercial crops such as jute and mesta, tea, sugarcane, potato, sweet potato, banana, papaya, arecanuts, chillies, turmeric, are being promoted by the State. The horticulture crops form more than five per cent of the total cropped area.

High concentration towards a few crops has been one of the important aspects of the State crop economy. Though Assam has attained self-sufficiency in production of rice towards the end of Ninth Plan on account of increase in area under summer rice with advancement of irrigation facility and thus contributing around 5 per cent in the total production of rice in the country, its performance in the production of pulses has been very negligible. Here we have divided production of major crops into three phases. As it is presented in table 2.2.4, the rice, pulses and oilseeds have registered positive but varied growth over the three phases.

Table 2.2.4: Percentage Change in the Production of Major Crops in Assam

Crops	Production (Annual % change)		
	1980-81 over 1974-75	1990-91 over 1980-81	2000-01 over 1990-91
Rice	27.18	29.63	22.29
Wheat	51.86	-11.41	-17.94
Maize	55.81	-3.73	16.28
Total Pulses	18.94	2.97	40.21
Total oilseeds	56.94	51.30	2.19
Jute & Mesta	10.79	-6.28	-23.09

Source: computation is based on data collected from various issue of CMIE, Agriculture

Rice being a principal food crop as revealed in the cropping pattern, maintained a steady growth in the production from 1974-75 to 2001. The production of rice grew by

27.18 per cent in the latter half of the 1970s, 29.63 in the 1980s and 22.29 per cent in the 1990s. Despite recording a decline in share in the total cropped area in the late 1990s, increase in the production by 22.29 per cent was noted.

Growth in the production of oilseeds shows deceleration in the third phase. It increased by only 2.19 per cent in the third phase as against 56.94 and 51.30 per cent respectively in the first and second phase. The performance of maize has been mixed. It shows positive growth of 55.81 per cent in the first phase and 16.28 per cent in the third phase. However, overall production of maize witnessed a decline by 3.73 per cent in the second phase. The production of wheat and jute and mesta also showed a continuous decline from the second phase.

Bihar

The economic development in Bihar has always been considered to be an enormous task due to persistent poverty, complex social stratification, unsatisfactory infrastructure and weak governance. Flood is a recurrent phenomenon for 37 districts in the state, which accounts for 56 per cent of flood-affected population in India. It also ranks third among the most populous states in the country. The State is physically divided in two agro-climatic zones viz. Middle Gangetic Plains and Eastern Plateau and Hill Region, which falls among naturally endowed regions with huge abundant natural resources. The water is abundant and soil is highly fertile. Agriculture is still the predominant source of livelihood as more than 81 per cent of the State is rural population and agriculture contributes 31.7 per cent in the state domestic income. The per capita income of the State at current prices was Rs. 5,466 in 2001-02. This figure was lowest as compared to other states in India, nonetheless the per capita income of the state increased from Rs. 1,504 in 1984-85 to Rs. 5,466 in 2001-02.

The net area under cultivation accounted for 64.08 lakh hectares, which was 68.46 percent of total geographical area in 2001-02. Net cropped area constituted 56.64 lakh hectares against the gross cropped area of 78.97 lakh hectares. However, 61 per cent of the net cropped area was under irrigation in the state in 2001-02. The distribution of holdings is skewed in State as in the earlier states. Marginal holdings form

more than 80 per cent of total holdings with less than 37 per cent of area operated. The marginal and small holdings still account for around 92 percent of the total holdings. The average size of holding declined from 1.52 hectares to 0.75 hectares during 1970–71 to 1995-96. The proportion of cultivators as per the Censuses to total work force decreased from 43.3 per cent in 1970 to 29.3 in 2001, whereas, the proportion of agricultural labourers increased from 38 per cent to 48 per cent in the same period.

The cropping pattern presented in the table 2.2.5 highlights that Bihar is predominately foodgrain producing state, which covers nearly 90 per cent of its total cropped area. Rice, wheat and maize are the principal dominating crops accounting for 80 per cent of the total cropped area. It is interesting to see that their proportion has increased from 73.42 per cent to 79.49 per cent during the period of 1980-81 to 2002-03. Though area under rice remained stagnant throughout 80s and 90s with marginal variation, it experienced a decline in its share from 50.58 per cent to 45.12 per cent during 1999-00 to 2002-03. On the contrary, the area under wheat increased in 80s (from 15.74 per cent to 21.1 per cent) and during year 1999-00 to 2002-03 (from 21.23 per cent 26.78 per cent). The share of maize has remained stagnant through the period 1980-81 to 2002-03.

Table 2.2.5: Changing Cropping Pattern of Bihar

(Area as a percent to GCA)

Crop/ Crop groups	1980-81	1992-93	1999-00	2002-03
Rice	49.79	48.28	50.38	45.12
Wheat	15.74	21.1	21.23	26.78
Maize	7.92	7.46	8.06	7.59
Ragi	1.59	0.93	0.71	0.18
Gram	1.76	1.36	1.07	0.90
Tur	0.84	0.7	0.65	0.47
Potatoes	1.19	1.7	1.44	1.77
Sugarcane	1.00	1.42	0.92	1.35
Sesamum	0.18	0.17	0.17	0.05
Rapeseed & Mustard	0.77	1.10	1.08	1.13
Small Millets	1.34	0.57	0.34	0.10
Total Cereals	77.66	78.9	80.5	76.44
Total Pulses	12.27	10.47	8.88	10.03
Total Foodgrains	89.93	89.37	90.1	86.46
Total Oil seeds	2.32	2.23	2.37	1.95
GCA (000' Ha)	11148	9356	9979	7957

Source: Various issues of CMIE, Agriculture.

However, share of the remaining crops like ragi, gram, tur, potato, sugarcane, sesamum, small millets, rapeseed and mustard have been decreasing over the period from 8.65 per cent to 5.95 per cent since 1980s. The production behavior of major crops presented in the table 2.2.6 shows the percentage change in the production of principal crops in Bihar. Here, the production of major crops are taken in four phases and compared by taking current year over the previous year.

Table 2.2.6: Production of Principal Crops in Bihar

Crops	Production (Annual % change)			
	1980-81 over 1970-71	1990-91 over 1980-81	1999-00 over 1990-91	2003-2004 over 2000-01
Rice	35.64	16.48	-6.66	-0.44
Wheat	83.15	54.42	26.88	-14.87
Bajra	-17.5	-33.33	-100	7.69
Jowar	-24.68	-62.07	-100	50.00
Maize	-21.89	19.32	46.53	-3.83
Groundnut	38.46	33.33	33.33	0.00
Rape & Mustard	-19.59	111.17	-8.05	-20.49
Sesamum	-44.44	-21.67	97.87	35.00

Source: Agriculture, CMIE (Centre for Monitoring Indian Economy), Economic Intelligence Service, (March 2005 & 2006)

As a principal crop, rice registered positive growth in the first and second phase but in the third and fourth phases the production decline by 6.66 per cent and 0.44 respectively. The production of wheat grew remarkably in the first phase by 83.15 per cent, 54.42 per cent, in the second phase and 26.88 per cent in third phase but in the fourth phase, during 2000-01 to 2003-04, it decreased by 14.87 per cent. While the production of maize decreased in the first phase by 22 per cent, it improved its performance again in the second and third phase by 19.32 and 46.53 per cent respectively. On the other hand, the production of bajra and jowar kept declining till the end of third phase, though in the fourth phase jowar increased by 50 per cent and bajra by 7.69 per cent. Groundnut has registered a steady positive growth in the first three phases though fourth phase it remained almost stagnant. It is obvious from the above discussion that the production behaviour of rice, wheat and maize determines the fate of State economy. The fall in the production of rice since 90s and wheat in the recent years has wide implications on the income of the farming community.

Himachal Pradesh

Himachal Pradesh is described as one of the most dynamic hill states in India. It is predominately an agricultural state, which provides for a direct source of livelihood for more than 71 percent of the total population and contributes nearly 20.1 per cent to its total state domestic product. More than 90 per cent of the population resides in the rural areas. The State is physically divided into four agro-climatic zone based on precipitation, altitude and irrigation viz., Shivalik hill zone, mid hill zone, high hill zone and cold dry zone. Soil texture, climate and rainfall vary across the zones and hence cropping pattern. The livestock, forestry and pastures constitute an important component of the state economy. Terrace farming is practiced in hilly areas and foodgrains are grown in the valley areas of the State. Despite this, the state scores significantly high on the national human development indicators. The state also falls among high per capita income states in India. In 2000-01, the per capita income of the state at current prices was Rs. 18,920 against Rs. 4,375 in 1989-90.

The state is having 55.67 lakh hectares of geographical area and only 16.14 per cent area (7.47 lakh hectares) was found under the net cultivation in 2000-01. Most of the area of the state is under forest, pastures and grazing land and barren hilly land. It can be noticed that that only 12.20 and 20 per cent area of total geographical area respectively was available for net sown and gross cropped area in 2000-01. Besides, the level of irrigation facilities was also quite scarce, which accounted for 22.70 per cent of net sown area in 2000-01. The distribution of holdings is also skewed in State. Marginal holdings form more than 64 per cent of total holdings with 23 per cent of area operated. The marginal and small holdings still account for around 85 percent of the total holdings. The average size of holding declined from 1.53 hectares to 1.16 hectares during 1970–71 to 1995-96. The proportion of cultivators and agricultural labours to total work force decreased from 70.6 per cent to 65.3 and 4.17 per cent to 3.1 per cent respectively during census year 1970 to 2001.

The cropping pattern presented in the table 2.2.7 shows that Himachal Pradesh is predominantly foodgrains producing state and foodgrains cover nearly 83 per cent of its total cropped area. Gross cropped area in the State has significantly increased from

4.29 lakh hectares to 9.84 lakh hectares during the period of 1960-61 to 1990-91, but then in the period of economic liberalisation, it has been continuously decreasing. Wheat, maize and paddy are the dominant food crops accounting for 78 per cent of the total cropped area in the year 2002-03.

Table 2.2.7: Changes in the Cropping Pattern of Himachal Pradesh (Area as per cent to GCA)

Crop/crop groups	1960-61	1990-91	1999-2000	2002-03
Wheat	33.1	38.3	38.7	37.8
Maize	27.5	32.1	31.3	31.5
Paddy	-	8.6	8.3	8.8
Barley	-	3.0	2.7	2.5
Total cereals	87.9	84.5	82.8	78.9
Total pulses	6.1	4.1	3.4	4.2
Total food grains	94.1	88.6	86.2	82.8
Total fruits	-	4.4	6.03	17.4
Total vegetables	-	2.9	3.6	-
Total spices	-	0.3	0.4	-
Total oilseeds	1.6	2.2	1.97	1.47
GCA (000' Ha)	429	984	970	951

Source: Directorate of Land Records, Himachal Pradesh.

It is noticeable that the share of wheat and maize experienced a positive growth during the years 1960-61 to 1990-91, but since then they show virtual stagnancy in the expansion. The share of wheat and maize which were 33.1 per cent and 27.5 respectively in year 1960-61, increased to 38.3 per cent and 32.1 percent for the respective crops in 1990-91. The share of paddy and pulses has also shown some tendency since 1990-94. On other hand the share of oilseeds has come down from 2.2 per cent to 1.47 per cent since 90s. Nevertheless, the period of economic reforms seems to have brought new changes in the cropping pattern of the State. It is more conspicuous from the above table that cropping pattern of the State has been showing greater diversifying tendency toward horticultural crops. Share of fruits crops is showing a positive trend and it has dramatically increased from 6.03 per cent to 17.40 per cent during 1999-00 to 2002-03. Such shift is generally considered to be beneficial from the view of enhancing income of the farmers.

Production and productivity scenario for the major crops in the Himachal Pradesh is shown in the table 2.2.8. It clearly brings out that the production and productivity of almost all crops except barley increased significantly in period 1970-73 to 1998-99. However, during 1998-00 to 2001-04, area, production and productivity of wheat and paddy have shown negative growth.

Table 2.2.8: Areas, Production and Productivity of Principal Crops in Himachal Pradesh

Crops	Area (000 ha.)			Production (000 MT)			Productivity (kg./ha.)		
	1970-73	1998-00	2001-04	1970-73	1998-00	2001-04	1970-73	1998-00	2001-04
Maize	257.3	304.2	299.87	402.9	654.8	660.37	1566	2154	2202.0
Paddy	99.8	82.5	81.73	104.7	135.9	114.57	1049	1440	1405.7
Wheat	319.8	375.9	365.27	328.9	568.6	532.60	1030	1513	1456.3
Barley	41.2	26.8	24.87	53	33.8	32.63	1286	1261	1311.0
Potato	15.1	14.3	13.33	67.9	152.8	153.77	4497	11167	11541.7
Apple	28.7	85.8	87.20	86	225.7	264.45	2997	2630	3107.0
Ginger	2.1	1.8	-	1.3	2.8	-	619	1404	-

Source: Ministry of Agriculture, Government of India.

The productivity of maize, barley, potato and apple has significantly increased during the reference period. Among these crops, the productivity of potato and apple showed a significant increase from 11167 kg per hectare to 11541.7 Kg/ha and 2630 kg/ha to 3107 kg/ha respectively.

Karnataka

With changing economic scenario, Karnataka has always been known for taking effective measures for improving the livelihood of people. The State is not only recognized for providing world-class software services, but also is on the forefront in making its agriculture competitive. However, the economy of the State is still predominantly dependant on agriculture which contributes 20.3 per cent of State domestic product and sustains more than 70 per cent of the total population in 2002-03. The share of agriculture in GSDP decreased from 33 per cent in 1993-94 to 20.3 percent in 2002-03. The per capita income at current prices of the State recorded a rapid growth from Rs. 4,044 in 1989-90 to Rs. 18, 041 in 2000-01. The State has 126.07 lakh hectares net area under cultivation, which accounts for 66.18 per cent of total geographical area. Out of the gross cropped area of 114.5 lakh ha, the net sown area

constitutes 98.74 lakh ha. Net irrigated area accounts for 28.20 lakh hectares. The land holdings are unevenly distributed in State. Marginal holdings account for more than 41 per cent of total holdings with only 10 per cent of area operated. The marginal and small-holdings still form around 70 percent of the total holdings with 30 per cent of area operated. The average size of holding in the State declined from 3.2 hectares to 1.95 hectares during year 1970–71 to 1995-96. The proportion of cultivators to total work force decreased from 40 per cent to 29.2 during census year 1970 to 2001, whereas, the proportion of agricultural labourers remained stagnated at 26 per cent during the reference periods.

Despite having exposed to vast rainfed agricultural conditions laden with severe agro-climatic and resource constraints, the performance of the agriculture in the State has been commendable both in terms of growth and technological development. The State agriculture manifests diversification and segmentation in many ways. Major crops like rice, ragi, jowar, maize, pulses and oilseeds form large proportion of State cropping pattern. Besides, cash crops such as coffee, cashew, coconut, arecanut, cardamom, chillies, cotton, sugarcane and tobacco also constitute a significant part in the cropping pattern of the State.

In order to get clear picture of the developments taking place in the crop economy of the State, cropping pattern of Karnataka presented in the table 2.2.9 has been classified into four phases. First three phases show cropping pattern over the last three decades. The fourth one shows updated figures for year 2002-03. The sign of diversification of cropping pattern in the State can easily be noticed from the above table. The cropping pattern of the State over the period of 1978-79 to 2002-03 clearly brings out some of the important facts. First, the share of foodgrains has decreased significantly during 1978-79 to 1998-99. Second, this decline is clearly explained by the reduction in the share of cereal crops mainly bajra, ragi and jowar. The share of pulses almost remained stagnant with marginal improvement during 90s. Third, the area under the cash crops such as cotton decreased significantly from 9.5 to 4.9 percent and in case of sugarcane, it increased significantly from 0.7 per cent to 7.7 per cent during the reference period. Fourth, crops such as rice, maize, gram, arhar, groundnut and

sugarcane show positive trends, whereas, jowar, bajra, ragi and sunflower showed negative trends in their shares during the reference period.

Table 2.2.9: Percentage Change in the Cropping Pattern of Karnataka

Crop	1978-79	1988-89	1998-99	2002-03
Rice	9.8	10.4	11.6	10.01
Maize	1.3	2.1	4.16	5.63
Jowar	17.9	17.8	15	15.49
Bajra	6.4	3.9	3.3	2.64
Ragi	10.3	9.7	8.3	6.65
Cereals	53.7	47.1	43.9	43.0
Gram	1.4	1.5	2.8	4.16
Arhur	2.9	4.2	3.8	4.45
Pulses	13.5	13.7	14.7	18.05
Total foodgrains	67.2	60.8	58.6	61.05
Safflower	1.3	1.6	0.7	0.74
Groundnut	7.9	10.8	9.9	7.32
Sesamum	1	1.6	0.9	0.65
Cotton	9.5	5.5	4.9	3.41
Sugarcane	0.4	4.2	7.7	3.32

Source: Directorate of Economics and Statistics, Government of Karnataka, Banagalore

Considering the further developments in the cropping pattern during the period 1998-99 to 2002-03, we get some contrary picture against behavior of cropping pattern observed during 1978 to 1998-99. From the above table, it is quite conspicuous that the area under foodgrains significantly increased from 58.62 per cent in 1998-99 to 61.03 per cent in 2002-03. However, sugarcane, groundnut and cotton showed declining trends in their share. The crops such as gram, arhar, maize and jowar were preferred more by farmers against rice and sugarcane. This phenomenon could be attributed to the fact of recent severe drought years in the State.

Madhya Pradesh

Madhya Pradesh is a centrally located State of India, endowed with huge natural resources. It is the second largest State and ranks seventh in population of the country after the formation of Chhatisgarh State in the year 2000. The State economy is primarily agriculture in nature. The agriculture is main occupation of more than 74 per cent of its total population and contributes 22.5 per cent in the State domestic income. Besides, allied services also occupy more than 10 per cent share in the State income.

The State is physically divided into eleven agro-climatic regions and five crops zones based on soil and rainfall. It receives southwest monsoon ranging from 800 mm in the northwest to 1600 mm in the southwest. The floods, droughts and hailstorms are common features in the State. Almost every year one of the parts of State is hit by vagaries of monsoon. Per capita income of the State at 1993-94 prices has been lowest as compared to that of other States in India and it was increased marginally from Rs. 6577 in 1993-94 to Rs. 7003 in 2000-01.

The State is having a large forest area of 8.58 million hectares, which forms 27.9 per cent of the State geographical area. The net area under cultivation is 174.45 lakh hectares, which constitutes around 57 per cent of total geographical area. Out of gross cropped area of 203.06 lakh hectares, the net cropped area accounts for 150.78 lakh hectares in 2004-05. The State has highest proportion of dryland area and the irrigation facilities are inadequate. However, the State is endowed with rich water resources and if fully harnessed could irrigate nearly 57 per cent of the gross cultivated area of the State as against 25.5 per cent observed in 2002-03. The distribution of land holdings in the State is quite asymmetric. Marginal holdings form more than 40 per cent of total holdings with less than 9 per cent of total area operated in the year 1995-96. The marginal and small holdings (less than 2 hectare of land) still account for around 65 percent of the total holdings with 23 per cent of total area operated. As in other states, the average size of holding has come down from 4 hectares to 2.28 hectares during period of 1970-71 to 2000-01. The proportion of cultivators to the total work force rapidly decreased in the State from 52.16 per cent to 42.8 during the census years 1991 to 2001, while no changes in the proportion were observed during 1970 to 1991. The proportion of agricultural labourers to the total work force remained stable across 70s and 80s with some marginal fluctuations. However, it increased from 25.24 per cent to 28.7 during the period of 1991 to 2001.

As it can be noticed from table 2.2.10 that foodgrains dominated the cropping pattern of Madhya Pradesh till mid 80s. Among foodgrains, paddy and wheat crops are the dominant crops in the cropping pattern of the State. However, soybean, introduced in mid sixties, was replacing the food crops to become one of the important crops grown in the State (accounting for about 23.18 per cent of the gross cropped area in year

2002-03). Paddy, wheat, soybean and gram have been accounting for more than 60 per cent of the gross cropped area of the State. From the table 2.2.11, it can be observed that the wheat, gram, soybean, rapeseed and mustard, vegetables and spices are sharing larger gross cropped area. The share of these crops has shown upward moving trends in the reference periods. On other hand, the overall performance of total cereals has been dismal in the State. The share of cereals to total gross cropped area has been declining continuously from 62.84 per cent in 1956-57 to merely 36.38 per cent in 2002-03. The downward trend in the area share of total

Table 2.2.10: Percentage Change in the Cropping Pattern of Madhya Pradesh

(Percentage to the GCA)

Crop	1956-57	1984-85	1996-97	1999-00 (New MP)	2002-03 (New MP)
Paddy	22.07	22.02	21.09	8.52	9.26
Wheat	18.38	15.98	16.91	22.87	17.03
Jowar	9.32	8.48	3.57	3.3	3.63
Maize	2.44	3.77	3.31	3.92	4.70
Other Cereals	10.42	7.59	4.53	3.73	0.00
Total Cereals	62.64	57.84	49.4	42.35	36.38
Gram	8.74	9.22	9.82	12.62	12.46
Tur	2.03	2.19	1.45	1.52	1.49
Total pulses	20.54	21.52	19.67	20.7	20.31
Total Foodgrains	83.18	79.36	69.08	63.04	56.85
Soybean	---	4.38	16.28	21.74	23.18
Groundnut	1.89	1.34	1.0	1.1	1.05
Rape. mustard	0.87	1.58	2.87	3.07	2.04
Total Oilseeds	9.97	12.29	23.41	28.35	26.59
Cotton	4.35	2.33	2.03	2.39	3.09
Sugarcane	0.3	0.16	0.16	0.21	0.22
Spices	0.66	0.67	1.02	1.43	---
Fruits	0.2	0.23	0.23	0.28	---
Vegetable	0.31	0.58	0.79	1.1	---

Source: Calculated from the Data taken from Indiatat.com and CMIE, agriculture 2005.

cereal is clearly reflected in the declining of the share of jowar, paddy and other minor millets. Paddy accounted for 21.09 per cent in the gross cropped area in 1996-97 and contributed only 9.26 per cent after the division (or the formation of Chhatisgarh) of the State. The shift from cereals crops to non-cereal crops can be observed in the State and the share of oilseed and non-food crops is increasing. The share of total oilseeds increased from merely 9.97 per cent in 1956-57 to 26.59 percent in 2002-03. The cropping pattern of the State looks relatively more balanced from the viewpoint of

proportion of food crops, which now occupies nearly 56.85 per cent of gross cropped area as compared to the earlier share of 83.18 per cent. Interestingly, the four major crops identified earlier, i.e., rice, wheat, soybean and gram continue to dominate the cropping pattern accounting for 61.93 per cent of the gross cropped area.

The production scenario presented in the table 2.2.11 since 1956-57 highlights that first, The food grains production in the State increased more than double from 8.9 million tonnes in 1964-65 to 19.53 million tonnes in 1996-97 and now it has reached 14.1 million tonnes in 2004-05 after separation of Chhatisgarh from Madhya Pradesh. The paddy, wheat, maize and gram were the Key player behind the success.

Table 2.2.11: Production Performance of Agricultural Crops in Madhya Pradesh
(’000 Tonnes)

Crops	1956-57	1984-85	1996-97	1999-00 (New M.P.)	2004-05 (New MP)
Paddy	3,316	3,761	5,979	1,750	1,169
Jowar	1,099	1,520	792	529	629
Maize	191	1,161	948	1,271	1252
Wheat	1,730	3,935	7,795	8,687	7,177
Gram	1,007	1,303	2,294	2,536	2,549
Tur	257	401	321	270	257
Total Pulses	1,625	2,343	3,546	3,426	3,580
Total Foodgrains	8,576	13,295	19,539	16,064	14,104
Sugarcane	N.A.	1051	1680	1900	2176
Fruits	N.A.	N.A.	1,245	1,579	N.A.
Vegetable	N.A.	N.A.	2,850	3379	N.A.
Soybean	N.A.	770	3,941	4743	3747
Groundnut	201	160	253	222	243
Rapeseed mustard	57	243	673	625	674
Total Oilseeds	483	1,378	5,095	5,745	N.A.
Cotton	562	269	424	417	626

Source: Indiatat.com and CMIE, Agriculture 2005.

Second, the introduction of soybean in the State during eighties boosted the oilseed production as well as the performance of agriculture in the State. The soybean production was only 0.77 million tonnes in 1984-85, which reached upto 4.743 million tonnes 1999-00 albeit in the recent year 2004-05 it decreased up to 3.74 million tonnes. Among cereals production, wheat increased more rapidly from 3.93 million tonnes to 8.69 million tonnes during the periods 1984-85 to 1999-00. Among oilseeds the

production performance of gram was quite noticeable. Its production increased more than double during the periods 1984-85 to 1999-00.

Maharashtra

Maharashtra is characterized as a highly industrialized state equipped with better infrastructural facilities as compared to other States. The State occupied second rank in terms of population and third with respect to per capita income across states in India for the year 2000-01. Agriculture continues to be the main occupation and the major source of livelihood for more than 55 per cent of the State population. More than 81 per cent area of the State is constrained by severe rainfed conditions. The contribution of agriculture over the period shows a declining trend. The share of agriculture and allied activities in the total State domestic product declined steeply from 36 per cent in 1960-61 to 16 percent in 2001-02. However, the State recorded a steady growth of 3 per cent per annum in the per capita income over the last two decades. Its per capita income at current prices increased remarkably from Rs. 6,570 in 1989-90 to Rs. 23,726 in 2000-01.

Maharashtra is a third largest state in terms of geographical area in the country. The State is having 209.2 lakh hectares net area under cultivation, which constitutes around 68 per cent of total geographical area. Gross cropped area of 221.09 lakh ha accounted for 71.14 per cent and net cropped area 56 per cent in the total geographical area in the year 2003-04. Around 19 per cent of the net sown area of the State was under the irrigation in the year 2002-03. The land holdings in the State are skewedly distributed. Marginal holdings accounts for more than 40 per cent of total holdings with less than 11 per cent of total area operated in the year 1995-96, whereas, the marginal and small holdings constitute around 70 percent of the total holdings with 40 per cent of total area operated. The size of large and medium landholding both in terms of numbers and area operated has found to be rapidly declining in the State. The average size of holding has also come down from 4.28 hectares to 1.87 hectares during period of 1970-71 to 2000-01. The proportion of both main and marginal cultivators to total work force rapidly declined from 34.04 per cent to 28.7 during census year 1991 to 2001, while no changes in the proportion were observed during the periods 1970 to 1991. In case of

the proportion of main and marginal agricultural labours, it has marginally decreased from 29 per cent to 26 per cent during the period 1970 to 2001.

The cropping pattern in the State over the last two decades is classified into two phases viz., 1982-83 to 1992-93 and 1992-93 to 2002-03. Table 2.2.12, given below presents a diversified picture of State crop economy.

Table 2.2.12: Percentage Change in the Cropping Pattern of Maharashtra

(Percentage to GCA)

Crop	1982-83	1992-93	2001-02	2002-03
Rice	7.49	7.5	6.79	6.86
Wheat	5.16	3.48	3.85	3.39
Jowar	33.16	28	23.02	21.46
Bajra	8.08	9.13	7.37	6.91
Maize	0.32	0.62	3.92	1.66
Total Cereals	56.14	50.2	43.7	41.28
Gram	2.04	2.68	1.69	3.56
Mung	2.73	3.58	2.95	---
Tur	3.29	4.8	4.71	4.73
Total Pulses	13.58	15.39	15.75	15.84
Total Foodgrains	69.72	65.6	59.44	57.13
Groundnut	3.37	3.58	2.18	1.87
Soybean	--	1.3	5.09	5.61
Sunflower	0.26	2.11	1.34	1.29
Total Oilseeds	8.5	12.18	11.43	11.00
Cotton	13.16	12.75	14.09	12.51
Sugarcane	1.83	2.63	2.63	2.56
Fruits	0.69	1.22	1.7	2.62
Vegetables	0.74	1.19	1.18	1.81

Sources: (various issues of *Season and Crop Report of Maharashtra state*) and GOM (2003) CMI 2006.

Jowar, cotton, bajra and wheat are the dominant crops in the cropping pattern of the State. It can be noticed that the share of foodgrains is showing a continuous decline. The share of pulses and oilseeds increased in the first phase, but subsequently declined in the next phase. The share of cash crops, such as cotton and sugarcane have remained stagnated with marginal fluctuations. The share of fruits and vegetable has increased marginally over the last two decades. A decline in the proportion of area under foodgrains is largely due to decline in jowar and marginally for bajra. The share of jowar declined steadily from 33.16 per cent to 21.46 per cent over the reference

period, while the share of bajra has shown a continuous decline from second phase. Though the area under the oilseed increased in the first phase from 8.5 to 12.18 per cent, its share declined marginally in the second phase. Besides it also experienced the changes in the shares of its contributors, primarily in the groundnut and soybean crops. The share of soybean increased from 1.3 per cent to 5.61 per cent in the second phase, whereas the share of groundnut shown a continuous decline through out the reference periods.

Over the last two decades, the production performance of major crops shows a mixed picture in the State. The State recorded positive growth in the production of foodgrains in the 80s. But during the period 1990-91 to 2003-04, the production of foodgrains significantly declined from 13.24 million tonnes to 10.31 million tonnes mainly as a result of declining in the production of some cereal as well pulses.

Table 2.2.13: Production Performance of Principal Crops in Maharashtra

Crops	('000 Tonnes)			
	1980-81	1990-91	1999-2000	2003-04
Rice	2314.7	2313.7	2558.8	2839.0
Jowar	4408.5	5948.0	4692.6	3304.0
Wheat	931.3	918.7	1436.1	892.0
Bajra	696.6	1114.3	1134.0	896.0
Tur	318.4	420.9	868.1	693.0
Mung	95.0	311.0	303.0	376.1
Gram	137.2	457.8	600.0	493.0
Total Pulses	825.2	1440.9	2210.6	1955.3
Foodgrains	9471.7	13241.8	12700.9	10317.0
Groundnuts	405.6	991.6	572.0	453.0
Safflower	174.3	258.2	175.0	81.0
Total Oilseeds	1005.0	8093.0	2668.6	2921.0
Sugarcane	23706.3	38416.2	53140.4	26982.0
Cotton	1224.2	1880.3	3099.0	3080.0

Source: CMIE, agriculture, 2005.

The production trends in the State show significant shift towards commercial crops such as cotton, sugarcane and oilseeds. The production of rice, wheat, tur, mung and gram increased in the 80s and 90s as a result of relatively better market price for the products and good yield. It can also be noticed from table 2.2.13 that the production of jowar, wheat, bajra, tur, gram, groundnuts safflower, cotton and sugarcane show a declining trend from year 1999-2000 to 2003-04.

Punjab

In the midst of dominant philosophy of 'industrialization is a sole way for achieving economic development', the Punjab has put forth a good example in improving economic conditions of masses through agricultural development. It is a leading State in agriculture production and has made a great stride in development of its agricultural sector through green revolution. The State has moved towards commercialization of agriculture and able to compete in international market. The State has fertile soil and good infrastructure facilities. It is not surprising that agriculture contributes 37.5 per cent to the State domestic income and sustains more than 61 per cent of the total state rural population. The per capita income of the State at current prices was highest at all India level (Rs. 25,652) in 2002-03.

Punjab has about 85.54 per cent net area under cultivation of the total geographical area of State. The gross cropped area of the State is about 79.41 lakh hectares with high share of area sown more than once. The State has almost its entire net sown area under irrigation. The land holdings are more or less normally distributed in the State. Marginal holdings form only 18 per cent of total holdings with less than 3 per cent of area operated in the year 1995-96. The State recorded an increase in the average size of holding during 1970-71 to 1985-86 from 2.89 hectares to 3.77 hectares, whereas, no changes in the average holding size were observed during 1985-86 to 1995-96. In Punjab, the proportion of main and marginal cultivators to total workforce witnessed a sharp decline in the 90s compare to 70s and 80s. It decreased from 31.66 percent in 1991 to 22.6 percent in 2001 as against a decline from 42.6 per cent in 1970 to 31.66 percent in 1991. The proportion of main and marginal agricultural labourers to total workforce also declined marginally from 20 per cent in 1970 to 16 per cent in 2001.

Punjab is the largest contributor of wheat and paddy to the central pool. It contributed more than 20 per cent and 10 per cent respectively in the total all India production of wheat and paddy in the year 2003-04. The cropping pattern presented in the table 2.2.14 clearly shows that wheat and rice are dominant crops in the State, which contributed more than 76 per cent of total cropped area and 97 per cent in area under total foodgrains in 2002-03. One of the striking features of the cropping pattern of the State showed phenomenal increased in the area under paddy. Its contribution in the

total cropped area in 1960-61 was merely 4.87 per cent, which increased up to 17.48 per cent in 1980-81 and 33.07 per cent in 2002-03.

Table 2.2.14: Percentage Change in Cropping Pattern of Punjab

(Area as per cent to GCA)

Crop/crop groups	1960-61	1980-81	1990-91	2000-01	2002-03
Wheat	29.59	41.56	43.62	42.95	43.57
Rice	4.8	17.48	26.98	32.90	33.07
Maize	6.91	5.59	2.51	2.08	1.95
Bajra	2.6	1.05	0.15	0.06	0.10
Sugarcane	2.81	1.06	1.35	1.52	1.56
Barley	1.39	0.96	0.49	0.40	0.29
Total Cereals		66.61	73.8	78.40	79.01
Gram	17.71	3.81	0.81	0.08	0.08
Total Pulses	19.10	5.00	1.90	0.74	0.61
Total Foodgrains		71.61	75.70	79.11	79.53
Rapeseed & Mustard	2.26	1.86	0.97	0.68	0.65
Groundnut	1.42	1.23	0.13	0.05	0.06
Total Oilseeds	3.90	3.70	1.30	1.10	1.10
Cotton	9.45	9.58	9.34	5.99	5.72
GCA (000' Ha)	4732	6763	7502	7935	7826

Source: CMIE, Agriculture 2006, & Department of Agriculture, Punjab.

Though, area under wheat recorded a significant growth from 29.59 per in 1960-61 to 41.56 per cent in 1980-81, it remained sluggish in the next period 1980-81 to 2002-03. After wheat and paddy, cotton occupies third place in major crops of the State albeit it showed dismal performance in the 90s. The share of cotton remained stagnated at 9.45 with some marginal fluctuations throughout 1960-61 to 1990-91. The share of cotton decreased from 9.34 per cent in 1990-91 to 5.72 percent in 2000-01. The percentage area under maize, bajra, barley, gram and oilseeds underwent a significant decline as a result of surge of wheat-paddy duo.

The overall changing scenario in the area, production and productivity for major crops over the last three decades is presented in the table 2.2.15. It highlights some of the major features that Punjab crop economy has undergone. First, there has been increasing specialization towards rice, wheat and cotton due to their positive yield. These crops have recorded a positive growth in terms of area, production and productivity. Effective price policies coupled with relatively better technology available have resulted into the emergence of these crops as the most secure and profitable ones.

Table 2.2.15: Area, Production and Productivity in Punjab

Crops	Area (‘ 000 ha.)		Production (‘ 000MT)		Productivity (kg./ha.)	
	1970-73	2001-04	1970-73	2001-04	1970-73	2001-04
Rice	438.7	2543.7	854.3	9117.0	1936.7	3583.0
Bajra	160.3	7.3	174.0	6.97	1063.3	948.3
Maize	554.9	157.0	874.7	418.0	1573.3	2580.0
Wheat	2346	3413.0	5377	14721.0	2293.3	4313.0
Gram	337.3	6.7	277.7	6.1	823.3	910.0
Groundnut	172.7	4.5	168.3	3.9	976.7	873.7
Sesamum	15.3	15.9	6.0	5.4	393.3	338.7
Rap & Mus	134.3	55.7	82	60.3	603.3	1101.7
Cotton	459.5	502.7	990.1	1289.3	366.3	444.0

Source: Department of Agriculture, Punjab & CMIE, and Agriculture, 2006.

Second, bajra, groundnut and sesamum have undergone a negative growth in terms of area, production and productivity. Over the last three decades area and production of these crops have shown a rapid decline. There was 160.3 thousand hectares of land under bajra in triennium 1970-73, which declined to 7.3 thousand hectares in triennium 2001-04. The area under groundnut reduced from 172.7 thousand hectares to merely 4.5 thousand hectares during the reference period. Though decline in the yield of groundnut was not significant as compared to bajra, its area and production declined due to change in the relative yield performance of other crops. Third, crops such as maize, gram and rapeseed & mustard, witnessed a significant decline in the area and production, despite having positive growth in their yield.

Haryana

Haryana, located in the northwest part of India, is considered to be breadbasket of the country along with Punjab. Haryana is a predominantly agrarian State. Agriculture is a direct and indirect source of livelihood for more than 80 per cent of the total population of the State and contributes 26.4 in the State gross domestic income. The per capita income of the State is above the national average. The per capita income of the State at current prices increased from Rs. 6,233 in 1989-90 to Rs. 23,742 in 2000-01. The per capita income of the State is estimated to have increased more than three times in the last three decades.

Haryana was having 3.8 million hectares of cultivable area, which accounted for 86 percent of geographical area of the State in 2001-02. Out of gross cropped area of

6.32 million ha, the net cropped area accounted for 3.62 million ha. More than 83 per cent of net cropped area and 85 per cent of the gross cropped area of the State was under the irrigation in 2001-02. The agrarian structure of the State also underwent a few changes. The share of marginal holdings both in terms of area operated and number of operational holdings was observed to have increased against a reduction in the share of medium and large holdings. The share of marginal holdings increased from 32 per cent in 1980-81 to 47 percent in 1995-96, whereas the share of medium holdings declined from 37 per cent to 33 per cent and for large holdings from 31 per cent to 19 per cent in the abovementioned period. Marginal holdings accounted for more than 47 per cent of total holdings with less than 11 per cent of area operated in the year 1995-96. The average size of holdings declined from 3.77 hectares to 2.13 hectares during period of 1970-71 to 2000-01. The proportion of main and marginal cultivators to total workforce continued to decline from 49.1 per cent in 1971 to 36 percent in 2001. The proportion of total agricultural labourers to total workforce though increased from 15 per cent to 21 percent in the 70s, it declined in the subsequent periods and reached up to 16.21 per cent in 2001.

The cropping pattern of the Haryana State for the last three decades is shown in the table 2.2.16. The table clearly reveals that wheat, rice, bajra, rapeseed & mustard and cotton are dominant crops in the State. These crops covered more than 80 per cent

Table 2.2.16: Percentage Change in Cropping Pattern of Haryana

(Area as a percent to GCA)

Crop/ Crop groups	1970-71	1980-81	1990-91	2000-01	2003-04
Wheat	22.78	27.10	31.26	38.51	36.44
Rice	5.43	8.64	11.17	17.24	16.08
Bajra	17.73	16.13	10.29	9.95	9.89
Jowar	4.18	2.49	2.20	1.79	1.60
Maize	2.30	1.35	0.59	0.25	0.24
Total Cereals	54.57	58.18	56.36	68.34	64.72
Total Pulses	23.01	14.72	12.44	1.83	3.10
Total Foodgrains	77.58	72.90	68.80	71.03	67.82
Rape & Mustard	2.60	5.51	8.01	6.69	9.72
Total Oil seeds	2.86	5.69	8.22	7.42	10.13
Cotton	3.89	5.79	8.28	8.90	8.32
GCA (000' Ha)	4957	5462	5919	6115	6320

Source: CMIE, agriculture and Statistical abstract of Haryana, Department of agriculture, Haryana

of the gross cropped area. Aggregate share of these crops to the total cropped area continuously increased from 52.43 per cent in 1970-71 to 81.29 per cent in 2000-01.

It can be also noticed that despite decline in the area share of foodgrains, it still accounted for more than two thirds of the total cropped area. This decline over the last three decades was marked by increase in the area share of oilseeds, cotton as well as inter-change in the major components of foodgrains. The proportion of area under oilseeds and cotton continued to increase at marginal rate during 70s and 80s. Share of oilseeds reflected and explained by the proportion of rapeseed & mustard, remained stagnant in the 90s. But in early years of 2000, it again went up from 7.42 per cent to 10.13 per cent. However, the share of cotton remained almost stable at 8.30 percent since 1990-91 up to 2003-04. The inter-change in the share of foodgrains components clearly reflects increasing preferences of foodgrain growers and policy makers towards value added specialized crops; wheat and rice. The share of wheat and rice demonstrate a steady growth over the last three decades. The share of area under wheat increased from 22.78 per cent in 1970-71 to 38.51 percent in 2000-01, while the share of area under paddy increased from 5.43 per cent to 17.24 per cent in the same reference period. On the contrary, area proportion under pulses reduced from 23.01 per cent to merely 1.83 per cent in the abovementioned period. Cereal crops such as bajra, jowar and maize were found to have reduced their share. The percentage area under bajra showed a declining trend. However, declining in the area share was quite steeper in the 1980s and negligible in the 1990s.

The percentage change in the production and productivity of principal crops over the decades is presented in the table 2.2.17. For the analysis purpose, we have classified these periods into four phases to explain some of the important features of the state crop economy viz., 70s, 80s, 90s and early 2000.

Table 2.2.17: Percentage Change in Production and Productivity in Haryana

Crops	Production				Productivity			
	1980-81 over 1970-71	1990-91 over 1980-81	1999-00 over 1990-91	2003-04 over 2000-01	1980-81 over 1970-71	1990-91 over 1980-81	1999-00 over 1990-91	2003-04 over 2000-01
Rice	166.96	49.35	41.44	3.64	0.52	6.54	-13.72	7.55
Jowar	-15.79	35.42	-64.62	13.04	0.25	42.86	-58.00	22.38
Bajra	-41.40	8.68	10.46	53.05	-0.46	56.36	15.12	48.98
Maize	-36.15	-40.96	4.08	11.76	-0.02	25.00	73.57	14.72
Wheat	49.10	84.42	49.72	-5.53	0.14	47.46	19.83	-3.41
Groundnut	-8.24	-76.92	-61.11	500.00	0.54	-41.41	33.33	5.85
Rape & Mus	103.41	254.19	-6.47	78.89	1.03	127.12	-1.19	13.80
Cotton	73.89	77.69	13.33	1.59	0.06	14.29	2.00	8.10

Source: Agriculture, CMIE, 2005

It is apparent from table that growth rates of rice, cotton and wheat in terms of production and yield slowed down over the periods. Rice, which had recorded a growth of 166.96 per cent in the first phase, continued to decline in the subsequent phases. The yield growth performance of rice was found upward moving in the first, second and fourth phases. However, the yield of the crop declined by 13.72 per cent in the third phase. Though growth in the production of wheat over the second phase was higher than the first phase, it declined in the third phase and turned negative (- 5.53 per cent) in the fourth phase. The same trends in the production and productivity growth of cotton were observed. The production and yield growth rates of these two crops went up in the second phase, but recorded declining trends in the subsequent phases. The growth rate of rapeseed and mustard production were quite remarkable in the first (103.41 per cent) and second phase (254.19 per cent), it experienced a negative growth (-6.47 per cent) in the third phase. However, in early period of 2000, the crop registered a positive growth of 78.89 per cent over the three years. The growth in production and productivity of the rapeseed and mustard crop were moved together. The rate of growth of groundnut production showed a continuous decline over the three decades (phases) though it has shown the sign of revival in the early 2000. A decline in production of bajra and jowar in the first phase was largely a result of decline in the area and productivity of these crops. However, in the subsequent phases the production performance of these crops was largely determined by the change in their productivities.

Rajasthan

Rajasthan, geographically the largest state of India, is predominantly an agrarian State. More than 75 per cent of its total population resides in rural areas and 70 per cent of total workforce is still engaged in the agriculture. Agriculture in the State is characterised by rainfed conditions and erratic rainfall. Out of 32 districts, 11 districts fall under arid climate. Desert land covers around two third of geographical area in the State. The average rainfall in the state is merely 58 cms. More than 60 per cent of its total cultivation is under *kharif* season. Growing of single rainfed crop in kharif season that is associated with high risk has led to dependence on livestock. However, considering the major economic indicators of the state, the share of agriculture sector shows a continuous decline from 62 per cent in 1970-71 to 20.8 percent in 2002-03. The per capita income of the state at current prices recorded a growth of more than three times over the last decades. The per capita income of the state at current prices increased from Rs. 3,241 in 1989-90 to Rs. 11,989 in 2000-01.

As we have mentioned earlier, Rajasthan being the largest state in the country covers about 34.26 million hectares of geographical area. A net area under cultivation accounted for 74.82 per cent of the total state geographical area in 2001-02. Out of gross cropped area of 20.79 million hectares (about 60.7 percent of total geographical area), the net-cropped area accounted for 16.76 million hectares (48.93 per cent of total area) in the above mentioned period. Whereas, around 32 per cent of total gross cropped area as well as net cropped was under the irrigation. Considering the pattern and distribution of operational land holdings in the state, it was observed to be quite a skewed and unchanged over the period of time. The marginal and small holdings accounted for around 50 percent of the total holdings with 17 per cent of area operated in 1995-96. The average size of holding declined from 5.46 hectares to 3.96 hectares during 1970–71 to 1995-96. The proportion of cultivators to total work force decreased from 64.9 per cent in 1970 to 55.3 percent to 2001, whereas the proportion of agricultural labors increased at negligible rate from 9.61 per cent in 1970 to 10.60 per cent in 2001.

The cropping pattern of the State over the last two decades is represented in the table 2.2.18. From the following table, it can be noticed that bajra, wheat, rapeseed &

mustard, jowar and maize crops dominate the cropping pattern of the state. These five crops share more than 50 per cent of the gross cropped area in the state. The cropping pattern of the state is characterized by a decline in the share of foodgrains and increase in the share of oilseeds.

Table 2.2.18: Changes Cropping Pattern in Rajasthan

Crops	(Percent to GCA)			
	1978-80	1988-90	1998-00	2000-02
Bajra	25.98	28.95	21.24	24.35
Wheat	12.0	9.31	12.86	11.48
Jowar	4.94	5.09	2.94	3.22
Maize	4.98	5.0	4.75	4.96
Rice	1.17	0.87	0.89	0.78
Total Cereals	51.83	50.47	43.79	45.93
Total pulses	19.58	15.99	15.76	14.32
Total foodgrains	71.42	66.47	59.55	60.25
Sesamum	2.19	2.07	1.14	1.37
Groundnut	2.0	1.39	1.33	1.09
Rape& Mustard	1.96	8.45	10.36	8.10
Total Oilseeds	6.7	13.04	17.63	14.37
Cotton	2.35	1.99	0.09	2.55

Source: CMIE, Agriculture, 2005 and www. Indiatstat.com

The rate of decline in the foodgrains in the 1980s from 71.42 per cent to 66.47 per cent was mainly due to decline in the area under pulses and marginally in the cereals. The proportion of pulses declined from 19.58 per cent in 1978-80 to 15.99 per cent in 1988-90. Though share of pulses in the total cropped area remained constant in the 1990s, a further decline in the share of foodgrains resulted on account of decline in the share of cereals, mainly bajra and jowar. The share of bajra recorded a significant decline from 28.95 per cent to 21.24 per cent, whereas jowar declined from 5.09 per cent to 2.94 per cent. It also can be noticed that a decline in the share of foodgrains was compensated by increase in the share of wheat from 9.31 per cent to 12.86 per cent in the same period. The share of maize remained almost stagnant around 5 percent over the reference period. Among non-foodgrain crops sesamum and groundnut showed reduction in the share albeit marginally over the period 1978-80 to 2000-02. The period of the 1980s is marked by increase in the area under oilseeds in many states. It is conspicuous that Rajasthan was not behind of other states in the race of promotion of cultivation of oilseed crops. A substantial increase in the share of oilseeds (mainly due to

increase in the rapeseed and mustard) was observed during the 1980s (from 6.7 per cent to 13.04 per cent). Moreover, in the subsequent periods it continued to increase (up to 17.63 per cent by 1998-00) in the state. In the early years of 2000, a few new developments/changes in the cropping pattern were observed, primarily in the favour of bajra and cotton crops. These crops expanded their share in the total cropped area. Whereas, crops such as rice, rapeseed and mustard, wheat and groundnut reduced their share.

Production behaviour of major crops over last two decades is presented in the table 2.2.19. It highlights some of the major features of the growth performance of crop economy that agriculture has witnessed over the last two decades in the state. First, the percentage change in the production of the major crops over the 1990s observed to have slowed down after impressive performance in the 1980s.

Table 2.2.19: Per cent Changes in Production and Productivity in Rajasthan

Crops	Production			Productivity		
	1990-91 over 1980-81	1999-00 over 1990-91	2003-04 over 1999-00	1990-91 over 1980-81	1999-00 over 1990-91	2003-04 over 1999-00
Bajra	119.51	-47.80	411.27	126.99	-35.67	244.55
Wheat	80.28	56.24	-12.72	62.23	6.95	10.00
Jowar	52.47	-66.59	204.45	64.79	-43.99	128.85
Maize	65.92	-25.67	113.62	51.95	-21.66	79.48
Rice	-5.14	77.76	-34.76	34.17	6.77	30.98
Sesamum	454.12	-91.67	799.36	303.75	-77.09	512.16
Groundnut	154.25	21.43	24.70	132.59	2.55	62.11
Castor seeds	3675.00	31.79	125.63	453.85	-53.33	180.16
Rape & Mustard	573.10	48.49	8.69	27.01	10.92	35.34
Cotton	136.58	7.16	-27.96	85.41	-15.45	21.03

Source: CMIE, Agriculture, 2005

Second, production behaviour is largely controlled by change in the yield of almost all crops such as bajra, jowar, maize, sesamum, groundnut, rapeseed and mustard, wheat, castor seed and cotton during 1980s and 1990s. Third, despite having a low level of agricultural infrastructure, Rajasthan was able to respond to the national priorities. The oilseed economy grew at the phenomenal rate of growth of 10 per cent over the last two decades. Groundnut, castor seeds, rapeseed and mustard were the

real drivers of growth in the production of oilseed. In the 1980s, the growth in the production of these crops was phenomenal, while in the 1990s they continued to show positive growth albeit at decreasing rates.

Uttar Pradesh

Uttar Pradesh, the most populous and fourth largest State, accounts for over 16 per cent of the total population of India and 9 per cent of the total geographical area of the country. The State is physically divided into four regions viz., Himalayan region, Alluvial plain region, Bundelkhand region and Eastern Plain region. The agriculture is a main stay of the state economy, where more than 75 percent of its' rural population are directly and indirectly engaged in this sector. The share of agriculture and allied services to the Gross state domestic product has decreased from 37.94 per cent in 1993-94 to 31.49 per cent in 2002-03. On contrary, Per capita income of the state at constant prices has increased from Rs. 5258 in 1993-94 to Rs. 9895 in 2002-03.

The State is having 24.20 million hectare of geographical area. The net area under the cultivation and gross cropped area accounted for around 78 per cent and 70 per cent of total state geographical area respectively in 2001-02. The land use pattern for the given period also shows that the area under gross cropped area surpasses the state geographical area as a result of higher proportion of area sown more than once, which accounted for, 8.63 million hectares, around 36 percent of total geographical area. The state is endowed with huge water resources. Around 53 per of the total net sown area and 76 per cent of gross cropped area were under irrigation. The distribution of operational land holdings has observed to be highly skewed in the state over the period of 1980-81 to 1995-96. The marginal holdings alone accounted for about 75 per cent of the total holdings with 34 per cent area operated in 1995-96. While, both marginal and small holdings accounted for 90 percent of the total holdings with 56 per cent of area operated in the same reference period. The marginalisation process seems to have accelerated further in the state. The proportion of marginal holdings in the total operational holdings increased from 70 percent in 1980-81 to 75 percent in 1995-96. The average size of holding declined from 1.16 hectares in 1971 to 0.86 hectares in

1995-96. The proportion of cultivators to total work force also decreased from 57.8 per cent in 1970 to 41.10 per cent to 2001, while the proportion of agricultural labors increased from 19.95 per cent to 24.80 per cent during the same period.

The cropping pattern of the state presented in the table 2.2.20, shows that the crop economy of the state is predominantly a foodgrain economy and area under rice and wheat covers more than 50 per cent of the total cropped area. It is quite conspicuous that the proportion of area under foodgrain has drastically declined from 79.18 per cent in 1999-00 to 70.95 percent in 2002-03 against virtual stagnancy in the 1990s and marginal decline in the 1980s.

Table 2.2.20: Changes in Cropping Pattern in Uttar Pradesh

Crop/ Crop groups	(Area as a percent to GCA)			
	1980-81	1992-93	1999-00	2002-03
Rice	21.53	21.33	22.68	17.53
Jowar	2.76	1.84	1.35	0.95
Bajra	4.05	3.26	3.09	2.79
Maize	4.98	4.18	3.65	3.02
Wheat	33.01	34.69	35.94	36.05
Barley	2.79	1.66	1.16	1.01
Total Cereals	71.66	68.01	69.5	61.40
Gram	6.09	4.15	3.14	1.01
Tur	2.13	2.08	1.63	1.30
Total Pulses	11.65	11.38	10.3	9.56
Total Foodgrains	83.31	79.39	79.18	70.95
Sugarcane	5.55	7.61	7.62	8.59
Rape & Mustard	9.26	4.69	4.08	2.31
Total Oil seeds	16.05	6.64	5.69	4.56
GCA (000' Ha)	24574	24400	24903	25225

Source: Agriculture, CMIE (1998 & 2006)

Decline in the proportion of foodgrain area during nineties was largely due to negative growth in the proportion of area under cereal crops (primarily in the rice) as well as pulses, while decline in the 1980s was mainly due to decrease in the share of jowar, bajra, barley, maize, gram and tur. The area proportion of oilseeds also shows a continuous decline from 16.05 per cent to 4.56 per cent as a result of a decline in the share of rapeseed and mustard over the abovementioned reference period. The share of rapeseed mustard was about 9.26 per cent in the total cropped area; it came down to

2.31 per cent in 2002-03. The area proportion of sugarcane has gone up from 5.55 per cent to 8.59 per cent over the period 1980-81 to 2002-03.

The production performance of the major crops is presented in table 2.2.21, which highlights some of the important features of overall pattern of the output growth of the state agriculture economy. Here, production behavior of different crops is divided into four phases by taking percentage change in the output over the decade. Considering the cropping pattern of the state, it can be observed that the crop economy of the state is moving towards more specialized crops; rice and wheat. The production of these crops has positively increased albeit at decreasing rate over the period of time.

Table 2.2.21: Per cent Changes in Production in Uttar Pradesh

Crops	Production (% change)			
	1980-81 over 1970-71	1990-91 over 1980-81	1999-00 over 1990-91	2003-04 Over 1999-00
Rice	50.5	84.12	23.18	3.06
Wheat	74.06	38.96	37.37	0.06
Bajra	-16.89	19.39	33.15	-3.89
Jowar	-16.46	21.43	-34.89	-2.21
Maize	-50.22	60.2	-5.61	-2.47
Groundnut	-39.64	-15.9	-16.59	-36.17
Rape & Mustard	-6.47	-10.59	-40.21	-18.95
Sesame	-52.17	-62.55	-9.71	-15.00
Cotton	-32.61	-47.1	-93.9	320.00

Source: computation is based on data collected from various issues of CMIE, Agriculture

The output of wheat increased by 74.06 per cent in the first phase and sustained the growth of around 38 per cent over the second and third phases. But in the early 2000 (the fourth phase), it could increase by only 0.06 per cent largely due to decrease in the area under the crop. While in the case of rice, the production increased from 50.50 per cent in first phase to 84.12 per cent in the second phase but came down to 23.18 per cent in the third phase and 3.06 per cent in fourth phase. On other hand, the output of cotton and oilseed crops namely groundnut, rapeseeds and mustard and sesamum shown a continuous negative growth over the all four phases. In the production growth of bajra, jowar and maize high fluctuations were observed.

CHAPTER III

METHODOLOGY

3.1: Selection of Crops and Districts

This study is based on both primary data and secondary data. To get primary data the study is confined to two crops, i.e. one cereal crop and one pulse crop based on the area predomination in the selected States, suggested by Indian Agricultural Statistics Research Institute, (ICAR) New Delhi. Accordingly, the primary data was collected through field survey from two districts of each selected States. The secondary data were collected from various State Government publications of respective selected State.

3.2: Sampling Design

For the 'study of estimation of seed, feed and wastage ratios of major foodgrains', the initial proposal, schedules for primary data collection and sampling design to be followed were provided by the Indian Agricultural Statistics Research Institute, New Delhi. The two districts, one for cereal and one for pulse crop, from each States were selected on the basis of density of area under the crop in the district (see table 3.2.1). After the selection of the district, four strata were formed by suitably combining the adjacent blocks/talukas based on area under the crop. From among the list of villages of these blocks, five villages were randomly selected from each stratum. After that, a complete enumeration was done of all the farmers growing these crops in the villages for sample survey. All the farmers in the village were divided into three categories viz., small, medium, and large farmers. A sample of 15 farmers was selected randomly from each of these three groups viz., small farmers (5), medium farmers (5) and large farmers (5) totaling to three hundred for each crop (each district).

Table 3.2.1: List of Selected Districts in the Major States and Total Number of Farmers in the Selected Villages

Sl. No.	Name of The States	Name of the Selected Districts	Number of the Selected Villages	Total Number of Farmers in the Selected Village \$
1	Andhra Pradesh	Godavari	20	4611
		Krishna	20	3267
2	Assam*	Jorhat	08	1297
		Morigaon	08	1003
3	Bihar	Saram	20	2680
		Patna	20	2440
4	H. Pradesh	Hamirpur	20	1003
		Shimla	20	1827
5	Karnataka	Bijapur	20	8899
		Gulbarga	20	5783
6	M. Pradesh	Rewa	20	4230
		Vidisha	20	3007
7	Maharashtra	Nanded	20	4933
		Ahemad Nagar	20	4912
8	Punjab	Amritsar	20	4960
		Sangrur	20	484
9	Rajasthan	Junjhun	20	1452
		Sikar	20	1611
10	Uttar Pradesh	Gautam Budh Nagar	20	2999
		Hamirpur	20	3379
11	Haryana	Kurkshetra	20	2021
		Bhiwani	20	3006
12	All India		416	69804

Note: 1) * In the case of Assam State, in the selected district, a total number of 100 sample farmers (50 for each stratum) were selected. Furthermore, only two strata were selected instead of four strata suggested as per the guidelines of study. In each stratum, four villages (instead of five villages as per guidelines of study) were selected with disproportionate number of households across the selected groups/categories of size holdings.

2) \$ indicates the total number of farmers growing selected crop in selected villages of the State.

3.3 Selection of the Farmers

A complete enumeration was carried out through census of all the farmers growing identified crops in the five selected villages from each selected district for the study. Five cultivators each from small (0.01 to 2 ha), medium (2.01 to 4 ha) and large

(4.01 and above ha) were selected randomly from the list of farmers in each village. Thus, a sample of 300 farmers was available from each selected district for the study. In case of Assam due to some technical problem a total size of the sample was 200 instead of 600 in other states.

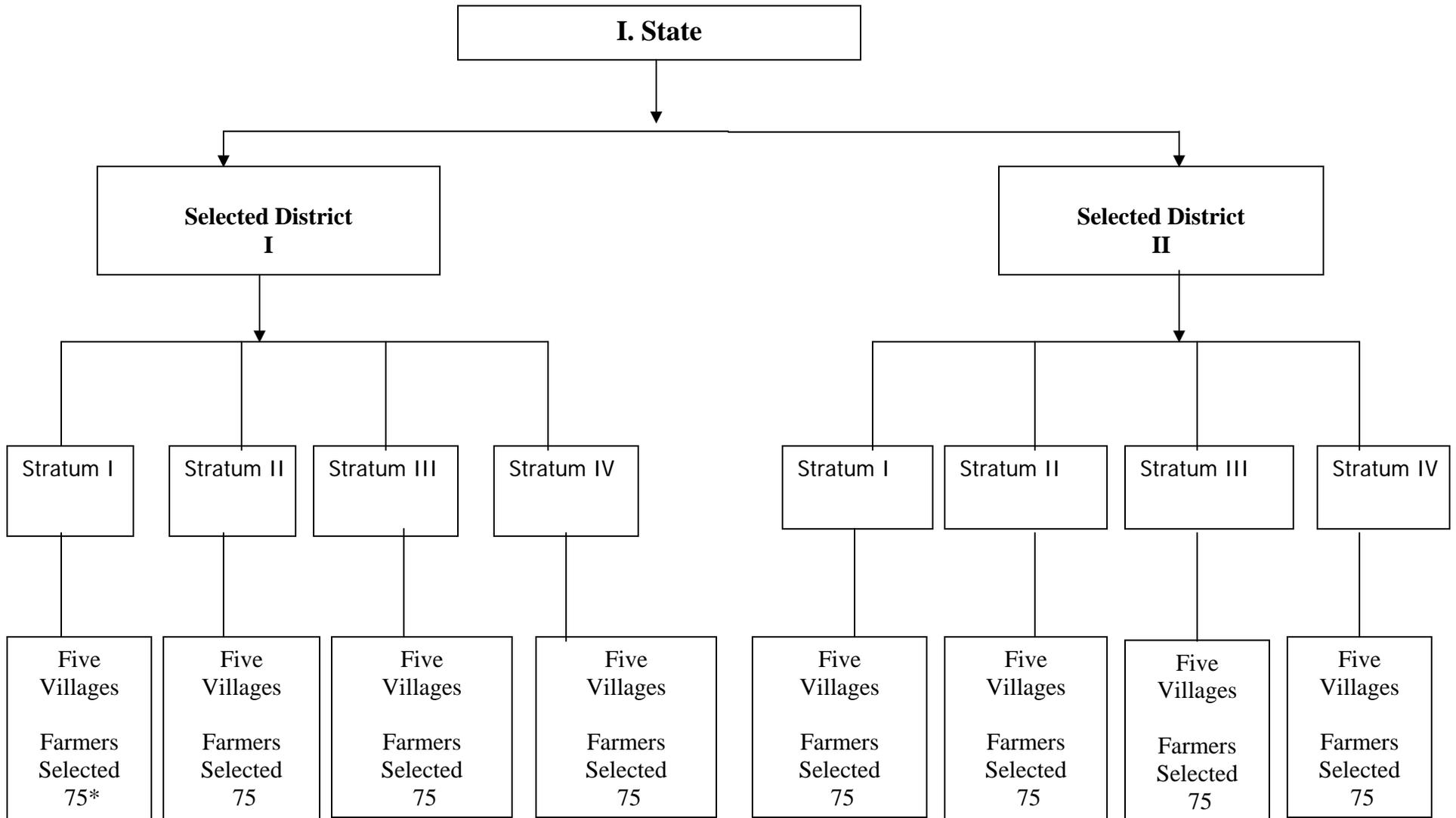
Fieldwork was carried out for both cereal and pulse crops in both districts taking the same sample of farmers. All the sample farmers were growing cereals and pulses in selected districts. Analysis of primary data includes tabulation of cereal and pulse crops separately. Hence, estimates of seed, feed and wastage ratios were calculated for both crops and for both the districts individually. However, one cereal growing district and one pulse growing district were selected in each state.

Reference Year

As per objectives of the study, the primary data for both crops were collected by personal interview method using the prescribed schedule. The reference year for the study was 2004-05. Tabular analysis and simple statistical tools such as averages, percentages etc., were used for the interpretation of the results.

This study is organised into five Chapters. Chapter 1 provides brief description about history of methods of estimation followed in the State income accounting process, trends over last three decades in the seed, feed and wastage ratios based on State Income Accounting Methodology and probable impact on the State Income Accounting, etc.: In Chapters 2 and 3, we present details about sampling design and profile of the selected States. Chapter 4 begins with discussion of agro-economic characteristics details of selected sample districts including number of farmers growing selected crop, number of selected sample farmers, their size of operational holdings, status of their agricultural land, cropping pattern and production and per hectare productivity levels of selected crops. Then it discusses the utilisation of grain for seed, feed and wastages, processes of utilisation, methods and assumptions with farm size-wise as well as crop-wise estimates of seed and feed and wastages proportions. Finally, summary and observations are presented in the fifth chapter.

SAMPLING PROCEDURE



* Fifteen sample farmers were selected from each village where five each belongs to small, medium and large farm categories.

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Introduction

As said in the earlier chapter, the important results of the study in terms of estimates relating to seed, feed and wastage ratios are brought out in this chapter. Though major focus of this chapter is on discussing estimates of seed, feed and wastage ratios for selected cereal and pulse crops, information with regard to the agro-economic characteristics of the study area has also been provided for each selected State. This includes distribution of sample farmers across the land holding size categories, their average size of holding, net and gross cropped area, irrigation status, cropping pattern, production and productivity levels of selected crops with their gross and per hectare gross value of output, livestock and poultry strength and their respective feed consumption. The chapter systematically proceeds by providing an insight into all these estimates explaining general situation of sample farmers in the study areas of the selected States and thereafter discusses estimates relating to seed, feed and wastage ratios with net quantity availability of major selected foodgrains for human consumption.

4.2 Agro-Economic Characteristics of Study Area in the Selected States

In this subsection, an attempt is made to highlight existing general situation observed in the study areas of the selected states with regard to distribution of number of farmers growing the selected crops and their average size of operational holdings, percentage of total operated land involved in land leasing practices, distribution of gross as well as net cropped area, distribution of agricultural land status, cropping pattern, production and per hectare productivity levels of selected crops/sample farmers.

4.2.1 Details on Number of Farmers and their Operational Land Holdings

The distribution of number of farmers growing selected crops and their average size of operational holdings observed in the study areas selected for cereal crops is presented in the following table 4.2.1. The total number of farmers in the sample villages growing selected cereal crops worked out to be 39, 077 for the selected states. Among the study areas of all these states, the total number of farmers growing selected cereal crops in Andhra Pradesh, Madhya Pradesh, Karnataka, Maharashtra and Punjab were estimated above the average number of farmers for all sample states (3552).

Table 4.2.1: Basic Features of Sample Households: Cereal Crop

Sl. No	Name of the States	No of Farmers in the Village (Nos)	Average Size of Holding (Ha)	Leased in / out area as % of Total Area (%)	Net Cropped Area (Average) per HH (Ha)	Gross Cropped Area (Average) per HH	No of Sample farmers Selected (Nos)	Average Size of Holding Selected Sample farmers (Ha)
1	A. Pradesh	4611	1.19	36.41	1.19	2.03	300	2.75
2	Assam	1297	0.65	11.08	0.67	0.80	100	1.45
3	Bihar	2680	2.46	-	2.21	3.51	300	2.34
4	H. Pradesh	1003	1.33	-	0.85	1.56	300	1.64
5	Karnataka	8891	2.61	0	2.61	2.91	300	4.17
6	M. Pradesh	4230	3.20	0	3.37	6.24	300	3.45
7	Maharashtra	4933	1.69	1.53	1.59	1.73	300	3.09
8	Punjab	4960	3.50	15.90	3.80	6.90	300	4.50
9	Rajasthan	1452	2.99	0	2.97	3.60	300	3.30
10	U. Pradesh	2999	0.86	4.38	0.88	12.63	300	1.63
11	Haryana	2021	2.62	-	4.01	4.01	300	4.08
	All	39077	2.10	-	2.20	4.17	3100	2.95
	Std. Error of Mean	696.60	0.30	-	0.37	1.02	18.18	0.33

Note: Bold figures indicate the average value and dash represents not available or given.

The average size of operational holdings for the sample states found to be 2.10 hectares. Moreover, at disaggregated level, the average size of operational holdings was estimated highest for Punjab (3.50 ha) followed by Madhya Pradesh (3.20 ha). Average size of operational holdings in Assam and Uttar Pradesh was even less than a hectare. Per household average net cropped area for all the sample states worked out at 2.20 hectares. Per household average net-cropped area for Haryana, Punjab, Madhya Pradesh, Karnataka, Rajasthan and Bihar were above the overall per household average

net cropped area for all the sample states. Whereas, per household average gross cropped area for Uttar Pradesh, Punjab and Madhya Pradesh were also observed to be higher than that of for all the sample states (4.03 ha). Per household average gross cropped area for these states were estimated at 12.63 ha, 6.90 ha and 6.24 hectares respectively. The land leasing observed to be a common practice in Andhra Pradesh, Assam, Maharashtra, Punjab and Uttar Pradesh. The proportion of leased in/out land to its total agricultural land were estimated at 36.41 per cent for Andhra Pradesh, 11.08 per cent for Assam, 1.53 per cent for Maharashtra, 15.59 per cent Punjab and 4.34 per cent for Uttar Pradesh. While in the remaining states, these practices were not in place. It can also be observed that except Assam, in each state 300 sample farmers were selected for the study. The distribution of size of operational holdings of sample farmers shows little variation across the states. Average size of operational holding for all sample farmers of the selected states was estimated at 2.97 hectares.

The distribution of number of farmers and their average size of operational holdings observed in the study area selected for pulse crop is presented in the following table 4.2.2.

Table 4.2.2: Basic Features of Sample Households: Pulse Crop

Sl. No	Name of the States	No of Farmers in the Village (Nos)	Average Size of Holding (Ha)	Leased in / out area as % of Total Area (%)	Net Cropped Area (Average) per HH (Ha)	Gross Cropped Area (Average) per HH	No of Sample farmers Selected (Nos)	Average Size of Holding Selected Sample farmers (Ha)
1	A. Pradesh	3267	1.23	26.37	1.23	2.07	300	3.31
2	Assam	1003	0.46	10.54	0.49	0.64	100	1.05
3	Bihar	2440	2.10	-	1.89	3.39	300	2.01
4	H. Pradesh	1827	0.91	-	1.09	1.53	300	1.41
5	Karnataka	5783	2.55	0.00	2.55	3.01	300	4.30
6	M. Pradesh	3007	3.47	0.00	3.97	6.42	300	3.79
7	Maharashtra	4912	1.33	1.26	1.25	1.45	300	3.02
8	Punjab	484	6.00	29.40	3.70	12.01	300	6.30
9	Rajasthan	1611	3.56	0.00	3.52	5.66	300	3.91
10	U. Pradesh	3379	1.68	6.50	1.69	3.86	300	3.19
11	Haryana	3006	3.29	-	4.28	4.28	300	4.38
	All	30719	2.42	9.26	2.33	4.03	3100	3.33
	Std. Error of Mean	477.49	0.48	-	0.40	0.96	18.18	0.45

Note: Bold figures indicate the average value and dash represents not available or given.

Total Number of farmer households growing selected pulse crops in the 208 sample villages worked out to be 25,273. The maximum and minimum number of farmers (5783) growing pulse was in Karnataka, and Punjab (484) respectively. Average size of operational holding for the farmers growing pulses in sample villages of the selected states worked out at 2.42 hectares. Average size of operational holdings in Punjab, Rajasthan, Karnataka, Madhya Pradesh and Haryana were higher than overall average for all the sample states. Per household average net and gross cropped area for overall sample states were estimated at 2.33 and 4.03 ha respectively. Per household average net as well as gross cropped area in the sample villages of Punjab, Rajasthan, Madhya Pradesh and Haryana were higher than that for all selected sample states. However, per household average net cropped area for Karnataka (2.55 ha) though found to be higher than the overall per household average net cropped area (2.33 ha) of the sample states, it's per household average gross cropped area (3.10 ha) was lower than that for all sample states (4.03). The table also reveals that average size of operational holdings of sample farmers varied from 1.05 ha in Assam to 4.38 ha in Haryana. Among the states having lease in/out practices, highest percentage of total operated area involved in leasing market was found to be in Punjab (29.40) followed by Andhra Pradesh (26.37 per cent), Uttar Pradesh (6.50 per cent), Assam (9.54 per cent) and Maharashtra (1.26 per cent).

4.2.2 Agricultural land Status of Selected Farmers

In table 4.2.3, the distribution of agricultural land status of the sample farmers observed in the study areas selected for cereal crops is presented. The role of irrigation in augmenting agricultural output can hardly be contended. Despite this, prime focus of state policies was quite biased towards a few regions in the country over the last five decades. The high variability in the proportional coverage of irrigation to total agricultural land across the states is clearly manifested in the following table.

Table 4.2.3: Distribution of Agricultural Land of Sample Farmers: Cereal Crop

Sl. No	Name of The States	Percentage to total area		Total Area (In ha)
		Irrigated	Un-irrigated	
1	Andhra Pradesh	92.45	7.55	1488.74
2	Assam*	24.65	75.35	1631.02
3	Bihar	14.09	85.91	1117.27
4	Himachal Pradesh	0.00	100.00	467.43
5	Karnataka	9.10	90.90	1251.78
6	Madhya Pradesh	51.32	48.68	1867.89
7	Maharashtra	12.15	87.85	906.34
8	Punjab	100.00	0.00	2694.00
9	Rajasthan	37.30	62.70	1670.76
10	Uttar Pradesh@	95.90	4.10	489.10
11	Haryana	100.00	0.00	1204.07
12	All	54.83	45.17	14788.40

Note: - (1) * The figures represent the agricultural land for sample villages unlike sample farmers taken in other selected states.

(2) @ Figures appearing for total agricultural land do not make clear that whether it stands for NCA or GCA or estimated for a few major foodgrain crops.

The irrigation coverage in the Punjab and Haryana have been fully accomplished, whereas in Karnataka, Maharashtra, Rajasthan, and Madhya Pradesh predominantly known for rainfed agriculture still show poor performance in bringing adequate cultivated area under irrigation coverage. The proportion of irrigation coverage to its total agricultural area was 9.10 per cent in Karnataka, 12.15 per cent in Maharashtra, 37.30 per cent in Rajasthan, and 51.32 per cent in Madhya Pradesh. It is necessary to note that since the selected paddy crop, generally known as irrigation intensive, is widely grown in the study areas (west Godavari district) of Andhra Pradesh. Hence, it was observed that the proportion of agricultural land under irrigation coverage of sample farmers in the study area (west Godavari district) was substantially higher than that of Andhra Pradesh state as a whole. In the sample area of Andhra Pradesh, about 92.65 per cent of total agricultural land of the sample farmers was under irrigation coverage. In the study area of Himachal Pradesh, namely Hamirpur district, no sample farmers found to have any irrigation facility. This area is known for high rainfall zone. Whereas, in Bihar, the proportion of irrigation coverage found to be 14.09 per cent of total agricultural land of the sample farmers. At aggregate level, the percentage of

agricultural land under irrigation coverage to total agricultural land of all the sample farmers of selected states was estimated at 54 per cent.

The distribution of agricultural land status of the sample farmers observed in the study areas selected for pulse crops is presented in the table 4.2.4. The following table reveals that the proportion of agricultural land under irrigation coverage for selected crops in the sample states was quite impressive than that of cereal crops (see table 4.2.3). Generally, selected pulses are grown in the rabi season across the country and particularly by the farmers having partly irrigation facility. Moreover, most of the pulses do not require much of irrigation and considered to be competing crops for the commercial crops in the Rabi season.

Table: 4.2.4: Distribution of Agricultural Land of Sample Farmers: Pulse Crop

Sl. No	Name of The States	Percentage to total area		Total Area (In ha)
		Irrigated	Un-irrigated	
1	Andhra Pradesh	53.07	46.93	1692.24
2	Assam*	43.34	56.66	875.22
3	Bihar	74.23	25.77	1071.56
4	Himachal Pradesh	9.35	90.65	459.48
5	Karnataka	4.17	95.83	1289.61
6	Madhya Pradesh	62.73	37.27	1925.42
7	Maharashtra	72.74	27.26	1253.44
8	Punjab	100.00	0.00	3811.30
9	Rajasthan	62.72	37.28	1658.67
10	Uttar Pradesh@	45.88	54.12	955.38
11	Haryana	23.75	76.25	1283.39
12	All	60.92	39.08	16166.93

Note: - (1) * The figures represent the agricultural land for sample villages unlike sample farmers taken in other selected states.

(3) @ Figures appearing for total agricultural land do not make clear that whether they stand for NCA or GCA or estimated for a few major foodgrain crops.

It is noticed from the table, the proportion of agricultural land under irrigation coverage of sample farmers to their total agricultural land was quite low at 9.35 per cent in Himachal Pradesh, 4.17 per cent in Karnataka and 23.75 per cent in Haryana. Whereas, corresponding figures for the sample farmers of Bihar, Madhya Pradesh, Maharashtra and Rajasthan states were reasonably better covering more than 60 per cent of their total agricultural land.

4.2.3 Cropping Pattern of Sample Farmers

In this subsection, we have highlighted cropping pattern of the sample farmers observed in the study areas selected for cereal and pulse crops. It has been already discussed in the previous chapter that the selection of a district each for cereal and pulse crop was done on basis of highest area concentration under the crop in the sample state to capture crop preferences of the sample farmers. The crop preferences reflected in the cropping pattern of any region, is generally dictated by agro-climatic conditions, institutional factors, viability of infrastructure facilities and agriculture inputs. In India, these factors often differ significantly from region to region. The cropping pattern in assured rainfall regions or in the regions having enough irrigation facilities are dominated by major cereal crops such as wheat and paddy. On other hand, in coastal, malanad and semi-arid regions, the cropping pattern appears to be altogether different from the former. The states falling in these regions namely, Rajasthan, Maharashtra and Karnataka, extensively produce coarse cereals like bajra, jowar, pearl millet etc.

The distribution of cropping pattern of the sample farmers in the study areas selected for cereal crop is presented in the following table 4.2.5.

Table 4.2.5: Cropping Pattern of Sample Farmers: Cereal Crop

Name of the States	Percentage area share of the major crops to GCA of the selected sample farmers										GCA (In Ha)	
	Crops ►	Paddy	Wheat	Jowar	Blackgram	Bajra	Maize	Gram	Redgram	Greengram		Barley
A. Pradesh	83.00	-	-	1.49	-	-	-	-	-	-	-	1488.74
Assam	80.74	2.10	-	6.02	-	-	-	-	1.95	-	-	173.21
Bihar	50.12	14.77	-	-	-	15.37	-	-	-	-	-	1117.27
H.Pradesh	0.73	48.83	-	1.47	-	48.01	-	-	-	-	-	467.43
Karnataka	-	-	44.13	-	5.01	-	1.97	5.84	-	-	-	1251.78
M. Pradesh	26.49	32.10	-	6.58	-	-	11.24	2.25	-	1.28	-	1867.89
Maharashtra	0.40	18.91	23.37	4.67	-	-	1.80	8.67	4.26	-	-	906.34
Punjab	35.6	44.9	-	-	-	-	-	-	-	-	-	2694.40
Rajasthan	-	7.38	-	-	34.89	-	32.86	-	-	-	0.19	1670.76
U. Pradesh	17.23	41.45	0.86	0.19	5.50	2.25	-	2.13	-	2.32	-	900.90
Haryana	74.33	-	-	-	-	-	-	-	-	-	-	1204.07

Note: Dash indicates figures not available/given

From the above table, it can be noticed that paddy dominated the cropping pattern in most of the sample states like Andhra Pradesh, Assam, Haryana, and Bihar. In these sample states paddy covered about 83 per cent, 80.74 per cent respectively and 74.33 per cent of total cropped area of the sample farmers. Whereas in the Bihar, it accounted for 50 per cent of the total cropped area of the sample farmers. Apart from these sample states, paddy found to be second largest dominating crop in Punjab and Madhya Pradesh. It covered around 35.60 per cent and 26.50 per cent respectively of the total cropped area of the sample farmers in these two sample states. After paddy, wheat was found to be another dominating crop in the study areas of four sample states. It covered around 48.83 per cent, 44.90 per cent, 41.45 per cent 32.10 per cent of total cropped area of the sample farmers respectively in Himachal Pradesh, Punjab, Uttar Pradesh and Madhya Pradesh. While, in Maharashtra, wheat stood second in terms of area dominating crop after jowar, accounting for around 19 per cent of the total cropped area of the sample farmers and in Bihar it shared about 15 per cent of the total cropped area of the sample farmers. Out of eleven sample states, jowar found to be a dominating crop in two sample states particularly in Maharashtra and Karnataka. It covered around 44.3 per cent and 23.37 per cent of total cropped area of the sample farmers respectively in Karnataka and Maharashtra. The cropping pattern of the sample farmers in Rajasthan was found to be dominated by bajra crop. It covered around 35 per cent of total cropped area of the sample farmers. However, the crop such as maize was also observed to be having a significant share in the cropping pattern of the sample farmers in Himachal Pradesh (48.01 per cent) and Bihar (15.37 per cent). Gram was also appeared to be quite significant covering around 34.89 per cent of total cropped area of the sample farmers in Rajasthan and 11.24 per cent in Madhya Pradesh.

Distribution of cropping pattern of sample farmers in the study areas selected for pulse crops is presented in table 4.2.6. Though major cereal crops such as paddy, wheat, bajra and jowar found to be dominating crops in the study areas selected for pulse crops, major focus of the analysis is limited to explanation the cropping pattern for the major pulse crops observed in the sample states. Gram found to be single area dominating crop among the all pulse crops of the five sample states. It covered around 57.37 per cent of the total cropped area of the sample farmers in Haryana, 26.72 per

cent in Madhya Pradesh, 23.26 per cent in Rajasthan, 17.89 per cent in Uttar Pradesh and 11.44 per cent in Maharashtra.

Table 4.2.6: Cropping Pattern of Sample Farmers in the Study Area of the States Selected for Pulse Crop

Name of the States	Percentage area share of the major crops to GCA of the selected sample farmers										GCA (In Ha)
	Crops ▶	Paddy	Wheat	Redgram	Gram	Blackgram	Greengram	Jowar	Bajra	Maize	
A. Pradesh	63.10	-	2.55	-	20.65	-	-	-	-	-	3180.97
Assam	79.46	2.83	-	-	6.07	2.22	-	-	-	-	137.70
Bihar	25.94	19.89	10.53	-	-	-	-	-	-	22.47	1071.56
H. Pradesh	2.71	22.39	-	-	8.23	-	-	-	18.45	-	459.48
Karnataka	-	-	44.63	5.52	-	-	26.16	3.88	-	-	1289.61
M. Pradesh	-	23.58	-	26.72	14.22	-	-	-	-	11.29	1925.42
Maharashtra	-	20.84	1.08	11.44	0.06	1.03	7.74	23.91	1.34	-	1253.44
Punjab	39.10	45.1	-	-	-	4.6	-	-	-	-	3811.03
Rajasthan	-	14.40	-	23.26	-	-	-	30.96	-	-	1658.67
U. Pradesh		19.33	8.27	17.89	12.06	2.86	8.94	0.08	-	12.66	1226.09
Haryana	-	14.09	-	57.37	-	-	-	-	-	-	1283.39

Note: Dash indicates figures not available/given

Blackgram found to be another dominating crop among all pulse crops of three states, primarily in Andhra Pradesh, Himachal Pradesh and Assam. It covered about 20.65 per cent, 8.23 per cent and 6.07 per cent of the total cropped area of sample farmers in these sample states respectively. In the remaining sample states, particularly in Karnataka, Punjab and Bihar the cropping pattern of the pulse growing sample farmers were dominated by redgram, greengram and lentil respectively. Redgram covered about 44.23 per cent of the total cropped area of sample farmers in Karnataka. Lentil shared about 22.47 per cent of the total cropped area of sample farmers in Bihar, while greengram accounted for 4.60 per cent of the total cropped area of the sample farmers in Punjab. From the table, it is noticed that lentil and blackgram covered significant part of total cropped area of the sample farmers of Uttar Pradesh and Madhya Pradesh. The area share of lentil crop in these two sample states found to be 12.66 per cent and 11.49 per cent respectively of the total cropped area. Blackgram covered about 12.06 per cent of the total cropped area of the sample farmers in Uttar Pradesh and 14.22 per cent in Madhya Pradesh. After lentil crop, redgram found to be

another important crop in Bihar covering around 10 per cent of the total cropped area of the sample farmers.

4.2.4 Production and Per Hectare Productivity Levels of the Sample Farmers

The distribution of production and per hectare productivity of sample farmers for selected the cereal and pulse crops observed in the study areas of the sample states are presented in the table 4.2.7 and 4.2.8, respectively. Besides, the distribution also provides the total as well as per hectare gross value of the output received by sample farmers. From the earlier discussion on the cropping pattern of the sample farmers, it became clear that the four cereal crops mainly, paddy, wheat, jowar and bajra had highest percentage area concentration to gross cropped area in the sample states. In the following table, the distribution brings out some of the important features of production and per hectare productivity of sample farmers selected for the cereal crops across the sample states.

Table 4.2.7: Distribution of Production and Per Hectare Productivity of the Sample Farmers in the District Selected for Cereal Crop

(Quantity in qtls)

Name of the States	Production				Per hectare Productivity				GVO at FHP (Rs.)	
	Paddy	Wheat	Jowar	Bajra	Paddy	Wheat	Jowar	Bajra	Total	Per hect.
A. Pradesh	74718.00	-	-	-	60.47	-	-	-	39849600	32248
Assam	3986.08	-	-	-	28.50	-	-	-	2016797	14421
Bihar	22096.13	-	-	-	118.40	-	-	-	1160046825	62160
H.Pradesh	-	2845.40	-	-	-	12.47	-	-	-	-
Karnataka	-	-	2798.15	-	-	-	5.22	-	-	-
M. Pradesh	-	15195.50	-	-	-	25.33	-	-	11016738	18364
Maharashtra	-	-	3825.50	-	-	-	18.22	-	1717650	8181
Punjab	-	55185.60	-	-	-	45.6	-	-	34766928	28728
U. Pradesh	-	11625.35	-	-	-	31.13	-	-	7207717	19301
Rajasthan	-	-	-	5130.10	-	-	-	8.80	-	-
Haryana	50422.35	-	-	-	56.77	-	-	-	29749000	33494
All										

Note: Dash indicates figures not available/given

Table 4.2.7 reveals that the per hectare productivity of the sample farmers producing same cereal crop have varied across the sample states. This is clearly reflected in the distribution of paddy, wheat and jowar crops. Considering paddy crop, large differences in per hectare productivity of the sample farmers across the selected sample states is quite evident. The per hectare productivity of sample farmers growing paddy in Bihar found to be substantially higher (118.40 qtls) than its competing sample states, mainly Andhra Pradesh (60.47 qtls), Haryana (56.77 qtls) and Assam (28.50 qtls). The per hectare gross value of output received by paddy growing sample farmers of Bihar also shown higher amount of income generation (Rs.62,160) as compared to that of competing sample states-Andhra Pradesh (Rs.32,248), Haryana (Rs. 33,494) and Assam (Rs.14,421). However, the total net production of all the paddy growing sample farmers of Bihar (22096.13 qtls) found to be lower than that of Andhra Pradesh (74718 qtls) and Haryana (50422.35 qtls). The net production, per hectare productivity gross value of output as well as per hectare productivity of paddy growing sample farmers in Assam found to be the lowest among all sample states selected for paddy. The per hectare productivity of the sample farmers in Assam found to be 28.50 hectare with total net production of 3986.08 qtls and per hectare gross value of output of Rs. 14,421.

The distribution of production and per hectare productivity of the sample farmers observed in the study areas selected for pulse crop is shown in the following table 4.2.8. There is no doubt that production of pulse crops assumes a significant importance in the nutritional as well as income security of the farmers. In many parts of the country, especially in the regions known for rainfed agriculture, the production of pulse crops are preferred to cereal crops by large number of farmers. Whereas, in the regions having irrigation facilities, most of these crops are preferred due to high yield and better returns. It is also expected that per hectare productivity of the selected crops may differ across the states due to difference in degree of inputs use, area under irrigation coverage and agro-climatic factors. The productivity levels of gram have varied across the gram growing sample states. The production and per hectare productivity of the sample farmers for gram found to be highest in Rajasthan. The overall net production of the sample farmers in Rajasthan was estimated at 6386.20 qtls with per hectare productivity of 16.54 qtls. While in the remaining gram growing sample states,

the overall net production of gram of all sample farmers were estimated 5963 qtls for Madhya Pradesh, 5693.65 qtls for Haryana and 2241.25 qtls for Uttar Pradesh. The per hectare productivity level of the sample farmers for gram were almost same in Haryana (7.73 qtls) and Maharashtra (7.64 qtls). While in the case of Uttar Pradesh, it appeared to be at median level (10.22 qtls). In Madhya Pradesh, per productivity of gram growing sample farmers found to be 11.59 qtls. However, considering the per hectare gross value received by the sample farmers across the gram growing sample states, the sample farmers of Madhya Pradesh found to be at much advantages place. The per hectare productivity of the gram growing sample farmers of found Rs.16,516 as compared to that of its competing states Uttar Pradesh (Rs.14,564), Maharashtra (Rs.12,606) and Haryana (Rs.11,858).

Table 4.2.8: Distribution of Production and Per Hectare Productivity of the Sample Farmers in the District Selected for Pulse Crop

(Quantity in qtls)

Name of the States	Production					Per hectare Productivity					GVO at FHP (Rs.)	
	Gram	Black gram	Red Gram	Lentil	Green gram	Gram	Black gram	Red gram	Lentil	Green gram	Total (Rs in Lakhs)	Rs. Per hect.
A. Pradesh	-	3981.46	-	-	-	-	6.27	-	-	-	63.70	10037
Assam	-	29.97	-	-	-	-	3.59	-	-	-	0.48	5841
Bihar	-	-	-	2158.17	-	-	-	-	8.97	-	3129.35	13007
H.Pradesh	-	176.35	-	-	-	-	4.66	-	-	-	-	-
Karnataka	-	-	3097.00	-	-	-	-	5.35	-	-	-	-
M. Pradesh	5963.00	-	-	-	-	11.59	-	-	-	-	84.97	16516
Maharashtra	998.80	-	-	-	-	7.64	-	-	-	-	16.48	12606
Punjab	-	-	-	-	1329.10	-	-	-	-	8.10	22.29	13590
U. Pradesh	2241.25	-	-	-	-	10.22	-	-	-	-	31.94	14564
Rajasthan	6386.20	-	-	-	-	16.54	-	-	-	-	-	-
Haryana	5693.65	-	-	-	-	7.73	-	-	-	-	87.31	11858
All												

Note: Dash indicates figures not available/given

The difference in productivity levels of sample farmers growing blackgram in the sample states Andhra Pradesh, Assam and Himachal Pradesh was not very significant. The per hectare productivity of sample farmers across these sample states varied from 6.27 qtls to 3.59 qtls. The per hectare gross value of output received by blackgram growing sample farmers were estimated at Rs.10,037 for Andhra Pradesh

and Rs.5,841 for Assam. The gross value of output received by the sample farmers shows significant difference in which the per hectare value of output received by sample farmers of Andhra Pradesh was 72 per cent higher than that of Assam. Redgram was dominant crop in the Karnataka. The overall net production of gram produced by the sample farmers of Andhra Pradesh was much higher (3981.46qtls) than that of Himachal Pradesh (176.35 qtls) and Assam (29.97 qtls). Redgram was dominant crop in Karnataka. All sample farmers in the sample State produced a total quantity of 3,097 qtls with per productivity of 5.35 qtls. The per productivity of the sample farmers producing lentil crop in Bihar and greengram crop in Punjab were found to be 8.97 qtls and 8.10 qtls respectively. Whereas, the gross value of output received by the sample farmers growing green gram in Punjab was estimated at Rs.13,540 per hectare. The corresponding figure for the sample farmers growing lentil in Bihar found to be Rs. 13,007.

4.3 Utilization of Grain for Seed

Seed is considered to be a vital input among all the factors of production, while quality of seeds continues to assume significant role in enhancing the productivity of crops. Hence, the importance of quality seeds over the years has always been realized by both farmers and policy makers in India. The expansion in the area of HYV crops is an indicative of the preferences of farmers and promotive measures taken by state as well as central governments. However, the major domain of these improved seeds remains to be low in volume but high in value, which also appears catering the needs of only few selected farmers. Furthermore, the principal source of seed for cereal as well as pulse crops in the many parts of the country has been farmers themselves rather than private or public industry. Seeds are saved from the preceding year's production and used to meet current year's seed requirements of farmers.

In this subsection, an attempt has been made to explain the utilization of selected cereal and pulse grains for seed in the study areas of the sample states. It begins with a brief account of the process of utilization of selected foodgrains for seed across the sample states and then discusses methods and assumptions taken into consideration while undertaking the study. After briefing on background information, it

discusses farm size wise estimates of seed requirements of the sample farmers for the selected foodgrain across the study areas of the sample states.

4.3.1: Process of Utilisation of Grain for Seed.

The process of utilisation of grain for the seed in selected study areas of sample states was more or less same. As we mentioned earlier that farmers themselves are principal source of seed production. The traditional method of grain utilization for seed found to be prevalent in many parts of the country and form dominant part of the seed sector. Sample farmers in Assam were observed to be using paddy grain for seed. After harvesting, the grains are cleaned and stored in gunny bags/granaries. These seed granaries are well protected from rain or water logging. In the cleaning process seeds are put in plain water, stirred well and then sunken seeds are selected while floating ones are rejected. Selected seeds are then soaked in the sunshine for three days before sowing. Pre-germinated seeds are sown in nursery beds and then they are transplanted in the well- prepared field. While in the field survey of Andhra Pradesh, sample farmers were observed to be using same practices of grain utilization for paddy seed. In the field survey of these two sample states, it was also of found that small cultivators purchase seeds from reputed farmers who grows crops for seed purpose. However, the presence of sale points of certified seed shops and their utilization by sample farmers were also observed. In case of Haryana and Bihar, the information on the utilization grain for paddy seed as well as selected pulse crops was missing in their reports. Hence, analysis of seed utilisation limited to the field surveys of these two states for selected paddy crop.

The process of utilisation of wheat grain for seed in Himachal Pradesh was quite similar with the practice of utilising paddy grain for seed in the Andhra Pradesh and Assam. In field survey of the state sample farmers were observed to be using some modern practice of treating seed with pesticides as well as traditional practice of keeping seeds in the ash. However, information on the process of utilisation of wheat grain for seed in the report of Uttar Pradesh, Punjab and Madhya Pradesh were missing. This problem was also encountered Rajasthan report for bajra grain. In the field survey of Maharashtra, the virtual absence of utilising hybrid jowar for seed purpose was

observed. The sample farmers were found to be relying for seed solely on the private agencies selling certified seeds. In Karnataka, though the presence of traditional method of utilizing jowar grain for seed was evident, its share was very small. Sample farmers were found to be purchasing seeds from seed growing farmers and private agencies selling certified seed in town or local markets.

The process of utilising pulse grains for seed was more or less same across the sample states. Sample farmers in Andhra Pradesh, Himachal Pradesh and Assam were largely seen to be using traditional method of utilizing blackgram for seed. Farmers themselves were major suppliers of seed. While, in Karnataka (redgram) and Maharashtra (gram) both traditional as well as modern practice of utilising grain for seed were observed. But considering the size of the market, traditional method of utilisation of grains for seeds was dominant practice in these states. In the traditional method for utilising grain for seed, activities such as cleaning and soaking in the sunshine and keeping carefully them in the granaries/bags were observed. Information regarding the process of utilisation of grain for seed in the report of Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh (for gram grain), Punjab (greengram grain) and Bihar (lentil grain) was not provided.

4.3.2: Methods and Assumptions.

Earlier, while explaining the process of grain utilisation for seed we observed that the traditional method of grain utilisation for seed was widely used by almost all the sample farmers in the sample states. Though the utilisation of modern certified seed by sample farmers was prevalent in the sample states, their contribution was not significant in satisfying the total seed requirement of the farmers except Maharashtra (for Hy. jowar) and Karnataka (for both jowar and redgram).

So far assumptions for utilisation of grain for seed by the sample farmers are concerned, they were found to be varying in selection of seeds, seed storage, seed treatment and seed sowing across the sample states. In the traditional method of utilising grain for seed, the most of common assumption was selection of healthy seeds for assured germination and expectations of better production. As we have earlier pointed out that some farmers used their own seeds retained from previous year's

production and some were found to be buying it from reputed farmers, which produce the grain for only seed purpose. Generally among the farmers, these seeds are assumed to be good in quality and believed to be able to produce more output. While in case of modern certified seeds selection, many varieties of seeds were observed and their selection was widely based on the cost and past experiences of farmers using those seed varieties. These varieties were also observed to be varying within the study areas of the State. In some states, sample farmers were observed to be treating seed with pesticides, or keeping in the ash was common for retaining quality of the seeds. These practices were assumed to be the best tool for quality control of the seeds.

4.3.3: Farm size-wise Estimates of Seed for Cereal Crops

Estimation of seed requirement of farmers for any crop across the farm size holdings assumes prime importance for two major reasons. First, the percentage quantity of grain used as seed by different size of holding farmers themselves gives their total requirement of grains for the seed purpose. Second, it also highlights the net dependence of different size of holding farmers on the particular grain for the seed across the states, which they have to retain every year. The tables 4.3.1, 4.3.2 4.3.3 and 4.3.4 provide the farm size-wise percentage as well as quantity of seed used and seed kept of selected cereals respectively by small, medium, large and all size of holdings sample farmers across the sample states. Percentages are the quantity of grain used or kept as a seed by particular size of holding farmers to their total net production in the selected State.

From the abovementioned tables, we find that there was great variation in the percentage quantity of selected cereals used for the seed and kept as a seed for the next year's production across the sample states and size of holdings. However, the percentage of quantity kept as a seed was higher than the percentage quantity used for the seed in all the selected states except Rajasthan and Andhra Pradesh. At an aggregate level, the highest percentage of seed used was found to be in Himachal Pradesh (9.80 per cent), whereas lowest in Haryana (0.21 per cent). Though the percentage of the quantity of cereals kept as seed remained highest (9.68 per cent), the lowest percentage found to be in Rajasthan (0.03 per cent). In Himachal Pradesh,

proportion of wheat grain used for the seed to its total net production was estimated at 9.30 per cent for small sample farmers, 10.20 per cent for medium sample farmers and 10.80 per cent for large sample farmers. The proportion of wheat quantity kept as seed found to be marginally higher at 9.50 per cent for small farmers, 9.60 per cent for medium farmers, 11 per cent for large sample farmers and 9.68 per cent for all sample farmers. The percentage quantity of paddy used as seed in Haryana was located at 0.21 per cent with almost no variation across the size of holdings. Whereas, percentage quantity used as seed found to be marginally higher at 0.22 per cent with negligible difference across the size of holdings. In Rajasthan, the percentage quantity of selected bajra cereal used as seed to its total production found to be 0.54 per cent for all sample farmers with negligible variation across the farm size of holdings. The percentage of bajra quantity kept as seed in the State found to be lower than that used as seed (0.03 percent). In the particular case of Maharashtra, sample farmers were observed to be using certified seed. Hence, the quantity of jowar used as seed and kept for the seed are seen to be nil in the tables. However, in the report submitted by Maharashtra AERC, it was mentioned that since selected crop is termination kind of seed, farmers cannot use it for germination or production, therefore, all sample farmers in the study area purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production of the crop.

Apart from the case of Himachal Pradesh, the percentage quantity of wheat used as seed by the sample farmers in Madhya Pradesh and Uttar Pradesh appeared to be quite significant. In Madhya Pradesh, as the farm size of holdings increase the percentage of wheat quantity used for seed decreased. The small sample farmers used around 5.14 per cent of their total wheat production for the seed, whereas the percentage for medium and large sample farmers found to be 4.94 per cent and 4.93 per cent respectively. In the contrast with Madhya Pradesh, the sample farmers of Uttar Pradesh used less percentage of wheat quantity for seed (3.92 by sample farmers, 4.02 by medium and 4.18 by large sample farmers) as the farm size of holdings increased.

Table 4.3.1: Seed requirement of Selected Small Sample Farmers for Cereal Crops in Different States

Sl. No	Name of The States	Crop	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	H. Pradesh	Wheat	99.29	126.84	11.82	12.08	9.30	9.50
2	M. Pradesh	..	78.56	186.65	9.59	10.05	5.14	5.38
3	Punjab	..	126.70	567.61	13.39	15.45	2.36	2.72
4	U. Pradesh	..	98.68	315.49	12.38	13.14	3.92	4.17
5	A. Pradesh	Paddy	184.23	1096.80	13.52	1.15	1.23	0.10
6	Assam	..	59.91	176.80	2.91	3.24	1.64	1.84
7	Bihar	..	176.90	715.84	17.14	28.71	2.39	4.01
8	Haryana	"	107.2	591.99	1.36	1.35	0.23	0.23
9	Karnataka	Jowar	88.50	47.30	0.89	0.86	1.88	1.81
10	Maharashtra	..	40.42	72.50	0.00	0.00	0.00	0.00
11	Rajasthan	Bajra	80.94	74.51	0.41	0.01	0.54	0.01
12	All		1141.33	3972.33	83.41	86.04	2.10	2.17

Note: In the report submitted by Maharashtra AERC, it was mentioned that all sample farmers in the study area purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production of the crop.

Table 4.3.2: Seed requirement of Selected Medium Sample Farmers for Cereal Crops in Different States

Sl. No	Name of The States	Crop	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	H. Pradesh	Wheat	108.32	135.50	13.76	13.00	10.20	9.60
2	M. Pradesh	..	175.46	439.30	21.70	27.70	4.94	6.31
3	Punjab	..	281.86	1261.56	24.29	31.33	1.93	2.48
4	U. Pradesh	..	143.02	452.07	18.19	19.65	4.02	4.35
5	A. Pradesh	Paddy	459.68	2770.28	35.07	3.91	1.27	0.14
6	Assam	..	36.55	103.33	1.79	2.13	1.73	2.06
7	Bihar	..	158.28	632.52	15.63	26.01	2.47	4.11
8	Haryana	"	232.9	1300.00	2.78	2.97	0.21	0.23
9	Karnataka	Jowar	146.58	81.69	1.97	2.13	2.41	2.60
10	Maharashtra	..	66.60	120.60	0.00	0.00	0.00	0.00
11	Rajasthan	Bajra	176.00	151.50	0.83	0.04	0.55	0.02
12	All		1985.25	7448.35	136.01	128.87	1.83	1.73

Note: In the report submitted by Maharashtra AERC, it was mentioned that all sample farmers in the study area purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production of the crop.

Table 4.3.3: Seed requirement of Selected Large Sample Farmers for Cereal Crops in Different States

Sl. No	Name of The States	Crop	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	H. Pradesh	Wheat	20.48	22.20	2.39	2.44	10.80	11.00
2	M. Pradesh	..	345.00	893.60	44.08	50.30	4.93	5.63
3	Punjab	..	802.30	3689.39	74.82	86.81	2.03	2.35
4	U. Pradesh	..	131.70	394.98	16.53	16.25	4.18	4.11
5	A. Pradesh	Paddy	591.80	3604.73	42.65	3.58	1.18	0.10
6	Assam	..	43.39	118.48	2.14	2.61	1.81	2.20
7	Bihar	..	224.81	861.25	23.26	42.44	2.70	4.93
8	Haryana	..	554.94	3150.25	6.63	7.02	0.21	0.22
9	Karnataka	Jowar	317.30	150.83	1.99	3.86	1.32	2.56
10	Maharashtra	..	104.80	189.45	0.00	0.00	0.00	0.00
11	Rajasthan	Bajra	326.0	287.00	1.54	0.10	0.54	0.03
12	All		3462.52	13362.20	216.03	215.41	1.62	1.61

Note: In the report submitted by Maharashtra AERC, it was mentioned that all sample farmers in the study area purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production of the crop.

Table 4.3.4: Seed requirement of selected All Sample Farmers for Cereal Crops in Different States

Sl. No	Name of The States	Crop	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	Himachal Pradesh	Wheat	228.09	284.54	27.97	27.53	9.80	9.68
2	Madhya Pradesh	..	599.99	1519.55	75.37	88.05	4.96	5.79
3	Punjab	..	1210.80	5518.56	112.50	133.59	2.04	2.42
4	Uttar Pradesh	..	373.44	1162.54	47.09	49.04	4.05	4.22
	Total	..	2412.32	8485.19	262.93	298.21	3.10	3.51
5	Andhra Pradesh	Paddy	1235.71	7471.80	91.24	8.64	1.22	0.12
6	Assam	..	139.85	398.61	6.84	7.98	1.71	2.00
7	Bihar	..	559.99	2209.61	56.03	97.16	2.54	4.40
8	Haryana	"	895.04	5042.24	10.77	11.34	0.21	0.22
	Total	..	2830.59	15122.26	164.88	125.12	1.09	0.83
9	Karnataka	Jowar	552.36	279.82	4.85	6.84	1.73	2.44
10	Maharashtra	..	211.82	382.55	0.00	0.00	0.00	0.00
	Total	..	764.18	662.37	4.85	6.84	0.73	1.03
11	Rajasthan	Bajra	582.94	513.01	2.78	0.14	0.54	0.03
12	All		6590.03	24782.83	435.44	430.31	1.76	1.74

Note: In the report submitted by Maharashtra AERC, it was mentioned that all sample farmers in the study area purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production of the crop.

In Bihar and Punjab the percentage of the quantity (paddy and wheat respectively) used as seed found to be 2.54 per cent and 2.04 per cent for all sample farmers showing a negligible variation across the size of holdings. The difference in the percentage of quantity kept as seed and used in Madhya Pradesh, Uttar Pradesh and Punjab were marginal across the size of holdings albeit in Bihar it was found to be significant. The difference in Bihar ranged from 1.62 per cent for the small sample farmers to 2.23 per cent in the case of large sample farmers.

In the remaining three selected states viz., Andhra Pradesh, Assam and Karnataka, the percentage quantity of the selected grain used as seed ranged from 1.22 per cent to 1.73 per cent and percentage seed kept from 0.12 percent to 2.44 per cent (see table 4.3.4). The percentage quantity of paddy used as seed to its total net production in Andhra Pradesh varied from 1.18 per cent for large sample farmers to 1.23 per cent for the small sample farmers. Similarly, corresponding figures in the Assam ranged from 1.81 per cent for the large sample farmers to 1.64 per cent for the small sample farmers. In Karnataka, medium sample farmers used higher percentage quantity of jowar for seed than the small sample farmers (1.88 per cent) and large sample farmers (1.32 per cent). The similar kind of behavior of sample farmers across all farm size of holdings was observed in the State for the quantity kept as seed. The proportion of the jowar quantity kept as seed to its total net production was estimated at 1.81 per cent for small sample farmers, 2.60 per cent for medium sample farmers and 2.56 per cent for large sample farmers.

At aggregate level, the proportion of the quantity of all selected cereals used as seed by the sample farmers was worked out at 1.76 per cent. The proportion of the quantity of selected cereals kept as seed found to be marginally lower (1.74 per cent) than that of seed used (1.76 per cent).

4.3.4: Farm size-wise Estimates of Seed for Pulse Crops

The farm size-wise seed requirements of sample farmers for the selected pulse crops are presented in the table 4.3.5, 4.3.6, 4.3.7 and 4.3.8 respectively for small, medium, large and all size of holdings farmers. Percentages shown in the tables are the quantity of grain used or kept as a seed by particular size of holding farmers to their total net production in the selected State.

From these abovementioned tables, we find quite significant variation in the percentage quantity of selected pulses used for the seed and kept as a seed across the sample states and farm size of holdings. The percentage of quantity of selected pulses kept for the seed purpose was higher than the percentage quantity of selected pulses used for the seed in all the selected states except Andhra Pradesh. At an aggregate level among the selected grains and sample states (see table 4.3.8), the highest percentage of total quantity of grain used for the seed to its total net production found to be in Uttar Pradesh (10.39 per cent), whereas lowest in Maharashtra (1.06 per cent) both for gram grain. On the other hand, the highest percentage of total quantity of grain kept as seed was located in Bihar (13.16 per cent) for the lentil and the lowest percentage in Andhra Pradesh (1.21 per cent) for the blackgram. In Uttar Pradesh, the proportion of gram grain used for the seed to its total net production was estimated at 10.49 per cent for small sample farmers, 10.50 per cent for medium sample farmers and 10.30 per cent for large sample farmers. The proportion of gram quantity kept as seed found to be marginally higher in the State at 11.31 per cent for small farmers, 11.88 per cent for medium farmers, 11.47 per cent for large sample farmers and 11.57 per cent for all sample farmers. The percentage quantity of selected gram used as seed in Maharashtra was located at 1.06 per cent with negligible variation across the size of holdings. However, the percentage quantity of the selected grain kept for the seed in the State found to be significantly larger than that for the seed used. The percentage quantity of selected gram grain kept for the seed in Maharashtra found to be 4.87 per cent for small sample farmers, 4.25 per cent for medium sample farmers, 3.08 per cent for large sample farmers and 3.81 per cent for all sample farmers. Though the percentage quantity of selected gram grain kept for the seed shows declining trend as the size of the holdings increases, the same is not visible in the case of seed used. In

Bihar, as we have noticed earlier, the percentage total quantity of selected lentil grain kept for the seed to its total net production was highest among the all states and size of holdings. The corresponding figure for the State was estimated at 14.84 per cent for small sample farmers, 13.18 per cent for medium sample farmers and 10.70 per cent for the large sample farmers. Whereas, the percentage total quantity of selected lentil grain used for the seed in Bihar was also found to be significantly high across the size of holdings. The corresponding percentage ranged from 9.01 per cent for large sample farmers to 9.59 per cent for small sample farmers. Interestingly, the trend of percentage seed used and seed kept for the selected lentil grain in the Bihar moved in opposite directions. In Andhra Pradesh, the percentage quantity of selected blackgram grain kept for the seed found to be lowest ranging from 0.09 to 1.88 per cent across the size of holdings. However, in the State, the percentage quantity of selected blackgram grain used for the seed was not significantly higher than that of kept as a seed. The percentage quantity of blackgram grain used for the seed found to be ranging from 7.28 per cent to 7.60 per cent higher than the percentage of aggregate quantity of all selected pulses used as a seed by sample farmers of all the selected states in each size of holding.

Table 4.3.5: Seed requirement of Selected Small Sample Farmers for Pulse Crops in Different States

Sl. No	Name of The States	Name of The Crops	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	M. Pradesh	Gram	62.69	78.30	5.25	6.64	6.71	8.48
2	Maharashtra	„	24.15	20.96	0.19	1.02	0.92	4.87
3	Rajasthan	„	50.56	85.67	2.44	4.08	2.85	4.76
4	U. Pradesh	„	37.04	34.30	3.60	3.88	10.49	11.31
5	Haryana	„	104.31	81.39	4.00	4.23	4.91	5.19
6	A. Pradesh	Black gram	78.23	46.21	3.36	0.16	7.28	0.35
7	Assam	„	4.13	1.51	0.06	0.6	3.70	4.26
8	H. Pradesh	„	19.40	9.06	0.50	0.61	5.50	6.70
9	Punjab	Green gram	27.59	17.41	0.46	0.59	2.64	3.39
10	Karnataka	Red gram	98.95	52.15	0.81	2.19	1.55	4.20
11	Bihar	Lentil	96.80	86.29	8.28	12.81	9.59	14.84
12	All		603.85	513.25	28.95	36.81	5.64	7.17

Table 4.3.6: Seed requirement of Selected Medium Sample Farmers for Pulse Crops in Different States

Sl. No	Name of The States	Name of The Crops	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	M. Pradesh	Gram	147.20	167.40	11.88	17.15	7.10	10.24
2	Maharashtra	„	42.15	30.03	0.39	1.28	1.31	4.25
3	Rajasthan	„	107.61	193.40	5.38	7.52	2.78	3.89
4	U. Pradesh	„	66.22	68.54	7.19	8.14	10.50	11.88
5	Haryana	„	208.82	162.60	7.94	8.60	4.88	5.29
6	A. Pradesh	Black gram	180.28	109.86	8.13	0.10	7.40	0.09
7	Assam	„	2.46	0.87	0.03	0.05	3.89	5.83
8	H. Pradesh	„	15.10	7.00	0.35	0.46	5.00	6.50
9	Punjab	Green gram	37.82	29.06	0.56	0.58	1.93	2.00
10	Karnataka	Red gram	161.27	88.05	1.32	3.08	1.50	3.50
11	Bihar	Lentil	78.43	69.41	6.64	9.15	9.57	13.18
12	All		1047.36	926.22	49.81	56.11	5.38	6.06

Table 4.3.7: Seed requirement of Selected Large Sample Farmers for Pulse Crops in Different States

Sl. No	Name of The States	Name of The Crops	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	M. Pradesh	Gram	304.69	350.60	24.43	37.10	6.97	10.58
2	Maharashtra	„	77.10	48.89	0.47	1.51	0.96	3.08
3	Rajasthan	„	227.67	359.25	11.17	14.27	3.11	3.97
4	U. Pradesh	„	116.10	121.29	12.49	13.91	10.30	11.47
5	Haryana	„	423.11	325.38	15.53	16.55	4.77	5.09
6	A. Pradesh	Black gram	375.76	242.08	18.39	4.55	7.60	1.88
7	Assam	„	1.77	0.61	0.02	0.03	4.00	4.94
8	H. Pradesh	„	3.32	1.58	0.09	0.11	5.70	7.10
9	Punjab	Green gram	105.20	86.44	1.46	1.48	1.69	1.71
10	Karnataka	Red gram	315.37	169.50	2.69	5.16	1.59	3.04
11	Bihar	Lentil	65.60	60.12	5.42	6.44	9.01	10.70
12	All		2015.69	1765.74	92.16	101.11	5.22	5.73

Table 4.3.8: Seed requirement of Selected All Sample Farmers for Pulse Crops in Different States

Sl. No	Name of The States	Crop	Area (ha)	Net Production (tons)	Quantity of seed (tons)		Percentage qty. of seed with production	
					Used	Kept	Used	Kept
1	M. Pradesh	Gram	514.58	596.30	41.56	60.89	6.97	10.21
2	Maharashtra	„	143.40	99.88	1.05	3.80	1.06	3.81
3	Rajasthan	„	385.83	638.32	18.99	25.87	2.97	4.05
4	U. Pradesh	„	219.36	224.13	23.28	25.93	10.39	11.57
5	Haryana	„	736.24	569.37	27.46	29.38	4.82	5.16
	Total	„	1999.41	2128.00	112.34	145.87	5.28	6.85
6	A. Pradesh	Black gram	634.27	398.15	29.88	4.81	7.51	1.21
7	Assam	„	8.36	3.00	0.11	0.15	3.81	4.86
8	H. Pradesh	„	37.82	17.64	0.94	1.18	5.40	6.69
	Total	„	680.45	418.79	30.93	6.14	7.39	1.47
9	Bihar	Lentil	240.83	215.82	20.34	28.39	9.42	13.16
10	Karnataka	Redgram	575.59	309.70	4.82	10.43	1.56	3.37
11	Punjab	Greengram	170.61	132.91	2.48	2.65	1.87	1.99
12	All		3666.89	3205.22	170.91	193.48	5.33	6.04

Out of eleven sample states, the percentage quantity of selected pulses used as seed in five states viz., Uttar Pradesh (gram), Andhra Pradesh (blackgram), Madhya Pradesh (gram), Himachal Pradesh (blackgram) and Bihar (lentil) were higher than the percentage of aggregate quantity of selected pulses used as seed (5.33 per cent) by the sample farmers of all the selected states. The corresponding percentages for the Bihar and Uttar Pradesh were significantly high, which accounted for almost 10 per cent of the total net production of these states' sample farmers. Whereas, the percentage of seed used in Madhya Pradesh and Andhra Pradesh were higher by around two percent as compared to that of all selected sample states. The corresponding percentage of seed used in the remaining selected states viz., Maharashtra, Rajasthan, Haryana, Assam, Karnataka and Punjab were located below the percentage of seed used for all the selected states (see table 4.3.8). At aggregated level, the percentage quantity of selected grains used as seed found to be 1.06 per cent for Maharashtra (gram), 1.56 per cent for Karnataka (redgram), 1.87 per cent for Punjab (greengram), 2.97 per cent for Rajasthan (gram), 3.81 per cent for Assam (blackgram) and 4.82 per cent for Haryana (gram). Further at disaggregated level, the variation in the percentage of seed used across the farm size of holdings found to be very negligible (even less than 1 percent

point) in these selected states. However, out of eleven selected states, the percentage quantity of selected grains kept as seed in four selected states viz., Bihar (13.16 per cent), Uttar Pradesh (11.57 per cent), Madhya Pradesh (10.21 Per cent) and Himachal Pradesh (6.69 per cent) were above the percentage of total aggregated quantity of all selected pulses kept as seed by sample farmers of all selected states (6.04 per cent) Whereas in the remaining selected states viz., Haryana, Assam, Rajasthan, Maharashtra, Karnataka, Punjab and Andhra Pradesh, the percentage quantity of selected grains kept as seed was below as compared to that of all the eleven selected states. The corresponding percentage for these states were estimated at 5.16 per cent for Haryana, 4.86 per cent for Assam, 4.05 per cent for Rajasthan, 3.81 per cent for Maharashtra, 3.37 per cent for Karnataka, 1.99 per cent for Punjab and 1.21 per cent for Andhra Pradesh. The variations in the percentage seed kept across the size of holdings were quite significant in Punjab (1.71 per cent to 3.39 per cent), Karnataka (3.04 per cent to 4.20 per cent), Maharashtra (4.87 per cent to 308 per cent) and Andhra Pradesh (0.09 per cent to 1.88 per cent), whereas negligible in Haryana, Assam and Rajasthan. Interestingly, the percentage seed kept in Maharashtra, Karnataka and Punjab shown a declining trend as the size of holdings increased, whereas opposite was observed in Andhra Pradesh.

Finally, considering the overall seed requirement of the sample farmers of all selected states for the selected pulses across the size of holdings, the proportions of the quantity of pulses used as seed were worked out at 5.64 per cent for small sample farmers, 5.38 per cent for medium sample farmers, 5.22 per cent for large sample farmers and 5.33 per cent for all sample farmers. The proportion of the quantity of selected pulses kept as seed by the sample farmers of all eleven States across the different size of holdings were located between 5.73 per cent for large sample farmers to 7.17 per cent for small sample farmers. Interestingly, the proportions of seed used and seed kept appeared to be moving in opposite directions. These results are in the line of our expectations as it is more easier for the farmers having large resource base and higher level of production capacity to keep higher percentage of grain/s for seed purpose out of their total net production than as compared to those having low resource base and production capacity. However, it may not give us homogeneous picture across the regions and crops due to various residual factors.

4.3.5: Crop-wise Estimates of Grain for Seed

Farm size-wise estimates of seed requirement of sample farmers for the major grains discussed earlier furnished us adequate information over the extent of seed requirement of the sample farmers for different foodgrains across the sample states. Here, we briefly take into account the crop-wise seed requirement of sample farmers for both cereals and pulses in general for all the states. A crop-wise seed requirement of sample farmers for the major cereals and pulses across the states is explained with the help of table 4.3.4 and 4.3.8, respectively.

From the table 4.3.4, it was found that the percentage seed requirement of wheat growing sample farmers was significantly higher than that of paddy, jowar and bajra. Percentage quantity of wheat used as seed to its total net production for all the four selected states viz., Himachal Pradesh, Madhya Pradesh, Punjab and Uttar Pradesh was estimated at 3.10 per cent. Whereas, the percentage quantity of the selected grain kept as a seed for all these sample states was found marginally higher at 3.51 per cent. On other hand, the percentage seed requirement of bajra growing farmers was found to be the lowest (even much less than 1 per cent of its total net production) among all the selected grains. Most of the farmers in the bajra growing State (particularly in Rajasthan) were found to be purchasing seed from the market, hence percentage of quantity retained for seed (0.03) is less than that of seed used (0.54 per cent). Whereas, the seed requirement of the paddy growing farmers for states viz., Andhra Pradesh, Assam, Bihar and Haryana found to be around 1 per cent of their total net production. Here too, paddy growing sample farmers were keeping less percentage of seed out of their total net production as compared to that of used for the seed. However, in the case of jowar, results are needed to be carefully interpreted. In Maharashtra almost all sample farmers found dependable on market (certified seed selling agencies) for the seed. According to field survey, around 2,200 Kg (0.54 per cent of its total net production) of certified seed was purchased from the market. Though there exists a well-developed certified seed market for jowar seed in Karnataka, a significant part of the sample farmers meet their seed requirements either out of their own previous year's crop production or purchasing from large seed growing farmers. If we exclude the Maharashtra, sample farmers growing jowar grain in Karnataka would be

best representative of the estimates since large section of the farmers still have faith on traditional seed market in the State. The percentage quantity of jowar kept as a seed (2.44 per cent) was higher than that of seed used (1.73 per cent). This could be assumed best indicative for our interpretation for the estimates of the crop.

Comparing the seed requirement of the sample farmers for cereals with pulses, we find that the extent of seed requirement of sample farmers for cereals is much higher than the pulses. This can be noticed from the tables 4.3.1 to 4.3.8. The percentage seed requirement of selected cereals was around 2 per cent, whereas, for pulses, it fluctuated between 5 to 6 per cent of the total net production. The large variation in the seed requirement of the sample farmers for the selected pulses across the sample states appeared to be one of the major characteristics of the distribution. The percentage seed requirement of the lentil growing sample farmers (specifically in Bihar) was significantly high among the all selected pulse grains. About 9.57 per cent of the total net production was used for the seed purpose and 13.18 per cent kept as a seed by the sample farmers. Whereas redgram growing sample farmers in Karnataka were using less percentage of quantity for the seed (1.56 per cent) among all farmers growing selected pulses. However, the redgram growing sample farmers were also noticed to be keeping higher percentage of quantity of the grain (3.37 per cent) as seed. The sample farmers growing greengram were noticed to be having least percentage of seed requirements for the seed among all the sample farmers growing pulses. About 1.99 per cent of total net production of greengram was retained as a seed, whereas 1.87 per cent used for the seed. The percentage seed requirement of gram and blackgram growing sample farmers were found to be fluctuating around the average percentage seed requirement of all the sample farmers growing selected pulses. The percentage quantity of gram used for the seed by the sample farmers of five selected states viz., Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Haryana was found to be 5.28 per cent slightly lower than that of average percentage (5.33 per cent). However, the percentage quantity of the selected grain kept as seed for these five sample states was marginally higher (6.85 per cent) than that of average percentage (6.04 per cent). Considering seed requirement of blackgram growing sample farmers, about 7.39 per cent of the total net production was used for the seed and on other hand, only 1.47 per cent retained as seed by all sample farmers of the

states viz., Andhra Pradesh, Assam and Himachal Pradesh. However, variation in the percentage seed requirements of the sample farmers across these states was also quite evident.

4.4: Utilisation of Grain for Feed

Livestock and poultry are considered vital components in the farming systems of the rural economy. These subsidiary agricultural activities play major role in sustaining income of the farmers during periods of harsh climates. The contribution of livestock in traditional economy for supply of power and transportation of goods is well recognized and in the modern economy, livestock and poultry are major source of income, nutrition and factor input of production. Though usage of animals in the recent past has been declining for the transportation of goods and power for crop cultivation, their demands for other purposes have increased significantly. A rising trend in the female bovine population in many states signifies ever growing economic opportunities for increasing milk production and other related commercial activities. The demand for fodder has also increased in the country due to increase in the population of livestock. In India, the demand for the fodders is met by various sources such as forest, open grazing ground, fallow lands, weeding of major crops, forage and fodder semi-forage crop residues. Beside these, foodgrains are also used to provide well-balance diet to milch livestock and other animals used for crop cultivation.

In this subsection, we explain the amount and percentage quantity of selected cereals and pulses used to feed livestock and poultry by the sample farmers across the different size of holdings and the sample states. We begin with explaining briefly the process, methods and assumptions held during the utilization of selected grains to feed livestock and poultry in the study areas of the selected states. Thereafter, we provide a detail account of the total quantity of selected grains used to feed livestock by all sample farmers to different types of livestock. This is followed by the quantity of selected grains used for poultry feed by all sample farmers across the sample states. Lastly, farm size-wise estimates of percentage quantity of selected foodgrains used for livestock and poultry feed across the sample states is discussed.

4.4.1 Process of Utilisation of Grain for Feed

In majority of the Indian States, farmers use field grass and various by-products from crop production as feed and fodder for livestock. Some of the by-products of the crops like bhusa, rice straw, bran from pulses, milling rice, barley and wheat are the main feeds fed to livestock. Generally, farmers use grains for the animal feed keeping in view that it will provide well-balanced diet for milch animals and bullocks. In the field survey of Himachal Pradesh, the sample farmers observed using wheat to feed animals by grinding the grain slightly rough as compared to wheat grain grinded for human consumption. Then this grinded wheat and maize are mixed in the water. While in Assam, sample farmers were feeding paddy grain to animals by using paddy grain with chaff cut green grass and dry fodder. Some sample farmers were observed using boiled rice with wasted vegetables and pulses. In field survey of Maharashtra, sample farmers were found using jowar grain for animal feed by mixing it with oil cakes, which serves as an important concentrate supplied to animals as feed. Similar process was observed in the field survey of Karnataka. In case Uttar Pradesh, the information grain utilisation for feed was not given and sample farmers of Himachal Pradesh and Andhra Pradesh were not found using selected pulse crop for animal feed.

4.4.2 Methods and Assumptions

The quantity of grain used for feed purpose depends on weight, size and type of cattle. Sample farmers usually give more quantity of grain for milch cattle. The main purpose is to get balanced-feed to milch animals and bullocks every day so as to maintain their health and higher productivity to fetch higher returns or benefits. During the crop season the bullocks and buffaloes are used for land preparation. They are provided extra feed for maintaining the draught energy. Milch animals are provided balanced diet with concentrates for getting higher milk production. In the field investigation, it was assumed that the information provided by the sample farmers is true and sample farmers have a complete knowledge of the quantity of selected grains fed to different types of animals and birds during the period of one year. The total cattle possessed by the sample farmers are categorized into two section viz., number of

livestock/birds fed selected grains and other. The proportion for per animal/bird consumption of selected grains was taken for those animals/birds that were fed, others were excluded.

4.4.3 Crop-wise Estimates of Grain for Feed

Here, we attempt to describe crop-wise estimates of the quantity of selected cereals and pulses used for feeding animals by the sample farmers in the selected states. This includes the quantity of cereals and pulses to feed various livestock such as cows, buffalows, calves, bullocks, goats, sheep and camels. It also refers to the quantity of cereals and pulses given to poultry/birds by all sample farmers in the selected states.

The distribution of annual quantity consumption of selected cereal crops by livestock of the sample farmers across the selected States is presented in table 4.4.1. From the table, it was observed that on an average around 48 per cent of the total livestock were fed by all the sample farmers of selected States except Maharashtra. Among these selected states, sample farmers of Uttar Pradesh and Assam fed all their livestock. On other hand, no animal/livestock was fed the selected cereal grains by the sample farmers of Haryana and Andhra Pradesh. The proportion of the livestock consuming selected crop to total livestock of the sample farmers found to be 31 per cent in Rajasthan, 38 per cent in Karnataka, 50 per cent in Himachal Pradesh, 56 per cent in Punjab, 70 per cent in Madhya Pradesh and 77 per cent in Bihar.

In the sample states selected for wheat crop, the sample farmers of Uttar Pradesh were found to have fed highest quantity of wheat to their livestock. Around 69,364 Kg of wheat was used to feed 1,470 livestock by sample farmers in the State. Out of this total, wheat quantity of 69,364 kg, grain quantity of 40379 kg was fed to 576 milch buffaloes, 17,575 kg to 261 dry milch buffaloes, 900 kg to 390 buffalo calves and about 9000 kg to both in milk and dry milch cows. Similarly, the large share of wheat quantity in Madhya Pradesh was fed to cows and buffaloes. Out of 52,350 kg of wheat, about 24,425 kg of the grain was fed to 333 milch buffaloes, 18,200 kg to 495 cows. Interestingly, bullocks were also given a significant amount of (9,725 kg, 18.58 per cent of total) of the total wheat quantity fed to livestock in the State. In Punjab, per animal

annual quantity consumption of wheat was found to be lower than that of Uttar Pradesh, Madhya Pradesh and Himachal Pradesh. From table 4.4.1, it can be noticed that annually, about 11.59 kg of wheat grain was fed to livestock in Punjab as compared to 47.19 kg in Uttar Pradesh, 46.43 kg in Himachal Pradesh and 43.81 Kg in Madhya Pradesh. Out of a total quantity of 15,015 kg of wheat fed to all livestock in Punjab, about 12,845 kg of the grain was given to milch buffaloes and 1,625 kg to milch cows. It can also be noticed that the sample farmers of Himachal Pradesh fed wheat grain relatively more to buffaloes than other livestock/animals. Out of 18,200 kg of wheat fed to the livestock, about 16,960 kg (93 per cent) were fed only to milch buffaloes, while 1,240 kg (6.18 per cent) to milch cows. From the above description, it is clear that sample farmers of Himachal Pradesh, Madhya Pradesh, Punjab and Uttar Pradesh fed significant quantity of selected wheat grain mainly to milch cows and buffaloes.

Considering the pattern of feeding of paddy grain in the study areas of Andhra Pradesh, Assam, Bihar and Haryana, we find a large variation in the extent of feeding across the different types of livestock. The sample farmers of Andhra Pradesh and Haryana were not observed feeding paddy grain to their animals. But in the case of Bihar and Assam, the sample farmers were found to be feeding a good amount of paddy grain to the livestock. In these two sample states, despite having small difference in number of livestock, the annual quantity of paddy fed to livestock was quite larger. The average per animal quantity paddy fed to livestock in Bihar was around 76.58 kg as against 17.10 kg in Assam. Out of 32,853 kg of paddy quantity fed to the livestock in Bihar, about 22,318 kg of the grain given to milch cow and 6,745 kg to dry milch cows. While sample farmers in the Assam fed around 1,525 kg of paddy fed to milch buffaloes and 1,385 kg to bullocks. Interestingly, it is noticed that out of total paddy grain fed to livestock in Bihar, nearly 89 per cent was given to milch and dry milch cows. In Assam, out of total quantity of paddy fed to livestock by the sample farmers, about 45 per cent (4,565 kg out of 10,070 kg) was given to buffalo calves and remaining 65 per cent to milch cow (2,637 kg) and dry milch cows (1,479 kg).

Table 4.4.1 : Distribution of Annual Quantity Consumption of Selected Cereal Crops as Feed by Livestock in the Study Area Selected for Cereal Crop in Different States

(Quantity in Kg)

Name of The States	Name of Crops	Cows						Buffaloes						Bullocks		He-Buffaloes		Any others		Total No. of Animals belonging to Sample farmers	Total No. of Animals Consuming the crop	Total consumption (kg)	Consumption of crop/animal (kg)
		in milk		dry		C. Calves		In milk		dry		B. calves		No.	Qty.	No.	Qty.	No.	Qty.				
		No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.										
H. Pradesh	Wheat	32	1240	4	0	8	0	360	16960	78	0	77	0	93	0	-	-	136	0	788	392	18200	46.43
M. Pradesh	„	379	17850	116	350	0	0	333	24425	73	0	394	0	367	9725	-	-	97	0	1759	1195	52350	43.81
Punjab	„	124	1625	19	0	0	0	916	12845	418	0	577	0	250	260	-	-	6	285	2310	1296	15015	11.59
U P Pradesh	„	97	8500	41	500	0	0	576	40339	261	17575	390	900	37	875	68	675	-	-	1470	1470	69364	47.19
Total	„	632	29215	180	850	8	0	2185	94569	830	17575	1438	900	747	10860	68	675	239	285	6327	4353	154929	35.59
A. Pradesh	Paddy	41	0	14	0	33	0	275	0	157	0	217	0	33	0	17	0	0	0	787	0	0	0.00
Assam	„	83	2637	58	1479	0	0	10	335	9	250	223	4565	96	414	-	-	110	390	589	589	10070	17.10
Bihar	„	195	22318	100	6745	130	0	23	425	44	1525	23	455	44	1385	0	0	0	0	559	429	32853	76.58
Haryana	„	120	0	52	0	773	0	619	0	317	0	0	0	172	0	-	-	-	-	2053	0	0	0.00
Total	„	439	24955	224	8224	936	0	927	760	527	1775	463	5020	345	1799	17	0	110	390	3988	1018	42923	42.16
Karnataka	Jowar	84	615	56	0	98	0	115	2195	93	0	121	0	245	3225	13	0	354	0	1179	444	6035	13.59
Maharashtra	„	149	0	151	0	181	0	122	0	83	0	128	0	421	0	1	0	138	0	1374	-	-	-
Total	„	233	615	207	0	279	0	237	2195	176	0	249	0	666	3225	14	0	492	0	2553	444	6035	13.59
Rajasthan	Bajra	114	2760	10	0	84	0	360	9548	34	0	285	0	0	0	0	0	615	1190	1502	474	13498	28.48
All		1418	57545	621	9074	1307	0	3709	107072	1567	19350	2435	5920	1758	15884	99	675	1456	1865	14370	6289	217385	34.57

Note: (1) The ratio of quantity of crop consumption to per animal excludes figures of those animals that have not been found consuming any quantity of the crop.

(2) Dash indicates figures not available/given

(3) In the case of Maharashtra, only figure of the total quantity (11709 Kg) by livestock is provided. In the report, the distribution of annual quantity consumption of selected Jowar crop as a feed by livestock across the different types of livestock has not been given separately.

Table 4.4.2 : Distribution of Annual Consumption of Selected Pulse Crops as Feed by Livestock in the Study Area Selected for Pulse Crop in Different States

(Quantity in Kg)

Name of The States	Name of Crops	Cows						Buffaloes						Bullocks		He-Buffaloes		Any others		Total No. of Animals belonging to Sample farmers	Total No. of Animals Consuming the crop	Total consumption (kg)	Consumption of crop/animal (kg)
		in milk		dry		C. calves		In milk		dry		B. calves		No.	Qty.	No.	Qty.	No.	Qty.				
		No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.	No.	Qty.										
M. Pradesh	Gram	311	10380	56	10	0	0	289	11690	41	0	301	115	320	6745	-	-	478	335	1796	1755	29275	16.68
Maharashtra	..	285	0	219	0	307	0	76	0	84	0	88	0	279	0	1	0	685	0	2024	-	-	-
Rajasthan	..	264	0	24	0	205	0	483	0	65	0	443	0	14	0	4	0	933	0	2435	0	0	0.00
Uttar Pradesh	..	120	100	60	40	0	0	261	2000	125	100	270	25	203	100	12	18	-	-	1051	1051	2383	2.27
Haryana	..	61	145	27	0	0	0	408	1975	137	165	495	100	36	0	-	-	232	0	1396	1101	2385	2.17
Total	..	1041	10625	386	50	512	0	1517	15665	452	265	1597	240	852	6845	17	18	2328	335	8702	3907	34043	8.71
A. Pradesh	Bll.gram	13	0	47	0	26	0	320	0	233	0	337	0	86	0	4	0	0	0	1066	0	0	0.00
Assam	..	89	87	80	0	0	0	0	0	3	0	94	0	177	63	-	-	135	0	578	266	150	0.56
H. Pradesh	..	309	0	79	0	98	0	93	0	33	0	23	0	191	0	-	-	45	0	871	0	0	0.00
Total	..	411	87	206	0	124	0	413	0	269	0	454	0	454	63	4	0	180	0	2515	266	150	0.56
Punjab	G. gram	73	52	32	0	0	0	831	586	269	0	674	22	586	28	-	-	23	0	2488	2164	688	0.32
Karnataka	Red gram	136	0	194	0	154	0	64	0	96	0	67	0	343	0	1	0	102	0	1157	0	0	0.00
Bihar	Lentil	36	1595	19	520	37	0	11	465	3	30	9	130	0	0	0	0	30	260	145	105	3000	28.57
All		1697	12359	837	570	827	0	2836	16716	1089	295	2801	392	2235	6936	22	18	2663	595	15007	6442	37881	5.88

Note: (1) The ratio of quantity of crop consumption to per animal excludes figures of those animals that have not been found consuming any quantity of the crop.

(2) Dash indicates figures not available/given

(3) In the case of Maharashtra, only figure of the total quantity (306 Kg) by livestock is provided. In the report, the distribution of annual quantity consumption of selected gram crop as a feed by livestock across the different types of livestock has not been given separately.

The quantity of jowar crop fed by sample farmers to livestock in Karnataka found to be 6,035 kg. In which, milch buffaloes (2,195 kg) and bullocks (3,225 kg) accounted for 90 per cent of total quantity of jowar fed to livestock. However, in the case of Maharashtra, we could not document the estimate relating to the distribution of the jowar quantity fed to various types of livestock by the sample farmers. The report received to the centre provides estimates relating to total fodder given to the livestock belonging to the sample farmers, which was quite redundant for the study. In the Rajasthan, sample farmers fed annually an average per animal 28.48 kg of bajra grain. Out of 1,502 livestock, only 474 animals were fed a total quantity of 13,498 kg of the grain. A significant amount of bajra grain was given to milch cows (2,760 kg to 114 cows) and milch buffaloes (9,548 kg to 360 buffaloes). The sample farmers of Rajasthan fed a significant amount of quantity (1,190 kg) to these animals.

Table 4.4.1 reveals that the study area selected of cereal crops, sample farmers used grains largely to feed milch cows and buffaloes, which accounted for around 89 per cent of total quantity fed to livestock. Out of total quantity of 2,17,385 kg of selected grains, around 49.25 per cent was fed to milch buffaloes, 26.47 per cent to milch cows, 8.90 per cent to milch dry buffaloes and 4.17 per cent to milch dry cows.

The distribution of annual quantity of pulses fed to the different types of livestock by the sample farmers across the states is presented in the table 4.4.2. From the table, it is found that the sample farmers of four states viz., Rajasthan (gram), Andhra Pradesh (bengalgram), Himachal Pradesh (bengalgram) and Karnataka (redgram) did not feed the pulses to their animals. Moreover, due to unavailability of information pertaining to these estimates in the report of Maharashtra (gram), results were not been discussed for the State. Hence, the focus of this subsection would be on analyzing the pertaining estimates for the remaining six sample states viz., Madhya Pradesh, Haryana, Uttar Pradesh, Assam, Punjab and Bihar.

Table 4.4.2 clearly shows that not all livestock possessed by the sample farmers are fed pulses. Even the proportion of livestock who have fed selected grains differs across these sample states. In Uttar Pradesh, all livestock were fed gram grain, whereas

the proportion of the livestock who have been fed gram grain to its total owned livestock population was found to be at 97 per cent in Madhya Pradesh and 79 per cent in Haryana. In Punjab, sample farmers fed greengram to its 87 per cent of the total livestock population. Similarly, the sample farmers in Bihar found to have fed lentil grain to at least 72 per cent of its total livestock population. However, in Assam, the proportion of livestock who have been fed blackgram grain by the sample farmers found to be least (46 per cent) among all selected states.

From table 4.4.2, it is found that average quantity of selected grains fed to per animal substantially varied across the sample states. Though the difference in per animal average quantity of selected grain fed was negligible between Uttar Pradesh (2.27 kg) and Haryana (2.17 kg), the difference was quite substantial among Madhya Pradesh (16.68 kg), Uttar Pradesh (2.27 kg) and Assam (0.56 kg). In two sample states viz., Haryana and Uttar Pradesh, the pattern of feeding amount of gram grain to different types of livestock appeared to be quite similar. Out of 2,383 kg of gram fed to total livestock by sample farmers in the Uttar Pradesh, 2000 kg (83.93 per cent of the total) was alone fed to in milch buffaloes. Similarly, in the Haryana, the sample farmers fed around 1,975 kg of gram grain to milch buffaloes, which constituted around 82.81 per cent of the total quantity fed to livestock. However, in Madhya Pradesh, out of 29,275 kg of gram fed to the livestock, about 11,690 kg (39.93 per cent of the total) was to milch buffaloes, 10,380 kg (35.46 per cent) to milch cows and 6,745 kg (23.04 per cent) to bullocks. The quantity of blackgram grain fed to livestock by the sample farmers in Assam found to be 150 kg to 266 animals. Out of which, 87 kg (58 per cent) of blackgram grain was fed to milch cows and 63 kg (42 per cent) to bullocks. The average per animal quantity of blackgram grain fed to the livestock in the State was 0.56 kg. Similarly, in Punjab, the average per animal quantity of greengram fed to livestock found to be low at 0.32 kg. The sample farmers in the State fed around 688 kg of greengram to 2164 livestock population. Out of which, the maximum amount of greengram (586 kg or nearly 85 per cent) was found to have fed to 831 milch buffaloes. Whereas, the average per animal quantity of lentil fed to the livestock in Bihar was located to be the highest (28.57 kg) among all selected States. The sample farmers of Bihar fed around 3000 kg of lentil grain to 105 livestock population. Out of which, 1,595 kg was fed to 36 milch cows, 520 kg to 19 dry milch cows, 465 kg to 11 milch buffaloes

and 130 kg to 9 buffalo calves. Overall, the sample farmers of all the selected states fed around 44.13 per cent (about 16,716 kg) of the total quantity of all selected pulses to milch buffaloes, 32.63 per cent (about 12,359 kg) to milch cows and 18.31 per cent (about 6,936 kg) to bullocks. The average per animal quantity of selected pulses fed to the livestock was worked out at 5.88 kg for all selected states except Maharashtra.

The distribution of annual quantity of selected cereal crops fed to livestock by the sample farmers across the study area of selected states is shown in table 4.4.3. From the table, we found that the sample farmers of four states viz., Himachal Pradesh, Uttar Pradesh, Haryana and Rajasthan did not possess any poultry animal. However, in the remaining selected states, the large variation in the quantity of selected cereals fed to the livestock can be observed both across the states and crops.

Table 4.4.3: Distribution of Annual Quantity of Consumption of Selected Cereal Crops as Feed by Poultry in the Study Area Selected for Cereal Crop in Different States

Sl. No	Name of The States	Crop	No. of birds	Total Consumption of crop	Consumption per bird
				(Kg)	Kg
1	Himachal Pradesh	Wheat	0	0	0.00
2	Madhya Pradesh	„	735	4400	5.99
3	Punjab	„	317	910	2.87
4	Uttar Pradesh	„	0	0	0.00
	Total	„	1052	5310	5.05
5	Andhra Pradesh	Paddy	450	4558	10.13
6	Assam	„	692	4955	7.16
7	Bihar	„	1006	11385	11.32
8	Haryana	„	0	0	0.00
	Total	„	2148	20898	9.73
9	Karnataka	Jowar	773	350	0.45
10	Maharashtra	„	226	805	3.56
	Total	„	999	1155	1.16
11	Rajasthan	Bajra	0	0	0.00
	All		4199	27363	6.52

In Madhya Pradesh, the average per bird quantity of wheat fed found to be 5.99 kg as against that of Punjab of 2.87 kg. The sample farmers of Punjab (317 birds) had less number of poultry/birds population than that of Madhya Pradesh (735 birds) and the quantity of wheat fed to birds in the State (910 kg) was also found to be less than that

of Madhya Pradesh (4400 kg). Whereas, the difference in the average per bird quantity of paddy fed by the sample farmers in Andhra Pradesh and Bihar was negligible, the birds' population and the quantity of paddy fed significantly differed in both states. In Andhra Pradesh, 450 birds were fed about 4558 kg of paddy, while in the Bihar, 1006 birds were given about 11,385 kg of the grain. In Assam, the per bird quantity of paddy fed by the sample farmers was estimated at 7.16 kg. The sample farmers in the State fed 4955 kg of paddy to 692 birds.

In case of Maharashtra and Karnataka, per bird quantity of jowar fed was found to be lowest as compared to the other selected states. The per bird annual quantity of jowar fed by the sample farmers was estimated at 3.56 kg for Maharashtra and 0.45 kg for Karnataka. The sample farmers in Karnataka fed about 350 kg of jowar to 773 birds during period of one year. While the sample farmers in Maharashtra fed about 805 kg of jowar to 226 birds during the same period. At aggregate level, the per bird average quantity of selected grains fed by the sample farmers to their poultry was estimated at 6.52 kg for all selected states. The sample farmers of all the sample states fed about 27,363 kg of selected grains to 4199 poultry/ bird population.

Table 4.4.4: Distribution of Annual Consumption of Selected Pulse Crops as Fed by Poultry in the Study Area Selected for Pulse Crop in Different States

Sl. No	Name of the States	Crop	No. of birds	Consumption of crop	Consumption per bird
				(Kg)	(Kg)
1	Madhya Pradesh	Gram	1334	5760	4.36
2	Maharashtra	..	1297	1814	1.40
3	Rajasthan	..	0	0	0.00
4	Uttar Pradesh	..	0	0	0.00
5	Haryana	..	0	0	0.00
	Total	..	2631	7574	2.88
6	Andhra Pradesh	Blackgram	362	25	0.07
7	Assam	..	881	0	0.00
8	Himachal Pradesh	..	0	0	0.00
	Total	..	1243	25	0.02
9	Punjab	Green gram	543	150	0.28
10	Karnataka	Red gram	306	0	0.00
11	Bihar	Lentil	0	0	0.00
	All		4723	7749	1.64

The distribution of quantity of selected pulse crops fed to the poultry during a period of one year across study area of selected states is presented in table 4.4.4. From the following table, it can be clearly noticed that the sample farmers in the study area of Rajasthan, Uttar Pradesh, Haryana, Himachal Pradesh and Bihar do not possess any poultry bird, hence the quantity consumption of selected grains found to be nil. However, though sample farmers of Assam and Karnataka possessed about 881 and 306 poultry birds respectively, none of these birds were fed selected grain (Blackgram in Assam and Redgram in Karnataka) in the respective states. It was only the sample of farmers of Madhya Pradesh, Maharashtra, Andhra Pradesh and Punjab who were found to have fed selected grains to the poultry birds. Moreover, we found quite significant variations across these four states in the birds' population, the quantity of selected pulses fed to these birds and average per bird quantity of the selected pulses fed by the sample farmers. The average per bird quantity of selected gram fed by the sample farmers was found to be 4.36 kg in Madhya Pradesh, 1.40 Kg in Maharashtra, 0.28 kg in Punjab and 0.07 kg in Andhra Pradesh. In Madhya Pradesh, sample farmers fed around 5760 kg of gram grain to 1334 bird population, while, sample farmers in Maharashtra, fed about 1814 kg of the same grain to 1297 bird population. The quantity of greengram fed to 543 bird population by sample farmers in Punjab was much less at 150 kg but quite higher as compared to the quantity of blackgram (25 Kg) fed to 362 bird population by sample farmers in Andhra Pradesh.

At aggregate level, from the table 4.4.3 and 4.4.4, it is found that the average per bird quantity of selected pulses fed by the sample farmers was much lower (1.64 kg) than that of cereals (6.52 kg). The sample farmers selected for pulses fed around 7,749 kg of selected pulse grains to 4,723 birds, whereas about 27,363 kg of selected cereal grains were fed to only 4199 birds by the sample farmers selected for cereals.

4.4.4: Farm size-wise Estimates of Animal Feed for Cereal Crops

The farm size wise estimates of the quantity of selected cereal crops fed to animals by sample farmers across the selected States are documented in the tables 4.4.5 to 4.4.8, in which an attempt has been made to highlight the percentage quantity

of selected cereal crops used to feed animals by farmers in the study areas of selected States. The percentage quantity of selected grain fed to animals (both livestock and poultry birds) is taken with respect to the total net production of the sample farmers of selected State for the particular size of holding.

From the tables, we find that though variations in the percentage quantity of selected cereals across the farm size of holdings were negligible, there were significant variations across the sample states. The percentage quantity of selected wheat grain fed to the animals found to be highest in Himachal Pradesh (6.40 per cent), whereas lowest in Punjab (just 0.29 per cent) for the same crop (see 4.4.8). Interestingly, on an average the sample states selected for wheat except Punjab have fed higher percentage of quantity to their animals as compared to sample farmers of other sample states. The percentage quantity of wheat fed to the animal was estimated at 6.40 per cent for Himachal Pradesh, 5.97 per cent for Uttar Pradesh and 3.73 per cent for Madhya Pradesh. At different farm size of holding levels, it was noticed that percentage quantity of wheat fed to the animals by large sample farmers was quite low as compared to that of medium and small sample farmers. However, pattern of percentage quantity of wheat fed to the animals by small and medium sample farmers was much similar across the selected states. In Himachal Pradesh, the percentage quantity of wheat fed to the animals was found to be 6.60 per cent for small sample farmers, 6.50 percent for the medium sample farmers and 4.70 per cent for large sample farmers. The small and medium sample farmers in Uttar Pradesh fed to the animals about 6.76 per cent of their total wheat production, whereas large sample farmers fed 4.43 per cent of their total net production, Similarly, small (5.65 per cent) and medium (5.14 per cent) sample farmers in Madhya Pradesh fed quite significant quantity of wheat to their animals as compared to the large sample farmers (2.64 per cent). However, Punjab remained an exception which used significantly lesser percentage of wheat to feed animals across the farm size holdings. In Punjab the percentage quantity of wheat fed to the animals varied from 0.23 per cent to 0.42 per cent.

Table 4.4.5: Distribution of Total Quantity of Cereal Crops Used as Animal Feed by Selected Small Sample Farmers in Different States

Sl. No	Name of States	Name of the Crops	Net Production (in qtls)	Livestock feed (qtls)	Poultry feed (qtls)	Total Animal Feed	
						Qty. (qtls)	%
1	U. Pradesh	Wheat	3154.85	213.40	0.00	213.40	6.76
2	M. Pradesh	..	1866.50	96.50	9.00	105.50	5.65
3	H.Pradesh	..	1268.40	83.30	0.00	83.30	6.60
4	Punjab	..	5676.10	18.50	1.30	19.80	0.35
5	Bihar	Paddy	7158.40	107.40	42.84	150.24	2.10
6	A. Pradesh	..	10968.00	0.00	14.20	14.20	0.13
7	Assam	..	1767.95	56.65	24.00	80.65	4.56
8	Haryana	..	5920.00	0.00	0.00	0.00	0.00
9	Karnataka	Jowar	473.00	5.45	1.20	6.65	1.41
10	Maharashtra	..	725.00	11.85	0.65	12.50	1.72
11	Rajasthan	Bajra	745.10	27.68	0.00	27.68	3.71
	All		39723.30	620.73	93.19	713.92	1.80

Table 4.4.6: Distribution of Total Quantity of Cereal Crops Used as Animal Feed by Selected Medium Sample Farmers in Different States

Sl. No	Name of States	Name of the Crops	Net Production (In qtls)	Livestock feed (qtls)	Poultry feed (qtls)	Total Animal Feed	
						Qty. (qtls)	%
1	U. Pradesh	Wheat	4520.70	305.45	0.00	305.45	6.76
2	M. Pradesh	..	4393.00	202.00	24.00	226.00	5.14
3	H.Pradesh	..	1355.00	88.30	0.00	88.30	6.50
4	Punjab	..	12615.60	48.75	4.00	52.75	0.42
5	Bihar	Paddy	6325.20	96.70	37.55	134.25	2.12
6	A. Pradesh	..	27702.75	0.00	18.09	18.09	0.07
7	Assam	..	1033.33	27.25	10.40	37.65	3.64
8	Haryana	..	13000.00	0.00	0.00	0.00	0.00
9	Karnataka	Jowar	816.90	17.10	1.55	18.65	2.28
10	Maharashtra	..	1206.00	39.29	1.35	40.64	3.37
11	Rajasthan	Bajra	1515.00	45.20	0.00	45.20	2.98
	All		7483.48	870.04	96.94	966.94	1.30

Table 4.4.7: Distribution of Total Quantity of Cereal Crops Used as Animal Feed by Selected Large Sample Farmers in Different States

Sl. No	Name of States	Name of the Crops	Net Production (qtls)	Livestock feed (qtls)	Poultry feed (qtls)	Total Animal Feed	
						qty. (qtls)	%
1	U. Pradesh	Wheat	3949.80	174.79	0.00	174.79	4.43
2	M. Pradesh	..	8936.00	225.00	11.00	236.00	2.64
3	H.Pradesh	..	222.00	10.40	0.00	10.40	4.70
4	Punjab	..	36893.90	82.90	3.80	86.70	0.23
5	Bihar	Paddy	8612.53	124.43	33.46	157.89	1.83
6	A. Pradesh	..	36047.25	0.00	13.30	13.30	0.04
7	Assam	..	1184.80	16.80	15.15	31.95	2.70
8	Haryana	..	31503.00	0.00	0.00	0.00	0.00
9	Karnataka	Jowar	1508.25	37.80	0.75	38.55	2.56
10	Maharashtra	..	1894.50	65.95	6.05	72.00	3.80
11	Rajasthan	Bajra	2870.00	62.10	0.00	62.10	2.16
	All		133622.03	800.17	83.51	883.68	0.66

Table 4.4.8: Distribution of Total Quantity of Cereal Crops Used as Animal Feed by Selected All Sample Farmers in Different States

Sl. No	Name of States	Name of the Crops	Net Production (qtls)	Livestock feed (qtls)	Poultry feed (qtls)	Total Animal Feed	
						qty. (qtls)	%
1	U. Pradesh	Wheat	11625.35	693.64	0.00	693.64	5.97
2	M. Pradesh	..	15195.50	523.50	44.00	567.50	3.73
3	H.Pradesh	..	2845.40	182.00	0.00	182.00	6.40
4	Punjab	..	55185.60	150.15	9.10	159.25	0.29
5	Bihar	Paddy	22096.13	328.53	113.85	442.38	2.00
6	A. Pradesh	..	74718.00	0.00	45.58	45.58	0.06
7	Assam	..	3986.08	100.70	49.55	150.25	3.77
8	Haryana	..	50423.00	0.00	0.00	0.00	0.00
9	Karnataka	Jowar	2798.15	60.35	3.50	63.85	2.28
10	Maharashtra	..	3825.50	117.09	8.05	125.14	3.27
11	Rajasthan	Bajra	5130.10	134.98	0.00	134.98	2.63
	All		247828.81	2290.94	273.63	2564.57	1.03

Considering percentage quantity of paddy fed to the animals by the sample farmers of Andhra Pradesh, Bihar, Assam and Haryana, we observed quite significant variations in the estimates across the sample states. However, variations across the farm size of holdings were insignificant. From the tables 4.4.5 to 4.4.8, these can be

clearly noticed. The percentage quantity of paddy fed by the sample farmers to their animals was estimated at 2.0 per cent for Bihar, 3.77 per cent for Assam, 0.06 per cent for Andhra Pradesh and none for Haryana. The percentage quantity of jowar grain fed to animals by all sample farmers was estimated at 2.28 per cent for Karnataka and 3.27 per cent for Maharashtra (see table 4.4.8). However, the corresponding figures for small sample farmers were observed to be lower as compared to that of medium and large sample farmers in both the states. The percentage quantity of jowar fed to the animals in Karnataka was estimated at 4.41 per cent for small sample farmers, 2.28 per cent for medium sample farmers and 2.56 per cent for large sample farmers. Whereas, the corresponding figures in Maharashtra estimated at 1.72 per cent, 3.37 per cent and 3.80 per cent respectively for small, marginal and large sample farmers. In the case of Bajra, no significant variation in the percentage of the grain fed to the animals by the sample farmers of Rajasthan was noticed across the farm size of holdings. The proportion of bajra grain fed to the animals by the sample farmers of the State was estimated at 3.71 per cent for small sample farmers, 2.98 per cent for medium sample farmers and 2.16 per cent for large. At aggregated level, percentage quantity of all selected cereals fed to the total animals by the sample farmers of all sample states was estimated at 1.80 per cent for small sample farmers, 1.30 per cent for medium sample farmers, 0.82 per cent for large sample farmers and 1.03 per cent for large sample farmers. At disaggregated level, it was found that the quantity of selected cereal grains fed to the livestock as compared to poultry found to be prominent across the sample states and farm size of holdings.

4.4.5 Farm size-wise Estimates of Animal Feeds for Pulse Crops

The farm size wise estimates of the quantity of selected pulse crops fed to animals by sample farmers across the selected States are presented in the tables 4.4.9 to 4.4.12. in which an attempt has been made to explain how much percentage quantity of selected pulse crop to its total net production have been used to feed animals by farmers in the study area of selected states.

From table 4.4.12, it is observed that out of eleven selected states, the sample farmers of Rajasthan (gram), Himachal Pradesh (blackgram) and Karnataka (redgram)

did not feed pulse grain to their animals. The percentage quantity of selected grain used for animal feed by sample farmers accounted for less than 1.40 per cent in the study area of Bihar (lentil), Uttar Pradesh (gram), Punjab (greengram), Haryana (gram) and Andhra Pradesh (blackgram). However, the percentage quantity of selected grain used for animal feed by sample farmers was found to be substantially high in Madhya Pradesh (5.87 per cent) for gram and Assam (5.01 per cent) for blackgram. While in Maharashtra, the corresponding percentage for gram was estimated at 2.13 per cent. It is quite noticeable from the table 4.4.12 that the percentage quantity of selected pulse crops used for animal feed by sample farmers revealed large variation across the selected states. Such pattern of the variation was also observed across the farm size of holdings.

The percentage quantity of gram fed to animals by the sample farmers of Madhya Pradesh was estimated at 5.89 per cent for small sample farmers, 6.08 per cent for medium sample farmers and 5.78 per cent for large sample farmers. In Maharashtra, the percentage quantity of gram fed to the animals varied from 1.68 per cent to 2.41 per cent across the farm size of holdings. In Uttar Pradesh, the corresponding percentage found to be ranging from 0.78 per cent to 1.24 per cent. With quite negligible variation, the percentage quantity of selected grains fed to the animals found to be less than 0.68 per cent across the farm size of holdings in Haryana (gram), Andhra Pradesh (blackgram) and Punjab (greengram). It is important to note that in Andhra Pradesh; only small sample farmers fed about 25 kg of blackgram to the animals. This constituted 0.05 per cent of their total net production. Similarly, the sample farmers of Punjab fed a little (150 kg) quantity of greengram to the animal which accounted for 0.63 per cent of their total net production. In Bihar, the percentage quantity of lentil fed to the animals varied from 0.86 per cent to 1.81 per cent. However, in Assam the percentage quantity of blackgram fed to the animals shown significant variation across the farm size of holdings. The percentage quantity of blackgram fed to animals by the sample farmers of Assam found to be 3.50 per cent for small sample farmers, 6.52 per cent for medium sample farmers and 6.59 for the large sample farmers.

Table 4.4.9: Distribution of Total Quantity of Pulse Crops Used as Animal feed by Selected Small Sample Farmers in Different States

Sl. No	District	Name of the Crops	Net Production (qtls)	Animal Feed (Qtls)	Poultry Feed (Qtls)	Total Used as Feed	
						Qty (qtls)	%
1	Madhya Pradesh	Gram	783.00	32.00	14.10	46.10	5.89
2	Maharashtra	„	209.60	0.00	3.53	3.53	1.68
3	Rajasthan	„	856.70	0.00	0.00	0.00	0.00
4	Uttar Pradesh	„	342.95	3.43	0.00	3.43	1.00
5	Haryana	„	814.00	1.05	0.00	1.05	0.13
6	Andhra Pradesh	Black gram	462.10	0.00	0.25	0.25	0.05
7	Assam	„	15.15	0.53	0.00	0.53	3.50
8	Himachal Pradesh	„	90.55	0.00	0.00	0.00	0.00
9	Punjab	Green gram	174.15	0.63	0.35	0.98	0.56
10	Karnataka	Red gram	521.50	0.00	0.00	0.00	0.00
11	Bihar	Lentil	862.87	7.40	0.00	7.40	0.86
	All		5132.57	45.04	18.23	63.27	1.23

Table 4.4.10: Distribution of Total Quantity of Pulse Crops Used as Animal feed by Selected Medium Sample Farmers in Different States

Sl. No	District	Name of the Crops	Net Production (qtls)	Animal Feed (qtls)	Poultry Feed (qtls)	Total Used as Feed	
						Qty (qtls)	%
1	Madhya Pradesh	Gram	1674.00	89.75	12.00	101.75	6.08
2	Maharashtra	„	300.30	0.00	5.89	5.89	1.96
3	Rajasthan	„	1934.00	0.00	0.00	0.00	0.00
4	Uttar Pradesh	„	685.40	5.35	0.00	5.35	0.78
5	Haryana	„	1626.00	4.05	0.00	4.05	0.25
6	Andhra Pradesh	Black gram	1098.61	0.00	0.00	0.00	0.00
7	Assam	„	8.75	0.57	0.00	0.57	6.52
8	Himachal Pradesh	„	69.97	0.00	0.00	0.00	0.00
9	Punjab	Green gram	290.60	1.29	0.33	1.62	0.56
10	Karnataka	Red gram	880.50	0.00	0.00	0.00	0.00
11	Bihar	Lentil	694.06	12.55	0.00	12.55	1.81
	All		9262.19	113.56	18.22	131.78	1.42

Table 4.4.11: Distribution of Total Quantity of Pulse Crops Used as Animal Feed by Selected Large Sample Farmers in Different States

Sl. No	District	Name of the Crops	Net Production (qtls)	Animal Feed (qtls)	Poultry Feed (qtls)	Total Used as Feed	
						Qty (qt)	%
1	Madhya Pradesh	Gram	3506.00	171.00	31.50	202.50	5.78
2	Maharashtra	..	488.90	3.06	8.72	11.78	2.41
3	Rajasthan	..	3592.50	0.00	0.00	0.00	0.00
4	Uttar Pradesh	..	1212.90	15.05	0.00	15.05	1.24
5	Haryana	..	3254.00	18.75	0.00	18.75	0.58
6	Andhra Pradesh	Black gram	2420.75	0.00	0.00	0.00	0.00
7	Assam	..	6.07	0.40	0.00	0.40	6.59
8	Himachal Pradesh	..	15.83	0.00	0.00	0.00	0.00
9	Punjab	Green gram	864.35	4.96	0.82	5.78	0.67
10	Karnataka	Red gram	1695.00	0.00	0.00	0.00	0.00
11	Bihar	Lentil	601.24	10.05	0.00	10.05	1.67
	All		17657.54	223.27	41.04	264.31	1.50

Table 4.4.12: Distribution of Total Quantity of Pulse Crops Used as Animal feed by Selected All Sample Farmers in Different States

Sl. No	District	Name of the Crops	Net Production (qtls)	Animal Feed (qtls)	Poultry Feed (qtls)	Total Used as Feed	
						Qty (qtls)	%
1	Madhya Pradesh	Gram	5963.00	292.75	57.60	350.35	5.87
2	Maharashtra	..	998.80	3.06	18.14	21.20	2.13
3	Rajasthan	..	6383.20	0.00	0.00	0.00	0.00
4	Uttar Pradesh	..	2241.25	23.83	0.00	23.83	1.06
5	Haryana	..	5694.00	23.85	0.00	23.85	0.42
6	Andhra Pradesh	Black gram	3981.46	0.00	0.25	0.25	0.01
7	Assam	..	29.97	1.50	0.00	1.50	5.01
8	Himachal Pradesh	..	176.35	0.00	0.00	0.00	0.00
9	Punjab	Green gram	1329.10	6.88	1.50	8.38	0.63
10	Karnataka	Red gram	3097.00	0.00	0.00	0.00	0.00
11	Bihar	Lentil	2158.17	30.00	0.00	30.00	1.39
	All		32052.30	381.87	77.49	459.36	1.43

Overall, from the tables 4.4.9 to 4.4.12, it is found that sample farmers across the selected states except Rajasthan, Himachal Pradesh and Karnataka, used selected pulses largely to feed livestock. However, the quantity of selected pulses fed to poultry was quite negligible as compared to that of livestock. Interestingly, the percentage

quantity of all selected pulses fed to all animals of the sample states found higher (1.42 per cent) as compared to that of all selected cereals (1.03 per cent)

4.5: Production and Disposal of Grain by Sample Farmers

In many developing countries, agriculture constitutes a major source of livelihood for the significant part of population and there exists many activities in the way of disposing total production. We generally find the farmers engaging in the activities such as keeping some portion of the produce for home consumption, animal feed, selling or exchanging agriculture produce as a seed, keeping as seed for the future use and marketing the surplus. With emergence of the commercialisation of economic activities, new development such as purchasing of certified seed and capital inputs began to evolve. As the farmers started to produce higher quantity of produce, they started marketing higher portion surplus to garner more economic gains. Generally, it is assumed that greater commercialisation of agricultural activities leads to reduction in the quantity of seed used, seed kept for the future production, less exchange of seed, less use of physical quantity of grains for hiring labor services and more usage of grain for animal feed to raise subsidiary income. On this background, this section attempts to highlight the observed scenario of net production and the proportion of the quantity of the selected grains disposed across various types of disposals by the sample farmers in the selected states. The estimates relating to disposal of selected grains mainly includes the proportion of the quantity of selected grain retained as seed from the previous year's production (seed used) to its total net production of this year, the quantity kept as seed for the future production (seed kept), exchange as a seed, sold for a seed, used for home consumption, later disposal, payment to labor in kind and quantity used for livestock and poultry feed. Moreover, we have also worked out the percentage quantity of selected grains marketed by the sample farmers in each selected State. The distribution of net production and disposal of selected cereal and pulse crops by all sample farmers has been shown in table 4.5.1 and 4.5.2, respectively for all sample states.

Table 4.5.1: Production and Disposal of Selected Cereal crops for All the Sample Farmers in Different States

Sl. No	Name of States	Name of Crops	Total Net Production (Tons)	Percentage to its Total Net Production									
				Previous year's Seed used	Kept for seed next time	Exchange as seed	Sold for seed	Home Consumption	Later Disposal	Kind wages to Labor	Used as livestock feed	Used as Poultry feed	Marketed Surplus
1	H. Pradesh	Wheat	284.54	9.83	9.68	-	-	42.81	-	0.00	6.40	0.00	37.45
2	M. Pradesh	„	1519.55	4.96	5.79	-	-	16.12	-	4.16	3.45	0.29	57.63
3	Punjab	„	5518.56	2.04	2.42	-	0.01	6.06	-	1.23	0.27	0.02	90.00
4	U. Pradesh	„	1162.54	4.05	4.22	-	0.49	30.45	-	5.68	5.97	0.00	53.19
	Total	„	8485.19	3.10	3.51	-	0.07	12.43	-	2.32	1.83	0.06	77.40
5	A. Pradesh	Paddy	7471.80	1.22	0.12	-	0.00	4.96	-	0.92	0.00	0.06	93.94
6	Assam	„	398.61	1.72	2.00	0.14	0.20	32.97	-	8.18	2.53	1.24	52.74
7	Bihar	„	2209.61	2.54	4.40	-	-	17.84	59.83	6.40	1.49	0.52	9.52
8	Haryana	„	5042.24	0.21	0.22	-	-	2.34	0.58	1.63	0.00	0.00	95.23
	Total	„	15155.30	1.09	0.83	0.00	0.01	6.69	8.92	2.15	0.28	0.14	80.77
8	Karnataka	Jowar	279.82	1.73	2.44	-	0.66	66.72	-	4.40	2.16	0.13	23.50
9	Maharashtra	„	382.55	0.00	0.00	-	-	51.46	8.12	9.74	3.06	0.21	19.43
	Total	„	662.37	0.73	1.03	-	0.28	57.91	4.69	7.48	2.68	0.18	21.15
10	Rajasthan	Bajra	513.01	0.54	0.03	-	-	13.75	-	1.00	2.63	0.00	64.08
	All		24782.80	1.76	1.74	0.00	0.04	10.18	5.58	2.33	0.92	0.11	77.78

Note: In case of Himachal Pradesh, Madhya Pradesh, Maharashtra and Rajasthan, the total disposal of selected grain is not equal to 100 per cent. Information obtained from the authors of respective State, however, has suggested that remaining percentage accounts for later disposal (undistributed percentage quantity).

Table 4.5.2: Production and Disposal of Selected Pulse crops for All the Sample Farmers in Different States

Sl. No	Name of States	Name of the Crops	Total Net Production (Tons)	Percentage to its Total Net Production									
				Previous year's Seed used	Kept for seed next time	Exchange as seed	Sold for seed	Home Consumption	Later Disposal	Kind wages to Labor	Used as livestock feed	Used as Poultry feed	Marketed Surplus
1	M. Pradesh	Gram	596.30	6.97	10.21	-	-	8.34	-	3.39	4.91	0.97	59.03
2	Maharashtra	„	99.88	1.05	3.80	-	-	24.14	47.75	6.11	0.31	1.81	16.08
3	Rajasthan	„	638.32	2.97	4.05	-	-	3.60	-	0.32	0.00	0.00	75.32
4	U. Pradesh	„	224.13	10.39	11.57	-	0.77	8.81	-	4.88	1.06	0.00	72.90
5	Haryana	„	569.37	4.82	5.16	-	-	3.15	15.84	0.00	0.42	0.00	75.43
	Total	„	2128.03	5.28	6.85	-	0.08	6.32	6.22	1.85	1.61	0.36	67.75
6	A. Pradesh	Blackgram	398.15	7.50	1.21	-	-	4.62	-	0.00	0.00	0.01	94.17
7	Assam	„	3.00	3.67	5.00	0.00	4.00	63.00	-	1.00	5.00	0.00	22.00
8	H. Pradesh	„	17.64	5.33	6.69	-	-	52.83	-	0.00	0.00	0.00	40.48
	Total	„	418.79	7.39	1.47	0.00	0.03	7.07	-	0.01	0.04	0.01	91.39
9	Bihar	Lentil	215.82	9.42	13.15	-	-	33.75	46.92	0.93	1.39	0.00	3.86
10	Karnataka	Redgram	309.70	1.56	3.37	0.00	0.66	7.02	-	6.39	0.00	0.00	82.57
11	Punjab	Greengram	132.91	1.87	1.99	-	0.23	7.50	-	0.24	0.52	0.11	89.40
	All		3205.22	5.33	6.04	0.00	0.13	8.38	7.29	1.92	1.19	0.24	68.87

Note: In case of Madhya Pradesh and Rajasthan, the total disposal of selected pulse grain is not equal to 100 per cent. Information obtained from the authors of respective State, however, has suggested that remaining percentage accounts for later disposal (undistributed percentage quantity).

The distribution of net production and disposal of selected cereal crops by sample farmers presented in table 4.5.1 clearly highlights large variations in the production and the disposal of selected crops across the sample states. As expected, the Punjab stood at prominent level in the wheat production among all wheat growing selected states. The total net production of wheat by the sample farmers of Punjab was found to be much higher (5518.56 tons) as compared to that of Madhya Pradesh (1519.56 tons), Uttar Pradesh (1162.54 tons) and Himachal Pradesh (284.54 tons). The proportion of the quantity sold or marketed by the sample farmers of Punjab to their total net production was estimated at 90 per cent, which was also much higher than that of Madhya Pradesh (57.63 per cent), Uttar Pradesh (53.19 per cent) and Himachal Pradesh (37.45 per cent). The percentage of seed used, seed kept, livestock and poultry feed as well as quantity used for home consumption found to be highest in Himachal Pradesh among the selected wheat growing states. The sample farmers of Himachal Pradesh used 42.81 per cent of their total net production for home consumption, as against that of Uttar Pradesh (30.45 per cent), Madhya Pradesh (16.12 per cent) and Punjab (6.06 per cent). The percentage quantity of wheat kept as seed for the future production by the sample farmers of the selected states was estimated at 9.68 per cent for Himachal Pradesh, 5.79 per cent for Madhya Pradesh, 2.42 per cent for Punjab and 4.22 per cent for Uttar Pradesh. While the percentage quantity of wheat fed to the livestock by sample farmers was estimated at 6.40 per cent for Himachal Pradesh, 5.97 per cent for Uttar Pradesh and 0.27 per cent for Punjab. Interestingly, the percentage quantity of wheat used for the kind of wages to labor found to be almost zero in Himachal Pradesh. This clearly reveals that labour requirement of the sample farmers are met out of family labors. The corresponding percentage for Uttar Pradesh found to be the highest (5.68 per cent) among the selected wheat growing states viz., Madhya Pradesh (4.16 per cent) and Punjab (1.23 per cent).

Unlike wheat, we do not find much variation in percentage quantity of paddy marketed/sold by the sample farmers to their total net production. However, the production and disposal pattern of the paddy across the selected paddy growing states did manifest significant variations. Out of 7471.80 tons of total net paddy production, almost 94 per cent of the quantity was marketed by sample farmers of Andhra Pradesh.

Similarly, the sample farmers of Haryana were also found to have marketed around 95 per cent of (5042.24 tons) their total net production. Whereas, the sample farmers of Assam marketed about 52.74 per cent of their total net production. However, in the case of Bihar, the percentage quantity of paddy marketed found to be low at 9.52 per cent of its total net production. But, since the percentage quantity left over after home consumption, kind wages to labors, animal and poultry feed and quantity kept as seed were treated as later disposal (59.83 per cent) in report of the State, we may expect that this quantity of the grain might have been sold in the market after some time lag. Hence, we may expect that the sample farmers of Bihar might have marketed/sold around 70 per cent of their total net production. While looking at the pattern of paddy disposal large variation is noticed particularly in the percentage quantity used for the home consumption, kept for seed, fed to the livestock and kind wages to labor. The percentage quantity used for home consumption to its total net production among these paddy growing States ranged from 32.97 per cent for Assam to 2.34 per cent for Haryana. Whereas, the percentage quantity used for kind wages to labors varied from 8.18 per cent for Assam to 0.92 per cent for Andhra Pradesh. The percentage quantity kept as seed by the sample farmers was found to be higher (4.40 per cent) in Bihar as compared to Assam (2.00 per cent), Haryana (0.22 per cent) and Andhra Pradesh (0.12 per cent).

From table 4.5.1, it is noticed that sample farmers of Karnataka and Maharashtra used significant percentage of the jowar quantity for home consumption. Out of total net production of 382.55 tons of jowar, the sample farmers of Maharashtra were observed to have used almost 67 per cent for the home consumption. Whereas, in Karnataka, this corresponding proportion found to be marginally less at 51.46 per cent. The percentage quantity given in the form of kind wages to labour found to be almost double (9.74 per cent) in Maharashtra as compared to Karnataka (4.40 per cent). The sample farmers in both states marketed around one fourth of their total net production. In Rajasthan, the sample farmers marketed two third of their total net bajra production. The percentage quantity of kind of wages to labour, livestock and poultry feed and quantity kept for seed altogether accounted for 3.66 per cent of its total net production in Rajasthan, which found to be lowest among all selected states except Andhra Pradesh

and Haryana. The percentage quantity of bajra grain used for home consumption was estimated at 13.75 per cent of its total production in the State.

Overall, it can be observed that around 78 per cent of the total selected cereal crops production was marketed by the sample farmers of all selected States. Though the percentage quantity of selected cereal grains marketed by the sample farmers varied significantly across the sample states, these variations were largely attributed to variations in the percentage quantity used for home consumption and kind of wages to labour.

The distribution of production and details of disposal of selected pulse crops across the selected States is shown in table 4.5.2. It is noticed that the pattern of the disposal of selected pulse crops reflects altogether different picture as compared to that of selected cereal crops. The percentage quantity of selected pulse grain used for both livestock and poultry feed were found to be below 2.12 per cent except Madhya Pradesh (5.88 per cent) and Assam (5 per cent). We also found large variations in the percentage quantity of pulse grain used for the human consumption across the selected crops and states. The percentage quantity of selected pulses used for human consumption found to be 53.83 per cent in Himachal Pradesh (gram), 63 per cent in Assam (blackgram), 33.75 per cent in Bihar (lentil) and 24.14 per cent in Maharashtra (gram). The corresponding percentage for remaining selected states ranged from 8.81 per cent for Uttar Pradesh to 3.60 per cent for Rajasthan.

The percentage quantity of selected pulse grains used for kind wages to labors was estimated at 6.39 per cent for Karnataka (redgram), 6.11 per cent for Maharashtra (gram), 4.88 per cent for Uttar Pradesh (gram) and 3.39 per cent for Madhya Pradesh (gram), while for remaining states it ranged between 0 to 1 per cent. Similarly, the percentage quantity of selected pulse gram kept as seed for the future use by the sample farmers was found to be much high in Madhya Pradesh (10.21 per cent), Uttar Pradesh (11.57 per cent) and Bihar (13.15 per cent) as compared to that of average of all selected states (6.04 per cent). On other hand, the corresponding percentages for Andhra Pradesh (1.21 per cent) and Punjab (1.99 per cent) was found to be much lower than that of average percentage (6.04 per cent) of all selected states. The percentage quantity of selected grain given in the form of the kind wages to labourers observed to

be 3.37 per cent for Karnataka, 3.80 per cent for Maharashtra, 4.05 per cent for Rajasthan, 5.16 per cent for Haryana and 6.69 per cent for Himachal Pradesh.

As we have discussed earlier, since some proportion of the quantity grain is likely to be sold after some time lag, the percentage quantity representing later disposal could be treated as the quantity sold or marketed. Hence, if we add the proportion of the later disposal to the marketed surplus of the State, the reflected variation in the marketed surplus can be easily explained. As the percentage quantity of selected grains used for the human consumption, kind wages to labour and quantity kept for the seed varied across the selected States, the percentage quantity of selected grains marketed also shown quite significant variation across the sample states. In the case of gram, the percentage quantity marketed by the sample farmers varied from 63.83 per cent (Maharashtra) to 91.27 per cent (Haryana). While, the estimated percentage quantity of blackgram marketed fluctuated between 22 per cent (Assam) to 94.17 per cent (Andhra Pradesh). In Punjab, around 90 per cent of total net production of Greengram was marketed by the sample farmers. Whereas, in Karnataka, the sample farmers producing redgram marketed around 83 per cent of their total net production. The estimated proportion of quantity marketed by sample farmers of Bihar found to be much lower (50.78 per cent) than the average proportion of all selected States (68.87 per cent).

Overall, it may be concluded that the percentage quantity of selected pulse grains marketed by the sample farmers was quite higher in the regions where the overall production of the grains was higher. Apart from this, the degree of commercialisation of crop seems to be major contributor for higher percentage of marketed surplus. The States like Punjab, Haryana and Andhra Pradesh, the production and percentage quantity of selected grains marketed were much higher than their counterparts.

4.6: Details of Wastages of Grain

As we have already discussed in the first chapter that reduction in the losses of foodgrains in handlings have wider implications on farmers' income and meeting the food requirements of the ever increasing population of the country. This would not only

help Indian agriculture achieving better food security level but also in realizing higher levels of competence at the international market for food and food-related products. But it requires Indian farmers to produce more by adopting scientific methods of production and minimizing losses of food-grains at various stages of handling. Since the growth in foodgrains production is increasingly witnessing fatigue in many parts of the country due to deceleration in yield levels, the reduction of wastages at different levels of production and distribution is likely to assume greater importance in near future. However, studies conducted on the wastages of foodgrains reveals that the sources of quantum wastages of any foodgrains are determined by a variety of factors that are likely to vary State-to-State and crop to crop. Under Indian condition, it was estimated that the post harvest losses amount to almost 10 per cent of the total grain yield. The overall wastage of grain including loss of quality of grain was estimated at around 40 percent total production (T. P. Ojha 1978). In a pilot study conducted by the Techno-Economic Research Institute on Seed, Feed and Wastage Rates in Food grains on behalf of Planning Commission in some of the districts of Punjab, Haryana and Western Uttar Pradesh in 1986-87, revealed that 10.32 per cent of the total production of food grains was used as seed, feed and wastage in these areas. The corresponding figures for Western Uttar Pradesh, Punjab and Haryana were 12.01 per cent, 8.22 per cent and 10.84 per cent respectively. Moreover, these studies also points out to conduct similar studies across the states to get more balance or unbiased picture of wastage ratios of foodgrains.

Here, in this section, we have brought the results of the wastages of selected cereal and pulse grains occurred at various harvest and post harvest stages in each farm size of holdings in the selected study areas of the sample states.

4.6.1: Methods and Assumptions

The wastages of foodgrains occur at various stages of production, marketing, home consumption and animal feed. These stages can be divided into harvest and post-harvest stages. While harvesting, some grains fell on the ground. Similarly in threshing process, some grains pass into the straw, some get shattered or get mixed with dust/dirt on threshing floor. Stored grains gets wasted due to insects, rats, dampness

etc. The wastages of grains also occur while loading and unloading, transporting from one place to another, cooking, cleaning, eating and feeding the animals and poultry. However, for estimating the wastage ratios for major foodgrains at different production stages, information was collected through survey method by canvassing the structural schedules to the sample farmers in the districts. In the schedule, data relating to wastages at different harvest and post harvest stages such as wastages at harvest (sickle or combine), at threshing floor, shattered on ground, left in straw and in transportation (field to threshing floor, threshing floor to storage and storage to market) were collected for major selected cereal and pulse crops. Beside this, data regarding wastage in storage at cultivator's level was also collected. In this category, the quantity stored, wastage in storage due to rats and dampness or by other causes, wastage during home consumption occurred at the time of cleanliness, cooking and eating and wastage during animal/poultry feeding were also collected. All these information on the wastages at different harvest and post-harvest stages for selected cereal and pulse crops across the farm size of holdings and States are documented in the tables 4.6.1 to 4.6.8

Regarding the results presented in the tables on wastage of grains at different harvest and post harvest stages, it was assumed that the respondents and the investigators were experienced one and given explanation of the results was based upon the experiences of the investigators and the report writer in crop production and management. Moreover, we also assume that given estimates are the best representative of the extent of wastages occurred during harvest and post-harvest stages and reflect structural nature or situation of the crop economy of the country.

4.6.2: Farm Size -wise Estimates of Wastages at Different Harvest and Post-harvest Stages for Cereal Crops

The distribution of percentage wastages of selected cereal crops at various harvest and post harvest stages for the selected States is presented in tables 4.6.1, 4.6.2, 4.6.3 and 4.6.4, respectively for small, medium, large and all sample farm size of holdings. The percentage quantity wastages of selected grain are taken with respect to the total net production of the sample farmers of selected State for the particular farm size of holding.

From the tables 4.6.1 to 4.6.4, we found significant variations in the percentage total wastage of selected cereal grains across the sample states and the farm size of holdings, albeit with different degrees. Moreover, the pattern of variation was quite region specific than the crop. The highest percentage of total wastage of selected grain was located in Himachal Pradesh (11.24 per cent) for wheat, whereas least in Uttar Pradesh (2.01 per cent) for the same crop (see Table 4.6.4). Apart from Himachal Pradesh, the percentage total wastage of selected cereal grain in Bihar (10.99 per cent) for paddy, Rajasthan (9.49 per cent) for bajra, Karnataka (8.15 per cent) and Maharashtra (7.96 per cent) for jowar found to be at significantly high. The percentage total wastage of wheat in Punjab was marginally higher (2.46 per cent) than that of Uttar Pradesh (2.01 per cent). Whereas, in the remaining sample states viz., Assam, Madhya Pradesh, Andhra Pradesh and Haryana, the percentage total wastage of selected grains found to be 6.71 per cent, 6.44 per cent, 5.60 per cent and 4.01 per cent respectively. From the tables 4.6.1 to 4.6.4, it was noticed that as the farm size of holding increased in Madhya Pradesh, Punjab, Andhra Pradesh, Bihar, Haryana, Karnataka and Rajasthan, the percentage total wastage of selected grains were found to have decreased. The trends in the percentage total wastage of selected grains in Rajasthan, Bihar, Haryana, Andhra Pradesh and Punjab were quite flatter as compared to that Madhya Pradesh and Karnataka. Percentage total wastage of jowar in Karnataka was estimated at 13.85 per cent for small sample farmers, 9.34 per cent for medium sample farmers and 5.72 per cent for small sample farmers. In Madhya Pradesh, percentage total wastage of wheat varied from 8.17 per cent to 5.88 per cent over the different size of holdings. Whereas, percentage total wastage of selected grains in Assam and Himachal Pradesh increased with the farm size of holding. In these two sample states, variations in the percentage total wastage of selected grains were negligible across the farm size of holdings. In Maharashtra, the percentage wastage of jowar across the farm size of holdings showed a significant variation especially over medium to the large size of holding. The percentage total wastage of jowar in the State was estimated at 6.99 per cent for small sample farmers, 6.57 per cent for medium sample farmers and 9.22 per cent for large sample farmers. In Uttar Pradesh, the variation in the percentage total wastage of wheat across the farm size of holdings was negligible ranging from 1.97 per cent to 2.07 per cent.

At disaggregated level, the percentage of wastages at various harvest and post harvest stages (such as harvesting, threshing and shattered, straw, transportation, storage, home consumption and left in animal/poultry feed) for the selected grains provide us a clear picture on major sources of wastages in each selected State. From the table 4.6.4, we notice that the percentage wastages during harvesting were at significantly high in Bihar (5.01 per cent) and Assam (4.42 per cent) for the selected paddy crop. Apart from these two sample states, the corresponding percentage in Madhya Pradesh, Andhra Pradesh, Karnataka and Rajasthan were also found to be quite significant ranging from 2.05 per cent to 2.60 per cent. The percentage wastages during harvesting in Haryana, Uttar Pradesh and Punjab were much less (0.58 per cent to 0.90 per cent). This lower percentage of wastages might have resulted from the mechanization of agricultural activities in the State. Considering variations in the percentage wastages during harvesting across the farm size of holdings, we found that these variations were quite less significant for all selected states except Karnataka and Punjab. The percentage wastage during harvesting for jowar grain in Karnataka was estimated at 4.63 per cent for small sample farmers, 2.97 for medium sample farmers and 1.49 per cent for large sample farmers. Whereas, in Punjab the corresponding percentage for small sample farmers found to be twice large (1.56 per cent) as compared to the large sample farmers (0.76 per cent).

The percentage wastages during threshing and shattered found to be quite high in Rajasthan (2.74 per cent) and Himachal Pradesh (2.39 per cent). In these two sample states, the corresponding percentages increased with the farm size of holdings though at marginal rate. Interestingly, the remaining sample states also did not exhibit much variation in the percentage wastages during threshing and shattered across the farm size of holdings except Karnataka. In Karnataka, the percentage wastage during threshing and shattered was estimated at 2.16 per cent for small sample farmers, 1.52 per cent for medium sample farmers and 0.86 per cent for large sample farmers. The percentage wastages of selected grains during the threshing and shattered in Assam, Punjab, Uttar Pradesh and Bihar were even less than 1 percent of their total net production of selected grains. The corresponding percentage in Madhya Pradesh, Andhra Pradesh and Haryana were also found to be around 1 per cent. The percentage wastage in straw was quite significant in Himachal Pradesh (2.19 per cent), Rajasthan

(1.59 per cent), Karnataka (1.42 per cent) and Bihar (1.26 per cent), whereas in the remaining sample states, it is less than 1 per cent. The variations in the percentage of wastages in straw were very less across the farm size of holdings in all selected sample states. The percentage of wastages during transportation of paddy is much significant (2.50 per cent) in Bihar as compared to that of Punjab (0.39 per cent), Haryana (1.06 per cent) and Andhra Pradesh (1.30 per cent). Interestingly, the percentage of wastages during transportation in wheat states viz., Madhya Pradesh, Punjab and Uttar Pradesh were very negligible varying from 0.03 per cent to 0.35 per cent of their total net production. Whereas, the corresponding percentage in Himachal Pradesh appeared to be significant (1.05 per cent) as compared to that of Madhya Pradesh, Punjab and Uttar Pradesh. Similarly, the percentage of wastage during the transportation of bajra crop in Rajasthan was found significant (1.79 per cent).

From tables 4.6.1 to 4.6.4, we noticed that the variations in the percentage wastages of selected grains during transportation were insignificant across the farm size of holdings for all selected states. However, in the case of percentage of wastage of selected grains in storage, significant variations were noticed across the sample states and farm size of holdings. In Himachal Pradesh, the percentage wastage in storage for selected wheat crop was highest (3.31 per cent) among all the selected cereal crops and the sample states. Whereas, on other hand, the percentage wastage of the same crop in storage found to be almost zero in Punjab (see table 4.6.4). Similarly, the percentage wastages in storage were quite negligible in Uttar Pradesh (0.23 per cent), Andhra Pradesh (0.18 per cent) and Haryana (0.07 per cent). However, the percentage wastages in storage of selected cereals in Madhya Pradesh and Maharashtra were nearly close to 2 per cent of their total net production of selected grains. The corresponding percentage in Rajasthan, Bihar, Assam and Karnataka oscillated from 0.82 per cent to 1.25 per cent. Over the farm size of holdings, variations in the percentage wastages of selected grains in storage were found to be negligible in Uttar Pradesh, Andhra Pradesh, Haryana, Assam and Bihar. Whereas in the remaining sample states viz., Himachal Pradesh, Madhya Pradesh, Karnataka, Maharashtra and Rajasthan, significant variations were noticed.

Table 4.6.1: Distribution of Wastages of Cereal Crops at Different Harvest and Post Harvest Stages in Case of Small Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							Total Wastage
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	
1	H. Pradesh	Wheat	126.84	1.40	2.30	2.16	0.92	3.11	0.94	0.02	10.84
2	M. Pradesh	„	186.65	2.30	1.01	0.20	0.34	3.12	0.85	0.36	8.17
3	Punjab	„	567.61	1.56	0.81	1.08	0.12	0.00	0.24	0.03	3.84
4	U. Pradesh	„	315.49	0.61	0.52	0.19	0.11	0.24	0.20	0.12	1.99
5	A. Pradesh	Paddy	1096.80	2.53	1.31	0.53	1.46	0.32	0.57	0.02	6.74
6	Assam	„	176.8	4.10	0.25	0.24	0.38	1.32	0.15	0.01	6.45
7	Bihar	„	715.84	5.00	0.83	1.27	2.49	1.15	0.47	0.03	11.24
8	Haryana	„	591.99	0.58	1.31	1.47	1.13	0.07	0.31	0.00	4.86
9	Karnataka	Jowar	47.30	4.63	2.16	2.47	0.97	1.97	1.65	0.00	13.85
10	Maharashtra	„	72.50	1.57	1.61	0.15	0.25	1.61	1.70	0.08	6.99
11	Rajasthan	Bajra	74.51	1.95	2.68	1.54	1.96	1.19	0.70	0.04	10.04
	All		3972.33	2.41	1.10	0.91	1.16	0.71	0.48	0.04	6.81

Table 4.6.2: Distribution of Wastages of Cereal Crops at Different Harvest and Post Harvest Stages in Case of Medium Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							Total Wastage
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	
1	H. Pradesh	Wheat	135.50	1.52	2.44	2.16	1.15	3.39	0.69	0.01	11.37
2	M. Pradesh	„	439.30	2.26	1.02	0.21	0.35	2.28	0.44	0.29	6.86
3	Punjab	„	1261.56	1.01	0.64	0.88	0.04	0.00	0.13	0.05	2.76
4	U. Pradesh	„	452.07	0.69	0.47	0.17	0.14	0.25	0.27	0.07	2.07
5	A. Pradesh	Paddy	2770.28	2.30	1.13	0.43	1.30	0.20	0.23	0.01	5.60
6	Assam	„	103.33	4.52	0.28	0.26	0.42	1.16	0.18	0.01	6.82
7	Bihar	„	632.52	5.03	0.79	1.25	2.49	0.93	0.47	0.03	10.99
8	Haryana	„	1300.00	0.60	1.07	1.20	1.19	0.07	0.19	0.00	4.32
9	Karnataka	Jowar	81.69	2.97	1.51	1.62	0.70	1.37	1.18	0.01	9.34
10	Maharashtra	„	120.60	1.53	1.64	0.17	0.38	1.28	1.46	0.12	6.57
11	Rajasthan	Bajra	151.50	2.09	2.65	1.63	1.78	1.01	0.53	0.03	9.72
	All		7448.35	1.93	1.01	0.74	1.02	0.45	0.29	0.04	5.47

Table 4.6.3: Distribution of Wastages of Cereal Crops at Different Harvest and Post Harvest Stages in Case of Large Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							Total Wastage
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	
1	H. Pradesh	Wheat	22.20	1.67	2.57	2.52	1.22	3.96	0.72	0.00	12.70
2	M. Pradesh	„	893.60	2.28	1.01	0.21	0.36	1.60	0.26	0.16	5.88
3	Punjab	„	3689.39	0.76	0.46	0.84	0.01	0.00	0.06	0.02	2.15
4	U. Pradesh	„	394.98	0.79	0.38	0.19	0.18	0.20	0.18	0.05	1.97
5	A. Pradesh	Paddy	3604.73	2.34	0.98	0.44	1.25	0.12	0.12	0.00	5.26
6	Assam	„	118.48	4.81	0.24	0.30	0.40	1.05	0.20	0.01	7.00
7	Bihar	„	861.25	5.01	0.66	1.26	2.51	0.87	0.43	0.03	10.77
8	Haryana	„	3150.25	0.57	1.06	0.91	1.00	0.07	0.12	0.00	3.72
9	Karnataka	Jowar	150.83	1.76	0.86	0.97	0.36	0.97	0.78	0.03	5.72
10	Maharashtra	„	189.45	1.49	1.48	0.18	0.46	2.36	3.08	0.17	9.23
11	Rajasthan	Bajra	287.00	2.05	2.81	1.59	1.75	0.62	0.38	0.02	9.22
	All		13362.16	1.60	0.86	0.72	0.82	0.29	0.19	0.02	4.51

Table 4.6.4: Distribution of Wastages of Cereal Crops at Different Harvest and Post Harvest Stages in Case of All Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							Total Wastage
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	
1	H. Pradesh	Wheat	284.54	1.47	2.39	2.19	1.05	3.31	0.80	0.02	11.24
2	M. Pradesh	„	1519.55	2.28	1.01	0.21	0.35	1.98	0.38	0.22	6.44
3	Punjab	„	5518.56	0.90	0.53	0.87	0.03	0.00	0.10	0.03	2.46
4	U. Pradesh	„	1162.54	0.70	0.45	0.18	0.15	0.23	0.22	0.08	2.01
	Total	„	8485.19	1.14	0.67	0.70	0.14	0.50	0.19	0.07	3.41
5	A. Pradesh	Paddy	7471.80	2.36	1.08	0.45	1.30	0.18	0.23	0.01	5.60
6	Assam	„	398.61	4.42	0.25	0.26	0.39	1.20	0.17	0.01	6.71
7	Bihar	„	2209.61	5.01	0.75	1.26	2.50	0.98	0.46	0.03	10.99
8	Haryana	„	5042.24	0.58	1.09	1.05	1.06	0.07	0.16	0.00	4.01
	Total	„	15122.26	2.21	1.02	0.76	1.37	0.29	0.24	0.01	5.89
9	Karnataka	Jowar	279.82	2.60	1.27	1.42	0.56	1.25	1.04	0.02	8.15
10	Maharashtra	„	382.55	1.52	1.56	0.17	0.40	1.88	2.31	0.14	7.96
	Total	„	662.37	1.98	1.43	0.70	0.47	1.61	1.77	0.09	8.04
11	Rajasthan	Bajra	513.01	2.05	2.74	1.59	1.79	0.82	0.47	0.03	9.49
	All		24782.83	1.83	0.94	0.76	0.93	0.41	0.27	0.03	5.17

In Madhya Pradesh, the percentage wastage of selected wheat grain declined as the farm size of holding increased. The percentage wastage of wheat in storage in the State was estimated at 3.12 per cent for small sample farmers, 2.28 per cent for medium sample farmers and 1.60 per cent for large sample farmers. In Himachal Pradesh, the corresponding percentage varied from 3.11 per cent to 3.96 per cent. In Maharashtra, the percentage wastage of selected jowar grain in storage was estimated at 1.61 per cent for small sample farmers, 1.28 per cent for medium sample farmers and 2.36 per cent for large sample farmers. The corresponding percentage in Karnataka varied from 0.97 per cent to 1.97 per cent. The percentage wastage during the home consumption across the all sample states except Maharashtra and Karnataka were found to be significantly less than 1 per cent. Moreover, the variations in the corresponding percentage across the farm size of holdings were also observed to be quite less significant. The percentage wastage of jowar grain during home consumption in Karnataka was estimated at 1.65 per cent for small sample farmers, 1.18 per cent for medium sample farmers and 0.78 per cent for large sample farmers. The corresponding percentage in Maharashtra was estimated at 1.70 per cent for small sample farmers, 1.46 per cent for large sample farmers and 3.08 per cent for large sample farmers. The percentage wastages of selected grains during animal or poultry feed found to be significantly less than 1 per cent ranging from zero to 0.36 per cent across the farm size of holdings and selected states.

Overall, from the tables 4.6.1 to 4.6.4, it is observed, as the farm size of holdings increased, the percentage wastages of selected cereal grains declined at marginal rate. The percentage wastages of all selected cereal grains varied from 6.81 per cent to 4.51 per cent. However, we did not find such pattern in the percentage wastages across the selected states in each farm size of holding. The percentage wastages at various harvests on post harvest shown significant variations across the sample states. From the abovementioned tables, it is clearly noticed that the percentage wastages during harvesting operations, transportation and threshing & shattered were significant as compared to that of storage, home consumption, straw and left in animal/poultry feed. These results may have emerged out of differences/heterogeneity in the factors such as extent of mechanization of harvest and post harvest operations, the type of storage structured used by farmers, infrastructure facilities, management

skill of farmers, climatic factors (rain, wind and altitude etc.), type or size of the grains and other residual factors. The percentage wastages of the selected grains in the sample states such as Punjab, Uttar Pradesh and Haryana were much lower than the average, while Himachal Pradesh, Bihar and Rajasthan appeared to be much higher than average percentage of wastages of selected cereals. The variation in the percentage wastages across the farm size of holdings could be attributed to varying nature of operational practices and structural conditions in each State.

4.6.3: Farm Size -wise Estimates of Wastages at Different Harvest and Post-harvest Stages for Pulse Crops

India is the world's largest pulse producer accounts for 27-28 per cent of global pulse production. Nearly 12 to 15 million tones of pulses are produced in the country every year. Most of the pulses are being harvested manually in the country. It is estimated that nearly 10 to 15 per cent of the grains of pulses go waste with the crop residue due to improper threshing in the traditional processes each year (S. Khuntia et al, 2002). The total amount of loss due to wastages is being estimated at around Rs. 1000 crore each year. However, doubts are also raised on the reliability of these estimates since they are based on limited coverage of the crops and regions. The extent and sources of wastages is being expected varying crop to crop and region to region. On this background, this section attempts to bring out the estimates pertaining to the extent of wastages of selected pulse grains occurred at various harvest and post harvest stages in the selected sample states. The estimates pertaining to the percentage wastages of selected pulse crops at various harvest and post harvest stages for the selected states have been shown in the tables 4.6.5 , 4.6.6, 4.6.7 and 4.6.8 respectively for small, medium, large and all sample farm size of holdings.

From tables 4.6.5 to 4.6.8, some of the important features of the percentage total wastages of selected pulse crops across the sample states can be noticed. First, though we found less significant variations in percentage total wastages of the selected pulse grain across the sample states and the farm size of holdings, significant variations could be noticed across the selected pulse crops in all size of holdings. Second, unlike cereals, the distribution pattern of total wastages of selected pulse grains revealed the

crop specific variations rather than regions. Third, a significant portion (on an average 32 to 92 per cent) of the total wastage of the selected pulse grains was covered by wastages during harvesting and threshing and shattered in all the selected states and farm size of holdings. From table 4.6.8, it is noticed that on an average high percentages of total wastage were found in blackgram growing states viz., Assam 9.12 per cent), Andhra Pradesh (8.64 per cent) and Himachal Pradesh (8.28 per cent). Whereas, on other hand, the percentage total wastages of selected greengram in Punjab found to be exceptionally low at 1.03 per cent. In the remaining sample states, the percentage total wastages of selected grains were found in between 3.35 per cent to 6.45 per cent. The percentage total wastage of selected grain in Bihar (lentil), Karnataka (redgram), Uttar Pradesh (gram) and Maharashtra found to be less than the average percentage total wastage of selected pulses (5.83 per cent) for all sample states. The percentage total wastages of the selected grains in these sample states was found to be 5.01 per cent for Bihar, 5.27 per cent for Karnataka, 3.35 per cent for Uttar Pradesh and 4.50 per cent for Maharashtra. The percentage total wastage of selected gram grain was estimated at 6.45 per cent for Madhya Pradesh, 6.02 per cent for Haryana and 5.84 per cent for Rajasthan. Considering the variations in the percentage total wastage over the different size of holdings, we did not find any significant variations in the estimates except for Karnataka. The percentage total wastage of redgram in Karnataka was estimated at 7.63 per cent for small sample farmers, 5.49 per cent for medium sample farmers and 4.44 per cent for large sample farmers. Moreover, it was noticed that the percentage total wastage of selected grains in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Himachal Pradesh, Karnataka and Punjab increased with the farm size of holding. The remaining sample states did not exhibit any particular trend in the percentage total wastages of the selected pulse grains.

At disaggregated level, the maximum wastages in the selected pulse grains across the farm size of holdings were found during the harvesting and threshing and shattered followed by transportation and storage. Interestingly, the percentage wastages of selected grains at various harvest and post harvest stages across the farm size of holdings did not exhibit significant variations in all selected states. The percentage wastage of selected pulse grain during harvesting was found to be highest at 5.01 per cent in Assam for blackgram, whereas lowest at 0.44 per cent in Punjab for

greengram. The percentage wastage of blackgram during the harvesting in Assam was estimated at 4.99 per cent for small sample farmers, 5.04 per cent for medium sample farmers and 5.44 per cent for large sample farmers. The percentage wastages of selected grains during harvesting were also quite significant in Andhra Pradesh (3.79 per cent) and Madhya Pradesh (2.37 per cent). Whereas the corresponding percentage in remaining sample states varied from 1.01 per cent to 1.80 per cent. The percentage wastage of selected grains during threshing & shattered found highest at 4.48 per cent in Haryana and lowest at 0.32 per cent Punjab. Apart from Haryana, the percentage wastages of selected grain during threshing shattered were quite significant in Rajasthan (2.10 per cent), Andhra Pradesh (1.84 per cent), Himachal Pradesh (1.36 per cent) and Maharashtra (1.26 per cent) as compared to Punjab (0.32 per cent), Assam (0.46 per cent), Bihar (0.58 per cent), Karnataka (0.70 per cent) and Uttar Pradesh (0.76 per cent). The percentage wastages of selected pulse grains in straw were found to be less than 1 per cent in all sample states except Andhra Pradesh. The percentage wastage of blackgram in Andhra Pradesh was estimated at 1.30 per cent for all sample farmers/farm size of holdings. The percentage wastages of selected grains in transportation varied from 0.05 per cent to 1.52 per cent across the sample states. The percentage wastage of selected grains in Rajasthan (1.04 per cent), Bihar (1.03 per cent), Andhra Pradesh (1.52 per cent) and Karnataka (0.79 per cent) found to be higher than that of the average (0.66 per cent) for all selected states. Moreover, the percentage wastage of selected blackgram in transportation was located to be highest (2.10 per cent) in Andhra Pradesh for the small sample farmers/farm size of holding (see table 4.6.5).

Table 4.6.5: Distribution of Wastages of Pulse Crops at Different Harvest & Post Harvest Stages in Case of Small Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	Total Wastage
1	M. Pradesh	Gram	78.30	2.55	1.01	0.23	0.37	2.15	0.54	0.31	7.14
2	Maharashtra	„	20.96	1.19	1.15	0.38	0.10	1.00	0.86	0.00	4.63
3	Rajasthan	„	85.67	1.41	2.25	0.92	1.13	0.46	0.25	0.00	6.42
4	U. Pradesh	„	34.30	1.34	0.93	0.23	0.38	0.55	0.47	0.03	3.97
5	Haryana	„	81.39	0.75	4.56	0.09	0.18	0.04	0.27	0.00	5.89
6	A. Pradesh	Blackgram	46.21	3.51	1.75	1.67	2.10	0.52	0.00	0.00	9.57
7	Assam	„	1.51	4.99	0.44	0.26	0.39	2.51	0.30	0.07	8.96
8	H. Pradesh	„	9.06	1.32	1.32	0.99	0.55	2.65	1.21	0.00	8.06
9	Bihar	Lentil	86.29	1.89	0.51	0.95	1.09	0.28	0.23	0.01	4.96
10	Karnataka	Redgram	52.15	1.98	1.13	0.90	1.13	0.65	1.84	0.00	7.63
11	Punjab	Greengram	17.41	0.52	0.40	0.17	0.11	0.00	0.11	0.06	1.38
	All		513.25	1.91	1.76	0.66	0.81	0.70	0.49	0.05	6.23

Table 4.6.6: Distribution of Wastages of Pulse Crops at Different Harvest & Post Harvest Stages in Case of Medium Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	Total Wastage
1	M. Pradesh	Gram	167.40	2.40	0.96	0.21	0.27	1.81	0.46	0.33	6.43
2	Maharashtra	„	30.03	1.33	1.37	0.37	0.17	0.80	0.67	0.00	4.70
3	Rajasthan	„	193.40	1.27	1.98	0.74	0.95	0.32	0.18	0.00	5.43
4	U. Pradesh	„	68.54	1.28	0.80	0.28	0.31	0.48	0.36	0.01	3.50
5	Haryana	„	162.60	1.05	4.71	0.10	0.22	0.09	0.17	0.01	6.35
6	A. Pradesh	Blackgram	109.86	4.54	1.81	1.44	1.33	0.15	0.00	0.00	9.27
7	Assam	„	0.87	5.04	0.47	0.29	0.42	2.52	0.31	0.09	9.14
8	H. Pradesh	„	7.00	1.29	1.43	1.00	0.71	3.00	1.29	0.00	8.71
9	Bihar	Lentil	69.41	1.90	0.58	0.97	0.97	0.30	0.20	0.04	4.94
10	Karnataka	Redgram	88.05	1.32	0.69	0.82	0.84	0.56	1.26	0.00	5.49
11	Punjab	Greengram	29.06	0.48	0.38	0.14	0.03	0.00	0.07	0.00	1.10
	All		926.22	1.85	1.86	0.58	0.63	0.59	0.35	0.06	5.92

Table 4.6.5: Distribution of Wastages of Pulse Crops at Different Harvest & Post Harvest Stages in Case of Large Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	Total Wastage
1	M. Pradesh	Gram	350.60	2.32	0.90	0.21	0.26	1.74	0.60	0.29	6.31
2	Maharashtra	„	48.89	1.06	1.27	0.33	0.20	0.78	0.67	0.00	4.32
3	Rajasthan	„	359.25	1.48	2.14	0.83	1.06	0.30	0.11	0.00	5.92
4	U. Pradesh	„	121.29	1.13	0.69	0.20	0.35	0.41	0.28	0.02	3.08
5	Haryana	„	325.38	1.06	4.35	0.08	0.19	0.07	0.13	0.02	5.90
6	A. Pradesh	Blackgram	242.08	3.50	1.87	1.16	1.51	0.15	0.00	0.00	8.19
7	Assam	„	0.61	5.45	0.49	0.31	0.41	2.40	0.35	0.10	9.51
8	H. Pradesh	„	1.58	1.27	1.27	0.63	0.63	2.53	1.27	0.00	7.59
9	Bihar	Lentil	60.12	1.76	0.70	1.03	1.01	0.43	0.20	0.03	5.17
10	Karnataka	Redgram	169.50	1.30	0.57	0.74	0.66	0.35	0.81	0.00	4.44
11	Punjab	Greengram	86.44	0.40	0.28	0.16	0.03	0.01	0.02	0.03	0.95
	All		1765.74	1.75	1.84	0.52	0.64	0.54	0.29	0.06	5.69

Table 4.6.6: Distribution of Wastages of Pulse Crops at Different Harvest & Post Harvest Stages in Case of All Selected Sample Farmers

Sl. No	Name of the States	Name of Crops	Net Production (Tons)	Percentage to its total net production							
				Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal/Poultry feed	Total Wastage
1	M. Pradesh	Gram	596.30	2.37	0.93	0.21	0.28	1.81	0.55	0.30	6.45
2	Maharashtra	„	99.88	1.16	1.26	0.35	0.17	0.83	0.71	0.00	4.50
3	Rajasthan	„	638.32	1.41	2.10	0.82	1.04	0.32	0.15	0.00	5.84
4	U. Pradesh	„	224.13	1.21	0.76	0.23	0.35	0.46	0.33	0.02	3.35
5	Haryana	„	569.37	1.01	4.48	0.09	0.20	0.08	0.16	0.01	6.02
	Total	„	2128.00	1.54	2.23	0.37	0.49	0.71	0.31	0.09	5.74
6	A. Pradesh	Blackgram	398.15	3.79	1.84	1.30	1.52	0.19	0.00	0.00	8.64
7	Assam	„	3.00	5.09	0.46	0.28	0.40	2.49	0.31	0.08	9.12
8	H. Pradesh	„	17.64	1.30	1.36	0.96	0.62	2.72	1.30	0.00	8.28
	Total		421.53	3.71	1.80	1.27	1.47	0.33	0.06	0.00	8.64
9	Bihar	Lentil	215.82	1.86	0.58	0.98	1.03	0.33	0.21	0.03	5.01
10	Karnataka	Redgram	309.70	1.42	0.70	0.79	0.79	0.46	1.11	0.00	5.27
11	Punjab	Greengram	132.91	0.44	0.32	0.16	0.05	0.01	0.04	0.03	1.03
	All		3205.22	1.80	1.84	0.56	0.66	0.58	0.34	0.06	5.83

The percentage of wastage of selected blackgram in storage found significantly high at 2.72 per cent in Himachal Pradesh and 2.49 per cent in Assam. The percentage of wastage of selected gram in storage was also found to be quite significant (1.81 per cent) in Madhya Pradesh. Over the farm size of holdings, the percentage wastage of selected blackgram in storage was noticed to be highest (3.00 per cent) in Himachal Pradesh for medium sample farmers. In the remaining sample states, the percentage wastages of selected grains were quite insignificant varying from 0.01 per cent to 0.83 per cent. Similarly, the percentage of wastages of selected grains in home consumption were significantly less than 1 per cent in all sample states except Himachal Pradesh (1.30 per cent) and Bihar (1.11 per cent). The percentage of wastage of selected grains left in animal/poultry feed too found to be significantly less than 1 per cent in all sample states. The corresponding percentages varied from zero to 0.30 per cent across the all sample states.

Overall, from table 4.6.8, it is noticed that the percentage wastages of all selected pulse grains was maximum during threshing and shattered (1.80 per cent) followed by losses during harvesting operations (1.80 per cent) for all sample farmers. The losses in straw, transportation, storage, home consumption and left in animal/poultry feed were quite negligible. The variations in the percentage wastages of pulse grains during harvest and post harvest stages across States were quite visible, though not so significant except Assam, Andhra Pradesh (during harvesting operations) and Haryana (in threshing and shattered). The variations in the percentage losses of the selected pulse grains across the farm size of holdings were also observed to be marginal in each selected State. As the farm size of holdings increased, the average percentage wastages of all selected pulse grains were found to have declined at marginal rate from 6.23 per cent to 5.83 per cent.

4.7: Estimates of Percentage Seed, Feed, Wastage and Quantity Availability of Selected Crops for Human Consumption

In the earlier sections of the chapter, we have presented the estimates pertaining to percentage quantity of selected cereal as well as pulse grains used for seed, kept as seed, used for animal feed and wastages occurred at various harvest and post stages for each selected states. In this section, an attempt has been made to provide comprehensive information on total amount/the percentages of selected foodgrains are available for human consumption in each selected states after deducting the amount/percentage used for seed, animal feed and the percentages of total wastage occurred during the harvesting and post harvesting processes.

4.7.1: Estimates of Percentage Seed, feed, Wastage and Quantity Availability of Selected Cereal Crops for Human Consumption

The estimates of seed, feed and wastage ratios with percentage quantity of selected cereal crops available for human consumption are presented in table 4.7.1. From the table, it is observed that the percentage quantity of selected grains used for seed, feed and wastages varies across the selected states. The percentage quantity of selected grains used for seed, animal feed and wastages found to be highest in Himachal Pradesh (27.47 per cent) for wheat, whereas, lowest in Haryana (4.22 per cent) for paddy crop. However, it can be also noticed that the points of percentage quantity of selected cereal grains used for seed, animal feed and total wastage for Himachal Pradesh (27.47 per cent), Haryana (4.22 per cent), Punjab (4.79 per cent) and Andhra Pradesh (6.89 per cent) were found at the extreme ends (outliers) of distribution. In fact, maximum points of corresponding percentage appeared to be in the range of 11.24 per cent to 15.52 per cent.

The sample farmers of Himachal Pradesh were found to have disposed significant percentage of wheat for seed used (9.80 per cent), animal feed (6.40 per cent) and wastages (11.24 per cent) as compared to other sample states. The proportions of seed used, animal feed and wastages were too less in Haryana, Punjab and Andhra Pradesh.

Particularly, the sample farmers of these sample states used negligible percentage (ranging from 0 to 0.29 per cent) of their total net production of selected cereal grains for animal feed. The proportions of selected cereal grains used for seed were also found to be less in these selected states as compared to other sample states. The percentage quantity of selected cereal grains used for seed was found to be 2.04 per cent in Punjab, 1.22 per cent in Andhra Pradesh and 0.21 per cent in Haryana. Whereas, percentage total wastage of selected grain was found to be 2.46 per cent in Punjab, 5.60 per cent in Andhra Pradesh and 4.01 per cent in Haryana.

The percentage quantity of selected grains used as seed, animal feed and total wastage varied marginally across the sample states viz., Maharashtra, Uttar Pradesh, Assam, Karnataka and Rajasthan. The corresponding figure/percentage was estimated at 11.24 per cent for Maharashtra (jowar), 12.03 per cent for Uttar Pradesh (wheat), 12.20 per cent for Assam (paddy), 12.17 per cent for Karnataka (jowar) and 12.66 per cent for Rajasthan (Bajra). However, at disaggregated level, we found quite significant variations across percentage seed used, used as feed and wastage ratios. The percentage quantity of selected grains used as seed found to be highest in Uttar Pradesh (4.05 per cent) followed by Karnataka (1.73 per cent), Assam (1.71 per cent), Rajasthan (0.54 per cent) and Maharashtra (0 per cent). The percentage quantity of selected grains used for animal feed was estimated at maximum 5.97 per cent for Uttar Pradesh, 3.77 per cent for Assam, 3.27 per cent for Maharashtra, 2.63 per cent for Rajasthan and 2.29 for Karnataka. Whereas, unlike the ratio of seed used and animal feed, the percentage total wastage of cereal grains observed to be significantly low in Uttar Pradesh (2.01 per cent) and quite high in Rajasthan (9.48 per cent), Karnataka (8.15 per cent), Maharashtra (7.96 per cent) and Assam (6.71 per cent). The percentage quantity of selected grains used as seed, animal feed and total wastage was estimated at 15.52 per cent for Bihar and 15.14 per cent for Madhya Pradesh. At disaggregated level, the percentage quantity of selected grains used as seed as well as animal feed were found to be higher in Madhya Pradesh (4.96 per cent and 3.73 per cent respectively) as compared to that of Bihar (2.54 per cent and 2.00 per cent respectively). However, the percentage total wastage of selected grains in Bihar (10.99 per cent) was higher as compared to that of Madhya Pradesh (6.44 per cent).

Table 4.7.1: State -Wise Distribution of Percentage Seed, Feed and Wastage of Selected Cereal Crops for All the Sample Farmers

(Quantity in tons and % to its total production)

Sl. No.	Name of the States	Name of Crops	Area (ha)	Net Production	Seed used		Seed kept		Used as Feed		Wastage		Used as seed, feed and wastages		Availability for Human Consumption	
					Qty.	%	Qty.	%	Qty.	%	Qty.	%	Qty.	%	Qty.	%
1	2	3	4	5	6	7	8	9	10	11	12	13	14 = (6 +10 +12)	15 = (7+11 +13)	16 = (5-14)	17
1	H. Pradesh	Wheat	228.09	284.54	27.97	9.80	27.53	9.68	18.20	6.40	31.98	11.24	78.15	27.47	206.39	72.53
2	M. Pradesh	„	599.99	1519.55	75.37	4.96	88.05	5.79	56.75	3.73	97.88	6.44	229.99	15.14	1289.56	84.86
3	Punjab	„	1210.80	5518.56	112.50	2.04	133.59	2.42	15.93	0.29	135.81	2.46	264.24	4.79	5254.33	95.21
4	U. Pradesh	„	373.44	1162.54	47.09	4.05	49.04	4.22	69.36	5.97	23.40	2.01	139.86	12.03	1022.68	87.97
	Total	„	2412.32	8485.19	262.93	3.10	298.21	3.51	160.24	1.89	289.07	3.41	712.24	8.39	7772.96	91.61
5	A. Pradesh	Paddy	1235.71	7471.80	91.24	1.22	8.64	0.12	4.56	0.06	418.71	5.60	514.51	6.89	6957.30	93.11
6	Assam	„	139.85	398.61	6.84	1.71	7.98	2.00	15.03	3.77	26.76	6.71	48.62	12.20	349.99	87.80
7	Bihar	„	559.99	2209.61	56.03	2.54	97.16	4.40	44.24	2.00	242.75	10.99	343.02	15.52	1866.59	84.48
8	Haryana	„	895.04	5042.24	10.77	0.21	11.34	0.22	0.00	0.00	202.05	4.01	212.83	4.22	4829.41	95.78
	Total	„	2830.59	15122.26	164.88	1.09	125.12	0.83	63.83	0.42	890.27	5.89	1118.98	7.40	14003.29	92.60
9	Karnataka	Jowar	552.36	279.82	4.85	1.73	6.84	2.44	6.39	2.29	22.81	8.15	34.05	12.17	245.77	87.83
10	Maharashtra	„	211.82	382.55	0.00	0.00	0.00	0.00	12.51	3.27	30.47	7.96	42.98	11.24	339.57	88.76
	Total	„	764.18	662.37	4.85	0.73	6.84	1.03	18.90	2.85	53.28	8.04	77.03	11.63	585.34	88.37
11	Rajasthan	Bajra	582.94	513.01	2.78	0.54	0.14	0.03	13.50	2.63	48.66	9.48	64.93	12.66	448.08	87.34
	All		6590.03	24782.83	435.44	1.76	430.31	1.74	256.47	1.03	1281.28	5.17	1973.18	7.96	22809.67	92.04

Once we get the estimates of percentage quantity of selected grains used as seed, animal feed and total wastage, it is easy to derive the estimates of percentage total quantity available for the human consumption. From the table 4.7.1, it can be observed that the percentage quantity of selected cereal grains available for human consumption were found to be significantly high in Punjab (95.21 per cent), Haryana (95.78 per cent) and Andhra Pradesh (93.11 per cent), whereas, lowest in Himachal Pradesh (72.53 per cent). The percentage quantity of selected grains available for human consumption was estimated at 88.76 per cent for Maharashtra, 87.83 per cent for Karnataka, 87.97 per cent for Uttar Pradesh, 87.80 per cent for Assam, 87.34 per cent for Rajasthan, 84.86 per cent for Madhya Pradesh and 84.48 per cent for Bihar. At aggregated level, the percentage quantity of all selected cereal grains used for seed, animal feed and total wastage was worked out at 7.96 per cent for all sample states. That is, about 92.04 per cent of total net cereal production was available for human consumption in the country.

4.7.2: Estimates of Percentage Seed, Feed, Wastage and Quantity Availability of Selected Pulse Crops for Human Consumption

The estimates of seed, feed and wastage ratios with percentage quantity of selected pulse crops available for human consumption is furnished in table 4.7.2 for all sample farmers.

From table 4.7.2, we notice significant variations in the percentage quantity of selected pulse grains used as seed, animal feed and total wastage across the sample states. The percentage quantity of selected pulse grains used as seed, animal feed and total wastage was found to be highest in Madhya Pradesh (19.30 per cent) for gram whereas, lowest in Punjab (3.53 per cent) for greengram. However, the corresponding figure for remaining selected states was estimated at 6.83 per cent for Karnataka (redgram), 7.67 per cent for Maharashtra (gram), and 8.79 per cent for Rajasthan (gram), 11.27 per cent for Haryana (gram), 13.63 per cent for Himachal Pradesh (blackgram), 14.80 per cent for Uttar Pradesh (gram), 15.80 per cent for Bihar (lentil), 16.16 per cent for Andhra Pradesh (blackgram) and 17.93 per cent for Assam (blackgram).

Table 4.7.2: State -Wise Distribution of Percentage Seed, Feed and Wastage of Selected Pulse Crops for All the Sample Farmers

(Quantity in tons and % to its total production)

Sl. No	Name of the States	Name of Crops	Area (ha)	Net Production	Seed used		Seed kept		Used as Feed		Wastage		Used as seed, feed and wastage		Availability for Human Consumption	
					Qty.	%	Qty.	%	Qty.	%	Qty.	%	Qty.	%	Qty.	%
1	2	3	4	5	6	7	8	9	10	11	12	13	14 = (6 + 10 + 12)	15 = (7+11 +13)	16 = (5-14)	17
1	M. Pradesh	Gram	514.58	596.30	41.56	6.97	60.89	10.21	35.04	5.87	38.49	6.45	115.08	19.30	481.22	80.70
2	Maharashtra	..	143.40	99.88	1.05	1.06	3.80	3.80	2.12	2.12	4.49	4.49	7.67	7.67	92.22	92.33
3	Rajasthan	..	385.83	638.32	18.99	2.97	25.87	4.05	0.00	0.00	37.26	5.84	56.25	8.79	582.07	91.19
4	U. Pradesh	..	219.36	224.13	23.28	10.39	25.93	11.57	2.38	1.06	7.51	3.35	33.17	14.80	190.96	85.20
5	Haryana	..	736.24	569.37	27.46	4.82	29.38	5.16	2.39	0.42	34.30	6.02	64.15	11.27	505.22	88.73
	Total	..	1999.41	2128.00	112.34	5.28	145.87	6.85	41.93	1.97	122.05	5.74	276.32	12.98	1851.69	87.02
6	A. Pradesh	Blackgram	634.27	398.15	29.88	7.51	4.81	1.21	0.03	0.01	34.41	8.64	64.32	16.16	333.82	83.84
7	Assam	..	8.36	3.00	0.11	3.81	0.15	4.86	0.15	5.01	0.27	9.12	0.54	17.93	2.46	82.07
8	H. Pradesh	..	37.82	17.64	0.94	5.40	1.18	6.69	0.00	0.00	1.46	8.28	2.40	13.63	15.23	86.37
	Total	..	680.45	418.79	30.93	7.39	6.14	1.47	0.18	0.04	36.14	8.63	67.26	16.06	351.51	83.93
9	Bihar	Lentil	240.83	215.82	20.34	9.42	28.39	13.16	3.00	1.39	10.82	5.01	34.16	15.80	181.66	84.17
10	Karnataka	Redgram	575.59	309.70	4.82	1.56	10.43	3.37	0.00	0.00	16.33	5.27	21.15	6.83	288.55	93.17
11	Punjab	Greengram	170.61	132.91	2.48	1.87	2.65	1.99	0.84	0.63	1.37	1.03	4.69	3.53	128.22	96.47
	All		3666.89	3205.22	170.91	5.33	193.48	6.04	45.94	1.43	186.71	5.83	403.58	12.59	2801.63	87.41

At disaggregated level, these variations can be traced in the percentage quantity of selected pulse grains used as seed, animal feed and total wastage for each sample State. The percentage quantity of selected grains used for animal feed by the sample farmers of Madhya Pradesh (5.87 per cent) and Assam (5.01 per cent) was quite significant as compared to that of Maharashtra (2.12 per cent), Bihar (1.39 per cent), Uttar Pradesh (1.06 per cent), Punjab (0.63 per cent) and Haryana (0.42 per cent). Interestingly, the sample farmers of Rajasthan, Andhra Pradesh, Himachal Pradesh and Karnataka did not feed pulses to their animals. The percentage quantity of selected pulse grains used for animal was zero in these sample states. The percentage quantity of selected pulse grain used as seed was significantly high in Uttar Pradesh (10.39 per cent) for gram and Bihar (9.42 per cent) for lentil. Whereas, the corresponding figure/percentage in the sample states viz., Maharashtra (1.06 per cent), Karnataka (1.87 per cent), Punjab (1.87 per cent), Rajasthan (2.97 per cent) and Assam (3.81 per cent) was significantly low. The percentage quantity of selected pulse grains used as seed was estimated at 4.82 per cent for Haryana, 5.40 per cent for Himachal Pradesh, 6.97 per cent for Madhya Pradesh and 7.51 per cent for Andhra Pradesh. The percentage total wastage of selected pulse grains found to be quite significant in Assam, Himachal Pradesh and Andhra Pradesh. The corresponding figure was estimated at 8.28 per cent for Himachal Pradesh, 8.64 per cent for Andhra Pradesh and 9.12 per cent for Assam. The percentage total wastage of selected pulse grains in Rajasthan, Bihar, Karnataka, Haryana and Uttar Pradesh varied from 4.49 per cent to 6.45 per cent.

It is observed from table 4.7.2 that the quantity proportion of selected pulse grains available for the human consumption to its total net production was found to be maximum 96.47 per cent in Punjab followed by 93.17 per cent in Karnataka, 92.33 per cent in Maharashtra, 91.19 per cent in Rajasthan. In these States, the percentage quantity of selected pulse grains used as seed, animal feed and total wastage were below 9 per cent. The percentage quantity of the selected pulse grains available for the human consumption were estimated at 80.70 per cent for Madhya Pradesh, 82.07 per cent for Assam, 83.84 per cent for Andhra Pradesh, 84.17 per cent for Bihar, 85.20 per cent for Uttar Pradesh, 86.37 per cent for Himachal Pradesh and 88.73 per cent for

Haryana. The percentage quantity of all selected pulse grains available for the human consumption was worked out at 87.41 per cent for all selected States.

4.7.3: Crop-wise Percentage Seed, Feed, Wastage and Quantity Availability of Selected Crops for Human Consumption

The crop-wise estimates of seed, feed and wastage ratios with percentage quantity of selected cereal and pulse crops available for human consumption is presented in table 4.7.3 for all sample farmers.

Table 4.7.3 reveals that the percentage of aggregate quantity of paddy grain used as seed, animal feed and total wastage for all sample states growing was found to be small (7.40 per cent) as compared to that of wheat (8.39 per cent), jowar (11.63 per cent) and bajra (12.66 per cent). At disaggregated level, the percentage of aggregate total wastage of wheat grain found to be lowest (3.41 per cent) among all selected crops. The percentage of total wastages for bajra and jowar were estimated at 9.48 per cent and 8.04 per cent respectively. The sample farmers growing bajra and jowar crops were found to have used negligible proportion of quantity as seed (even less than one per cent). Whereas percentages of these crops used to feed animals/poultry found to be marginally high (2.85 per cent for jowar and 2.63 per cent for bajra) as compared to that of wheat (1.89 per cent) and paddy (0.42 per cent). At overall level, the percentage quantity of wheat and paddy available for the human consumption were higher than jowar and bajra. The percentage quantity available for the human consumption was estimated at 91.61 per cent for wheat, 92.60 per cent for paddy, 88.37 per cent for jowar and 87.34 per cent for bajra. The percentage quantity of all selected cereal crops was found to be 92.04 per cent.

Table 4.7.3 clearly reveals that percentage quantity of all selected pulse crops available for human consumption was less (87.41 per cent) than all selected cereal crops (92.04 per cent). Among all selected pulse crops, the highest percentage of quantity available for the human consumption was estimated at 96.47 per cent for greengram.

Table 4.7.3: Crop-wise Percentage of Seed, Feed and Wastage of Selected Crops at Aggregate level

(Quantity in tons and % to its total net production)

Sl. No	Name of The Crops	Area (Ha)	Net Production (Tons)	Seed used		Seed Kept		Used as Feed		Wastage		Used as seed, feed and wastage		Availability quantity for Human Consumption	
				Qty.	%	Qty.	%	Qty.	Qty.	Qty.	%	Qty.	%	Qty.	%
1	2	3	4	5	6	7	8	9	10	11	12	13	14 = (6 +10 +12)	15 = (7+11 +13)	16 = (5-14)
Cereal Crops															
1	Wheat	2412.32	8485.19	262.93	3.10	298.21	3.51	160.24	1.89	289.07	3.41	712.24	8.39	7772.96	91.61
2	Paddy	2830.59	15122.26	164.88	1.09	125.12	0.83	63.83	0.42	890.27	5.89	1118.98	7.40	14003.29	92.60
3	Jowar	764.18	662.37	4.85	0.73	6.84	1.03	18.90	2.85	53.28	8.04	77.03	11.63	585.34	88.37
4	Bajra	582.94	513.01	2.78	0.54	0.14	0.03	13.50	2.63	48.66	9.48	64.93	12.66	448.08	87.34
5	All	6590.03	24782.83	435.44	1.76	430.31	1.74	256.47	1.03	1281.28	5.17	1973.18	7.96	22809.67	92.04
Pulse Crops															
1	Gram	1999.41	2128.00	112.34	5.28	145.87	6.85	41.93	1.97	122.05	5.74	276.32	12.98	1851.69	87.02
2	Black gram	680.45	418.79	30.93	7.39	6.14	1.47	0.18	0.04	36.14	8.63	67.26	16.06	351.51	83.93
3	Lentil	240.83	215.82	20.34	9.42	28.39	13.16	3.00	1.39	10.82	5.01	34.16	15.80	181.66	84.17
4	Red gram	575.59	309.70	4.82	1.56	10.43	3.37	0.00	0.00	16.33	5.27	21.15	6.83	288.55	93.17
5	Green gram	170.61	132.91	2.48	1.87	2.65	1.99	0.84	0.63	1.37	1.03	4.69	3.53	128.22	96.47
	All	3666.89	3205.22	170.91	5.33	193.48	6.04	45.94	1.43	186.71	5.83	403.58	12.59	2801.63	87.41

The corresponding figure for redgram was estimated at 93.17 per cent, while the percentage quantity of gram, blackgram and lentil available for human consumption were estimated at 87.02 per cent, 83.93 per cent and 84.17 per cent respectively. The variation in percentage quantity of selected pulse grains available for human consumption was largely reflected in the variations of percentage quantity of selected crops used for seed and feed purpose. The percentage quantity of selected redgram and greengram used as seed were estimated at 1.56 per cent and 1.87 per cent, whereas, the same crops used for animal feed purpose were estimated at 0 and 0.63 per cent respectively. However, the percentage quantity of selected lentil, blackgram and gram crops used as seed were quite significant as compared to that of redgram and greengram. The percentage quantity of selected grain used as seed was estimated at 9.42 per cent for lentil, 7.39 per cent for blackgram and 5.26 per cent for gram. Whereas, the percentage the quantity of these selected grains used for animal feed were observed to be ranging from 0.04 per cent to 1.97 per cent. The variation in the percentage total wastage of selected pulse grains occurred at various harvest and post harvest stages were negligible except greengram. The percentage total wastages of selected pulse grains were estimated at 8.63 per cent for blackgram, 5.74 per cent for gram, 5.01 per cent for lentil and lowest 1.03 per cent for greengram. Overall, the percentage quantity of selected pulse grains used for seed, feed and wastages was estimated at 16.06 per cent for blackgram, 15.80 per cent for lentil, 12.98 per cent for gram, 6.83 per cent for redgram and 3.53 per cent for greengram. At aggregated level, about 5.33 per cent of the total net production of selected pulses was used for seed purpose, 1.43 per cent for animal/poultry feed and 5.83 per cent on wastages at various harvest and post harvest stages by the sample farmers in the selected study areas. The percentage quantity of selected all selected pulse grains used for seed, feed and wastage was estimated at 12.59 per cent for all selected sample states.

CHAPTER V

SUMMARY AND CONCLUSION

5.1: Introduction

Agricultural statistical system underwent changes during the early years after independence. We had very good statistical design to estimate crop production but usually home retained production and wastages were estimated using certain assumptions. In the process of estimating the GDP generated from agriculture, it was felt necessary that allowance should be made for seed, feed and wastages out of the gross production, which would give clear picture of the actual economic production of the country. In order to arrive at such estimates, initially, ratios were worked out on the basis of data collected from a few sample surveys conducted by the Ministry of Agriculture through the concerned Departments at the state level. These ratios were used in the initial years, but by mid-sixties they were modified again using the Farm Management Data. Subsequently, during eighties, it was felt that the seed, feed and wastage ratios should be worked out scientifically and following that the Government of India constituted a Committee of Experts comprising of members from the Directorates of Economics and Statistics, National Sample Survey Organisation, Central Statistical Organisation and Indian Agricultural Statistics Research Institute (1986). The Committee was helped by Ministry of Food and Civil Supplies and the Ministry of Agriculture. The Committee concluded that on an average 12.5 per cent of the total production could be deducted towards the allowance for seed, feed and wastages. However, at the same time, the Committee stressed the need for a fresh study for getting reliable estimates for the purpose of National Accounts Statistics (GOI, 1986).

Keeping in view the need for fresh estimates, a study was initiated by the Ministry of Agriculture, Government of India during the Officers' Incharge of AERCs meeting held during February 26-27, 2004 for scientifically estimating the ratios. Most of the States were asked to participate in the project and the project design was prepared with the help of Indian Agricultural Statistics Research Institute at the Institute for Social and Economic Change, Bangalore. The project was undertaken with two simple and straightforward objectives: (i) to estimate the total quantity of foodgrains

utilised for seed, feed and lost as wastage; and (ii) To estimate the net availability of foodgrains for human consumption. Initial sampling design was given by Experts from the Indian Agricultural Statistics Research Institute and which was already dealt in the earlier chapters. A detailed questionnaire was prepared and data were collected from major states in order to arrive at seed, feed and wastage ratios.

We have received data and reports from 11 States and which are utilised in order to arrive at the seed, feed and wastage ratios. The States covered include: Himachal Pradesh, Madhya Pradesh, Punjab, Uttar Pradesh, Andhra Pradesh, Assam, Bihar, Haryana, Karnataka, Maharashtra and Rajasthan. The crops include major cereals viz., wheat, paddy, jowar and bajra and major pulses viz., gram, bengalgram, redgram, lentil and greengram.

5.2: Estimates for Cereals

Table 5.2.1 gives the crop-wise percentage of seed, feed and wastage among cereals at an aggregate level. We observe that 7.96 per cent of the production accounts for seed, feed and wastage but there are significant variations across the States. The highest ratio was found in Himachal Pradesh (27.47 per cent), whereas, the lowest was in Haryana (4.22 per cent). Out of eleven sample states, eight have shown high percentage of seed, feed and wastage, whereas, three states have lower than the average percentage. For wheat, 8.40 per cent of the production goes to seed, feed and wastage whereas, for paddy it is 7.40 per cent. Coarse cereals like jowar and bajra have also shown higher percentage of seed, feed and wastage (11.62 and 11.66 per cent respectively). Highest percent of wastage is seen in Himachal Pradesh for wheat. It was noted that the farmers in the Himachal Pradesh use traditional methods for harvesting and threshing. Hill terrain also matters in the process. Besides, the losses in transportation are also high as the product is transported by head loads. Wheat is grown as a rainfed crop in the Himachal Pradesh and therefore, seed rate was found to be higher as compared to neighbouring states. In Madhya Pradesh, wastage during storage was high. Moreover, during the field survey, the inefficiency of combined harvest was also pointed out.

Table 5.2.1: State -Wise Percentage of Seed, Feed and Wastage of selected crops

(% to its total production)

Sl. N o.	Name of the States	Name of Crops	Seed used	Used as Feed	Wastage	Used as seed, feed and wastages
1	2	3	4	5	6	7= (4+5+6) *
Cereal Crops						
1	Himachal Pradesh	Wheat	9.80	6.40	11.24	27.47
2	Madhya Pradesh	..	4.96	3.73	6.44	15.14
3	Punjab	..	2.04	0.29	2.46	4.79
4	Uttar Pradesh	..	4.05	5.97	2.01	12.03
	Total	..	3.10	1.89	3.41	8.40
5	Andhra Pradesh	Paddy	1.22	0.06	5.60	6.89
6	Assam	..	1.71	3.77	6.71	12.20
7	Bihar	..	2.54	2.00	10.99	15.52
8	Haryana	..	0.21	0.00	4.01	4.22
	Total	..	1.09	0.42	5.89	7.40
9	Karnataka	Jowar	1.73	2.29	8.15	12.17
10	Maharashtra	..	0.00	3.27	7.96	11.24
	Total	..	0.73	2.85	8.04	11.62
11	Rajasthan	Bajra	0.54	2.63	9.48	12.66
	All		1.76	1.03	5.17	7.96
Pulse Crops						
1	Madhya Pradesh	Gram	6.97	5.87	6.45	19.30
2	Maharashtra	..	1.06	2.12	4.49	7.67
3	Rajasthan	..	2.97	0.00	5.84	8.79
4	Uttar Pradesh	..	10.39	1.06	3.35	14.80
5	Haryana	..	4.82	0.42	6.02	11.27
	Total	..	5.28	1.97	5.74	12.99
6	Andhra Pradesh	Blackgram	7.51	0.01	8.64	16.16
7	Assam	..	3.81	5.01	9.12	17.93
8	Himchal Pradesh	..	5.40	0.00	8.28	13.63
	Total	..	7.39	0.04	8.63	16.06
9	Bihar	Lentil	9.42	1.39	5.01	15.80
10	Karnataka	Redgram	1.56	0.00	5.27	6.83
11	Punjab	Greengram	1.87	0.63	1.03	3.53
	All		5.33	1.43	5.83	12.59

Note: * figures may not match due to rounding off

Figure 5.1

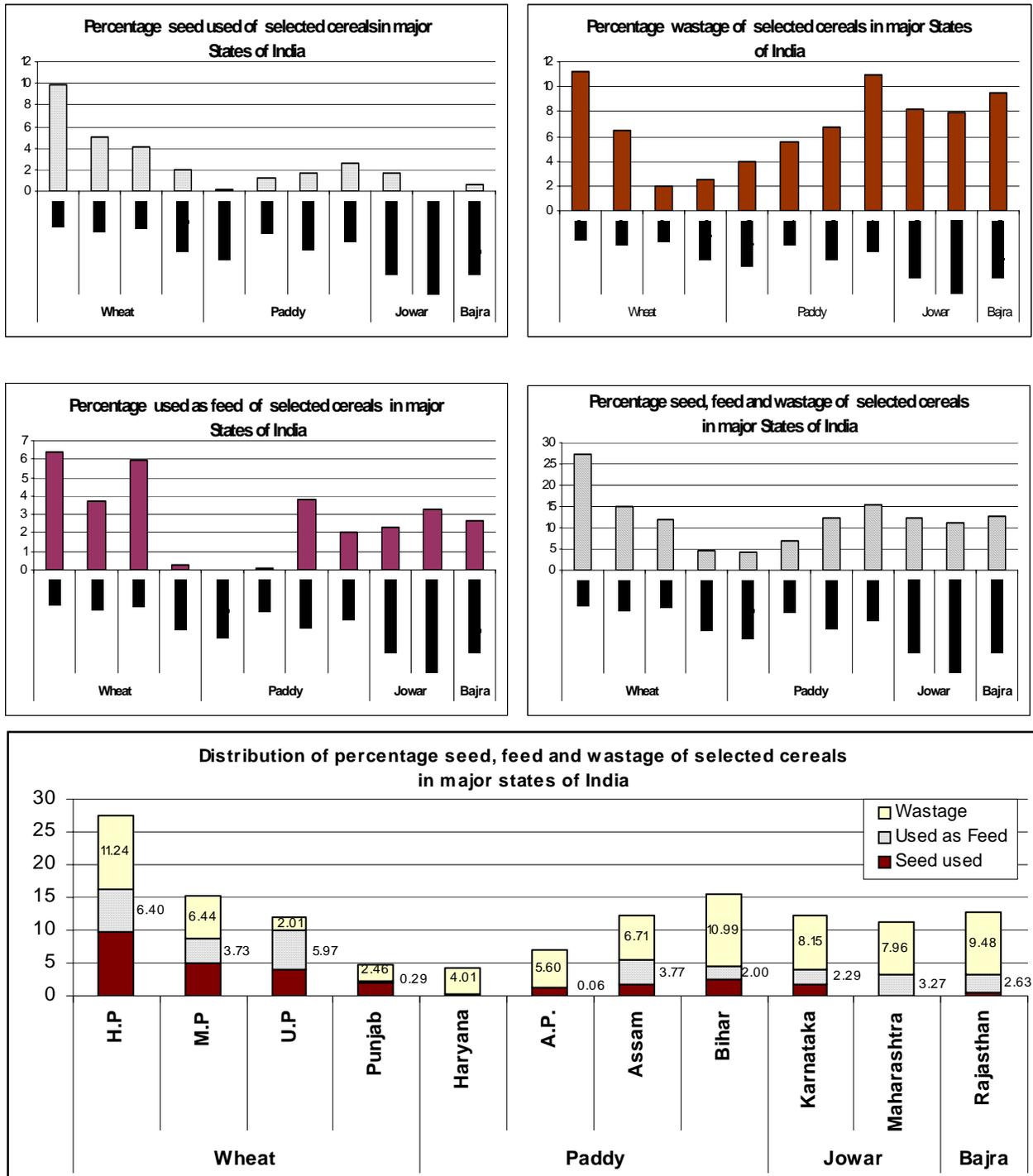
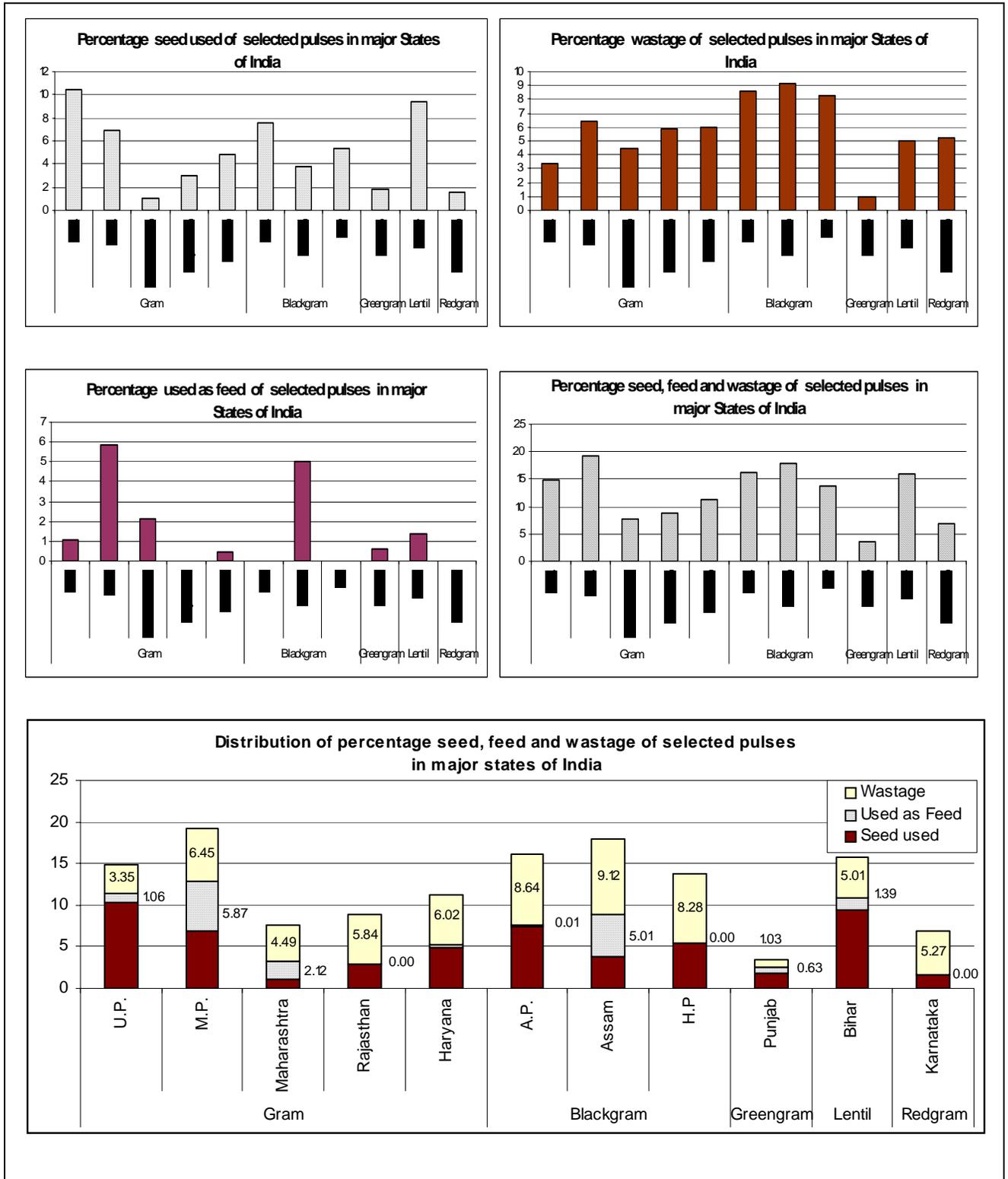


Figure 5.2



5.3: Estimates for Pulses

Table 5.2.1 also includes the crop-wise percentage of seed, feed and wastage pertaining to pulse crops. Here, an aggregate 12.59 per cent of the pulse crop production goes towards seed, feed and wastage. The highest ratio was found in Madhya Pradesh (19.30 per cent) and Assam (17.93 per cent), whereas the lowest percentages were found in Punjab (3.53 per cent) and Karnataka (6.83 per cent). Except four States, rest of the States showed higher ratios than all India average. The percentage seed, feed and wastage for gram and blackgram work out to 12.99 per cent and 16.06 per cent respectively. Whereas, for Lentil it is 15.80 per cent. For Redgram, the seed, feed and wastage ratio is at 6.83 per cent in Karnataka whereas, Punjab recorded 3.53 per cent for greengram.

Many significant observations have come out of this study, which are vital in the computations of the national income and gross value output in the agricultural sector. These ratios were arrived at scientifically available and statistically competent research design provided to the Agro-Economic Research Centres/Units. Therefore, in conclusion, one can say that seed, feed and wastage ratios in terms of cereals be taken as 7.96 per cent whereas, for pulses it may be taken as 12.59 per cent.

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Appendix-I

Study for estimation of Seed, Feed and Wastage Ratios for Major Foodgrains Tentative Method of Writing of Report

I. Introduction

- 1.1 History of methods of estimation followed in the State Income Accounting process.
- 1.2 Trends over last three decades in the seed, feed and wastage ratios based on State Income Accounting Methodology. (Earlier studies undertaken in this direction should also be included).
- 1.3 Probable impact on the State Income Accounting due to this.
- 1.4 Need for the present study.
- 1.5 Objectives of the study.
- 1.6 Organizations responsible for the study (Due Planning and Implementation).

II. Description of the Survey

- 2.1 Sampling Design.
- 2.2 Profile of the regions selected for the study.
- 2.3 Cropping pattern of the State, Districts and Selected villages.
- 2.4 Methods of data collection (This should include schedules used, items on which data collected, periodicity, by enquiry or physical observations, crops covered, field staff used etc.).

III. Methodology

Methodology should include the procedure for getting the ratios and other results.

IV. Results and Discussion

4.1 Utilization of grain for seed

- 4.1.1 Process of utilization
- 4.1.2 Methods and assumptions
- 4.1.3 Crop-wise estimates for seed
- 4.1.4 Farm size-wise estimates

4.2 Utilization of grain for feed

- 4.2.1 Process of utilization
- 4.2.2 Methods and assumptions
- 4.2.3 Crop-wise estimates for feed
- 4.2.4 Farm size-wise estimates

4.3 Wastages in foodgrains

- 4.3.1 Wastages at different production stages
- 4.3.2 Assumptions and Methods
- 4.3.3 Crop-wise estimates of Wastages
- 4.3.4 Farm size-wise estimates

V. Summary and Conclusion

VI. References

Appendix-II

Appendix Table1: List of Sample Villages & Number of Farmers growing Selected Cereal

State	District/Crop	Name of the selected villages	Total No. of farmers growing cereal
1. Andhra Pradesh	West Godavari/Paddy	All	4611
		Darbhagudem	253
		Gavaravaram	359
		Kallacheruvu	264
		Kethavaram	336
		Ravikampadu	311
		Marellamudi	144
		Nawabpalem	232
		Ponangi	304
		Ravulaparru	352
		Surapuram	105
		A. Gopavaram	151
		Eduro	376
		Kasipadu	308
		Krovvidi	323
		Vaandram	246
		Digamarru	139
		Kovvada	82
		Narasimhapuram	69
		K.Navarasapuram	85
		Saripalli	172
2. Assam	Johrat/Paddy	All	1297
		Upur Deuri	142
		Nam Deuri	192
		Karang Chapori	205
		Charighoria	123
		Kakorikata	62
		Jugunidhari	203
		Namkatoni	221
		Potryoi	149
3. Bihar	Saran/ Paddy	All	2680
		Bastijalal	133
		Sitalpur	135
		Trilockchak	138
		Kurayan	130
		Kanakpur	128
		Khariyadih	138
		Sikarpur	132

		Akilpur	125
		Vajalpur	135
		Samara	126
		Purbitelpa	137
		Ghaghta	132
		Bishunpur	136
		Damari	139
		Khalpur bala	132
		Jagdishpur	135
		Akbarpur	138
		Bela	137
		Daryapur	138
		Pratappur	136
4. Haryana	Kurkshetra/Paddy	All	2021
		Surajpur	76
		Dawoo Majra	152
		Landi	249
		Madanpur	83
		Tigri	81
		Harigarh Barakh	129
		Dunia Majra	89
		Bherian	42
		Megha Majra	98
		Jurasi Kalan	118
		Raogarh	34
		Manjda khera	45
		Udarsi	109
		Jhimar Hedi	120
		Singpura	64
		Ban	131
		Banot	134
		Budha	137
		Jhandola	57
		Bhukhri	73
5. Himachal Pradesh	Hamirpur/Wheat	All	1003
		Jagdiyal	86
		Chamardi	40
		Chakuiana	22
		Chamayana	144
		Godli	59
		Paddar	27
		Majhogkhas	37
		Ropa	20
		Guhai	29

		Tibbi	48
		Ganoh Brahouana	48
		Dhabdiana	62
		Samoh	64
		Makteri	36
		Tukhaini	59
		Bassi	39
		Dayalag	38
		Bhoranj Rahala	60
		Samlog	26
		Tikkar	59
6. Madhya Pradesh	Rewa/Wheat	All	4230
		Etaura	139
		Mahsua	139
		Navagaon	126
		Sonaura	198
		Varrehi	462
		Alva Khurd	120
		Majhigawa	182
		Masuriha	114
		Noun kala	536
		Salaiya	265
		Delahi	458
		Gaura	194
		Kanji	139
		Karaudaha	114
		Nakta	85
		Azgarha	202
		Khadda	107
		Khaur	108
		Kothi	217
		Vasi	325
7. Punjab	Amritsar/Wheat	All	4960
		Balachak	250
		Gohalwar	190
		Dabrji	200
		Karion	1300
		Johra	600
		Chatenpura	120
		Majjupur	100
		Sangatpura	200
		Balkalan	150
		Balkhurd	140
		Kohali	300

		Vanieke	150
		Kotliaulakh	50
		Bhakna Kalan	300
		Bhakna Khurd	200
		Babowal	200
		Sohiankalan	200
		Nagkalan	120
		Jhitakalan	150
		Jhitakhurd	40
8. Uttar Pradesh	Gautam Budh	All	2999
		Kulsara	111
		Jalpura	204
		Asgarpur Jageer	86
		Bisrakh Jalalpur	120
		Raipur Khadar	66
		Chandrawal	176
		Daudpur	111
		Bagpur	147
		Dadupur	252
		Rasulpur Ikbal	54
		Dayanagar	77
		Rasulpur Dasna	172
		Bairangpur	218
		Milak Khandra	71
		Chaksenpur	161
		Kanpur	197
		Mayana	143
		Sirauli Bangar	113
		Kureb	160
		Ahmadpur Chauroli	360
9. Karnataka	Bijapur/Jowar	All	8899
		Kakkalmeli	1331
		Nagarahalli	311
		Madari	295
		Hikanagutti	432
		Kadani	535
		Sulakod	99
		Agasball	202
		Hunasyhall	403
		Domanal	703
		Kubakaddi	545
		Harnal	152
		Hadaginal	178
		Hadalgeri	636
		Harindral	334
		Karkur	217

		Bandhanal	302
		Deginal	458
		Kyatankeri	267
		Dhulkhed	861
		Benakanhalli	638
10. Maharashtra	Nanded/Hy.Jowar	All	4933
		Sayal	227
		Kolgaon Khurd	275
		Masalga	236
		Jakapur	238
		Wakad	396
		Rajwadi	189
		Kedarguda	235
		Shivpuri	241
		Gojegaon	164
		Dagadwadi	285
		Hersad	355
		Kalamber	243
		Palshi	176
		Madkewadi	219
		Landgewadi	279
		Savargaon wadi	181
		Bhendgaon	197
		Bhawani Tanda	277
		Hipalnari	263
		Kotgyal	257
11. Rajasthan	Jhunjhunu/Bajra	All	1452
		Monga	54
		Kharia	65
		Mehradas	82
		Ghasi ram ka bas	64
		Haripura	71
		Aqavanakala	70
		Salimka bas	66
		Bajdoli	85
		Badasari ka bas	73
		Kakoda	68
		Jaitpura	62
		Posana	80
		Indrapura	110
		Raghunathpura	100
		Duria	79
		Puhaniya	78
		Manpura	65
		Saga	58
		Kalakhari	65
		Sanvlod	57

Appendix Table 2: List of Sample Villages & Number of Farmers growing Selected Pulse

State	District/Crop	Name of the selected villages	Total No. of farmers growing Pulse
1. Andhra Pradesh	Krishna/ Blackgram	All	3267
		Akumarru	126
		Arisepalli	165
		Bhogireddipalli	287
		Chinnayadara	110
		Chodavaram	120
		Komaravolu	205
		Ramannapudi	221
		Seridentakuru	143
		Tativarru	210
		Vemavaram	165
		Gurajada	157
		Kanakavalli	77
		Penamakuru	131
		Saipuram	120
		Veeravalli	157
		Annavaram	217
		Bulusupadu	196
		Dechupalem	113
		Takkalapadu	175
		Venkatapuram	172
2. Assam	Morigoan/ Blackgram	All	1003
		Borchapori	84
		Doloi gaon	107
		Tattikata	123
		Bhajakhaiti	99
		Otolabori	109
		Dakhinchenimari	76
		Dholangkhaiti	267
		Borkhabul	138
3. Bihar	Patna /Blackgram	All	2440
		Chipura	123
		Chainpur	120
		Bahuapur	122
		Khusialchak	124
		Baruna	122
		Pannal	120
		Kanchanpur	122
		Pandepur	122
		Jaitipur	120

		Gorhanna	121
		Pitambarpur	124
		Bikhva	118
		Nathupur	123
		Gangapur	122
		Lasgarichak	122
		Rahi	122
		Bara	123
		Mohammadpur	123
		Benibigaha	124
		Balyari	123
4.Himachal Pradesh	Shimla/ Blackgram	All	1827
		Ravi	283
		Dharali	105
		Tyabal	264
		Majagaon	207
		Badhal	113
		Tikkari	36
		Sainj	50
		Lailu	31
		Bhalyana	23
		Dhali	18
		Shakhal	41
		Lowerkoti	144
		Dhare	48
		Kiyartu	74
		Parsa	81
		Mool Sak	80
		Tari	33
		Tarsanee	58
		Bagasin	42
		Shiwala	96
5. Haryana	Bhiwani/Gram	All	3006
		Dhulkot	162
		Khera	105
		Gadwa	108
		Mohila	95
		Gandawas	143
		Alkapura	181
		Nigana	239
		Dharan	119
		Dhanibirani	106
		Baganwala	271
		Sorda Kadim	113

		Sudhiwas	144
		Obra	237
		Kasni khurd	72
		Sarda Jadid	136
		Simliwas	216
		Khariawas	182
		Mansarwas	152
		Khaperwas	165
		Ladianwali	60
6. Madhya Pradesh	Vidhisha/Gram	All	3007
		Biladana	194
		Gamakar	193
		Mudara	103
		Pachama	86
		Rojaru	219
		Berkhedi	102
		Chopra	155
		Maliyakheda	100
		Parochha	235
		Roshan Piparia	288
		Bamori	135
		Hingoli	132
		Jatpura	159
		Mahoota	199
		Pali	242
		Khejra gopal	89
		Kakarkhedi khurd	100
		Manjoor khedi	93
		Sabdapur	110
		Siyalpur	73
7. Uttar Pradesh	Hamirpur/Gram	All	3379
			77
		Issauli	86
		Surajpur Danda	81
		Helapur Danda	255
		Damar	352
		Tilsar	150
		Alra	82
		Pipraudha	124
		Chandi Kalan	126
		Bhainsta	160
		Barda	200
		Barua	120
		Chilli	231

		Budharwar	270
		Tunka	84
		Bilgoan	138
		Churha	178
		Barkhera	109
		Barakharka	147
		Pawai	409
8. Rajasthan	Sikar/Gram	All	1611
		Raghunathgarh	96
		Chainpura	66
		Gokulpura	95
		Piparali	174
		Kudali	70
		Koran	66
		Narodada	81
		Jasarasar	61
		Shiv ram ka bas	75
		Lalashi	70
		Bamrada	75
		Shilki ka Bada	90
		Hanumannagar	72
		Kali Kheda	85
		Hodd	69
		Thehat	69
		Chandeli ka bas	67
		Mandamadani	100
		Bajdoli	65
		Bad ka charnwas	65
9. Maharashtra	Ahmad Nagar/Gram	All	4912
		Chinch ban	178
		Nagapur	279
		Malewadi	294
		Khedle Kajle	282
		Dhamori	300
		Kanhegoan	172
		Ghumandeo	270
		Zapharabad	329
		Kadit Kh	228
		Brahaman Wetal	248
		Sheri Koldara	263
		Mazampur	284
		Dhawanwadi	235
		Gatewadi	233
		Ghanegaon	200

		Domalewadi	240
		Chormalewadi	215
		Mahadeowadi	202
		Arvi	250
		Bhingan Khalsa	210
10. Punjab	Sangrur/ Greengram	All	484
		Moom	35
		Kurur	40
		Vazeedke kalan	12
		Kalebule	15
		Vazeedke kalan	3
		Katron	20
		Bhudan kalan	27
		Khanpur	10
		Rotalan	8
		Hathan	18
		Medevi	8
		Kothala	15
		Bhasur	19
		Thikriwala	22
		Kattu	6
		Pahokalan	30
		Dhanaula	15
		Bhadur	5
		Hadike	20
		Khudikalan	19
		Pednikalan	6
		Sehna	5
		Chatha	10
		Chhahar	21
		Korian	32
		Dehkalan	5
		Bardwal	25
		Saron	10
		Bangawali	13
		Kakarwal	10
11. Karnataka	Gulberga/Redgram	All	5783
		Munavalli	763
		Suntanur	222
		Shakapur	132
		Tellur	219
		Kudiganur	254
		Shankrajpur	158
		Malagak	382

		Yanagundi	272
		Ganapur	233
		Konthanpalli	216
		Harakanchi	232
		Sontha	916
		Kattalli	128
		Sidnal	144
		Jewalaga	276
		Channur (J)	197
		Budihal	332
		Singanahalli	172
		Siddapur (B)	196
		M.Bomanahalli	339

APPENDIX –III

Study for Estimation of Seed, Feed and Wastage Ratios for Major Foodgrains

Schedule I- Stratum –wise list of selected villages for each crop covered under study

Crop: _____ State: _____ District: _____

Stratum No.	Name of Taluka / Blocks	Name of the Selected Village
I		
II		
III		
IV		
All		

Study for Estimation of Seed, Feed and Wastage Ratios for Major Foodgrains

Schedule II- Complete enumeration respondents of the selected village

State: _____ District: _____

Stratum: _____ Tehsil/Block: _____

Village: _____ Date of Visit: _____

Crops to be covered:

Kharif: Foodgrain _____ Pulse _____

Rabi: Foodgrain _____ Pulse _____

	Name of the Cultivator	Father's/ Husband's Name	Area Owned (acres)	Cultivated Area	Holding Size Code
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Holding Size: Small (0-2 ha), Medium (2-4 ha), Large (More than 4 ha).

(C) PRODUCTION AND DISPOSAL OF CROPS

Sr. No.	Name of the crop	Total Production (Kg)	Quantity (Kg) for							
			Previous year's Seed used	Kept for seed for next time	Sold for seed	Home Consumption	Later Disposal	Kind wages to Labour	Animal feed	Poultry feed

(D) Consumption of feed fed to cow and buffaloes

Animals	No.	How many months to be given in a year	Feed code	Quantity (in qtls)	Remarks
Cows	Dry				
	In Milk				
	Calves				
Buffaloes	Dry				
	In Milk				
	Calves				
Bullocks					
He-Buffaloes					
Poultry					
Any Others					

Feed Code = 1- Green fodder, 2- Dry stover/ Straw, 3-Hay, 4-Concentrate, 5- Tree lopping, 5- Any other (Specify)

(E) Wastage (kg) as different harvest and post harvest stages

Crop	At harvest*		At threshing floor	Scattered on ground	Left in straw	In transport **		
	Sickle	Combine				F-T	T-S	S-M
Total								

* After collection of ear-heads called 'sila collected by labours

** F-T: Field to Threshing floor, T-S: Threshing floor Storage, S-M: Storage to Market.

(F) Wastage (Kg) in Storage at cultivator's level:

Crop	Quantity Stored	Wastage in storage due to		Wastage during home consumption		Wastage during animal/poultry feeding			
		Rats	Dampness /other causes	Cleanliness	Cooking and eating	Cattle		Poultry	
						Qty. given	Qty. unconsumed (waste)	Qty. given	Qty. unconsumed (waste)

Schedule given for the tabulation of Data

Table 1: Stratum wise List of Selected Villages and Total Number of Sample Farmers for Cereal/Pulse Crop

Stratum No.	Name of Stratum of Talukas / Blocks	Name of the Selected Villages	Total Number of Farmers in the Village
I			
II			
III			
IV			
All			

Table 2: Size-Class Wise Distribution of Total Number of Sample Farmers and their Average Size of Holdings

Size of holding	No of Farmers in the Village (Nos)	Average Size of Holding (Ha)	Leased in / out area as % of Total Area (%)	Net Cropped Area (Average) per HH (Ha)	Gross Cropped Area (Average) per HH (Ha)	No of Sample farmers Selected (Nos)	Average Size of Holding Selected Sample farmers (Ha)
Small							
Medium							
Large							
All							

Table 3: Size-Class-Wise Distribution of Agricultural Land of the Sample Farmers

Size of Holding	Area (Hectare)		
	Irrigated	Un irrigated	Total
Small			
Medium			
Large			
All			

Table 4: Cropping Pattern of the Sample Farmers

Size of Holding /Crop →	Area and percentage share of the major crops to GCA						GCA (in Ha)
Small							(100.0)
Medium							(100.0)
Large							(100.0)
All							(100.0)

Note: Figures in the parenthesis indicate share of the crops to GCA.

Table 5: Production and per hectare productivity of the major crops grown by the sample farmers

(Qty in Kgs)

Size of holding/ Crop →						Total gross value of production (Rs.)
Medium						
Large						
All						

Note: Figures in the brackets show per hectare productivity of crop

Table 6: Size Class-wise distribution of seed requirement for Cereal/Pulse Crop

Size of holding	Area (ha)	Net Production (Kg)	Quantity of Seed (Kg)		Percentage qty. of Seed with Production	
			Used	Kept	Used	Kept
Small						
Medium						
Large						
All						

Table 7: Consumption of Cereal /Pulse Crop as Feed by Live Stock

(Qty. in Kg)

Name of Animal	in Milk		Dry		Total No. of Animal	Total Consumption (Kg)	Consumption of Crop/animal
	No	Qty	No	Qty			
Cow							
no clave							
Buffaloes							
B. Clave							
Bullocks							
He-Buffaloes							
Any Other							
All							

Note: The ratio of quantity of crop consumption to per animal excludes figures of those animals that have not been found consuming any quantity of the crop.

Table 8: Consumption of Cereal / Pulse Crop as Feed by Poultry

Name of the Districts	Size of Holding	No. of Birds	Consumption of Crop (Kg)
	Small		
	Medium		
	Large		
	All		

Table 9 : Size Class-wise distribution of Value of Crop output of Cereal/ Pulse Crop

Size of holding	Crop		Total Gross Value of Crop Output
	Crop 1	Crop 2	
Small			
Medium			
Large			
All			

Table 10: Size Class-wise Distribution of Production and Disposal of Cereal/Pulse Crop

Size of Holding	Net Production (Kg)	Quantity (kgs) for									
		Previous year's Seed used	Kept for seed next time	Exchange as Seed	Sold for seed	Home Consumption	Later Disposal	Kind wages to Labor	Used as Animal feed	Used as Poultry feed	Marketed Surplus
Small											
Medium											
Large											
All											

Table11: Size Class wise distribution of Wastage of Cereal/Pulse Crop at Different harvest and Post harvest Stages

Size of holding	Net Production	(Qty in Kgs)							
		Harvesting	Threshing and Shattered	Straw	Transportation	Storage	Home consumption	Left in Animal / Poultry Feed	Total Wastage
Small									
Medium									
Large									
All									

Table12: Size Class-wise distribution of percentage of Seed, Feed and Wastage of Cereal/ Pulse Crop

(Qty in Kgs)

Size of holding	Area (ha)	Net Production	Seed Used		Seed Kept		Used as Feed		Total Wastage		Used as seed, feed and wastage	
			Qty	%	Qty	%	Qty	%	Qty	%	Qty	%
Small												
Medium												
Large												
All												

Table13: Crop-wise distribution of percentage Seed, Feed and Wastage of foodgrains

(Qty in Kg)

Name of selected crop	Area (ha)	Net Production	Seed Used		Seed Kept		Used as Feed		Total Wastage		Used as seed, feed and wastage		Availability for Human Consumption	
			Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%

Annexure I

COMMENTS ON THE DRAFT REPORT

- 1. Title of the Study Report** : Estimation of Seed, Feed and Wastage Ratios for the Major Foodgrains in India.

2. Comments on Chapters

Chapter I

- No comments
-

Chapter II

- No comments

Chapter III

- Please write full form of IECAR

Chapter IV

- In tables 4.5 (a) to 4.5 (d), it is noticed that quantity of jowar crop used for seed and kept for next years' production in Maharashtra appears to be zero. Please clarify it or state reasons below the tables in note.
- In section 4.3.5, paragraph one, figure stated for the proportion of quantity of wheat used as seed to total net production for all wheat growing states appears to be different from table 4.7(a) figure. Please check it.
- In table 4.11 (a), total disposal of selected cereal crops is not equal to 100 per cent in case of Himachal Pradesh, Madhya Pradesh, Maharashtra and Rajasthan. Please check it and do necessary.
- In table 4.11 (a), total disposal of selected pulse crops is not equal to 100 per cent in case of Madhya Pradesh and Rajasthan. Please check it and do necessary.

Chapter IV

- Table 5.1 and 5.2 can be modified and reduced to only seed, feed and wastage ratios.
- Draw the graphs from modified table 5.1 and 5.2, this would provide clear picture of seed, feed and wastage ratios across the states.

ACTION TAKEN ON THE COMMENTS

Chapter III

- Action taken

Chapter IV

- Regarding the case of Maharashtra in tables 4.5 (a) to 4.5 (d), we found that selected Hybrid jowar crop is termination kind of seed and it is not used by farmers for germination or production. In the field investigation, all sample farmers were observed to have purchased around 2,200 kg of hybrid jowar seed from the external market, which did not form part of their production. As per the suggestion, we have provided a note below the tables.
- Figure stated for the proportion of quantity of wheat used as seed to total net production for all wheat growing states has been corrected in the section 4.3.5, paragraph one.
- In the case of mismatching of total disposal of selected cereal crops equal to 100 per cent for the states viz., Himachal Pradesh, Madhya Pradesh, Maharashtra and Rajasthan, it was found that these states did not include so called ' undistributed production in table (4.11 a and b). However, in this report we treated it as 'later disposal'. As per the suggestion, we have provided a note with respect to this problem below the table (4.11 a and b).

Chapter V

- As per comments table 5.1 and 5.2 were modified and reduced to only seed, feed and wastage ratios.
- As per suggestions, we have draw graphs on modified table 5.1 and 5.2 and incorporated in the section.

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I. Maruthi