AERC, Jabalpur-Research Study No.-129

Relevance and Distribution Efficiency of Seed Mini-Kits of Pulses in Madhya Pradesh

Study Sponsored by
Ministry of Agriculture and Farmers Welfare
(Govt. of India)

AGRO- ECONOMIC RESEARCH CENTRE
Jawaharlal Nehru Krishi Vishwa Vidyalaya,
Jabalpur (M.P.) 482004

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AGRO- ECONOMIC RESEARCH CENTRE FOR MADHYA PRADESH AND CHHATTISGARH

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PREFACE

The present study entitled "Relevance and Distribution Efficiency of Seed Mini-Kits of Pulses in Madhya Pradesh" has been assigned by the Directorate of Economics and Statistics Ministry of Agriculture Government of India to this centre in the year 2016-17 under the close coordination of Agricultural Development and Rural Transformation Centre (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore.

The study comprises 200 beneficiaries and 100 non-beneficiaries respondents of seed minikits of viz. chickpea, black gram and lentil of Datia & Sagor districts of Madhya Pradesh. The seed minikit programme was found to be successful in the study area. Out of total seed minikits distributed to HHs majority of respondents were found to marginal and small. The minikits also distributed to SC/ST and women respondents. The varieties of different pulses provided in seed minikits were of good quality & short duration, more yielded and fetches more prices as compared to local varieties and majority of HHs were able to identified the varieties.

On behalf of the Centre, I express deep sense of gratitude to Prof. P.K.Bisen, Hon'ble Vice-Chancellor and Chairman, Advisory Body of AERC, Jabalpur, Shri. P.C. Bodh, Adviser, AER Division, Ministry of Agriculture and Farmers' Welfare, Govt. of India, New Delhi, Dr. D. Khare, Dean, Faculty of Agriculture, Dr. P.K.Mishra, Director Research Services, Dr. (Smt.) Om Gupta, Director Extension Services and Dr. R.M.Sahu, Dean, College of Agriculture/Prof. & Head (Dept. of Agril. Econ.&F.M.), Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur for providing the valuable guidance and all facilities during various stages in successful completion of this study of high importance. I extended my special thanks to Dr. G. K. Vani, Department of Agricultural Economics, for providing help in preparation of chart & map for the study.

I extend heartfelt thanks to Dr. Parmod Kumar Professor and Coordinator of this study Agricultural Development and Rural Transformation Centre (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore for providing valuable guidelines and time to time suggestions for conducting the study successfully.

The present study was conducted by Dr. H. O. Sharma, Dr. Deepak Rathi and Dr. H. K. Niranjan of this centre. The field investigation, tabulation, analysis, interpretation and drafting of the report were performed by them. I wish to express my deep sense of gratitude to team members namely; Mr. S. K. Upadhye, Mr. S. S. Thakur, Mr. P. R. Pandey, Mr. R. S. Bareliya and Mr. Akhilesh Kuril & Mr. P. K. Patidar for their untiring efforts in bringing this innovative study to its perfect shape.

I express sincere thanks to Shri R. M. Sharma and Shri A. K. Nema, Deputy Director of Agriculture, of Datia and Sagor districts respectively and their field staff for providing not only secondary data but also extending great assistance in collection of primary data from the selected respondents.

I hope the findings and suggestions made in the study would be useful to policy makers of the State and Govt. of India.

Date : 20.10.2020 **(Hari Om Sharma)**

Place: Jabalpur **Prof. & Director**

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Executive Summary

In India, pulses can be produced with a minimum use of resources and hence, it becomes less costly even than animal protein. In comparison to other vegetables, pulses are rich in protein, less expensive can be cultivated as an inter-crop and also as mixed crop. Pulses are mostly cultivated under rainfed conditions and do not require intensive irrigation facility and this is reason, pulses are grown in areas left after satisfying the demand for cereals/cash crops. Even in such conditions, pulses give better returns. Apart from this, pulses possess several other qualities such as these improve soil fertility and physical structure of the soil, fit in mixed/inter-cropping system, crop rotations and dry farming and provide green pods for vegetable and nutritious fodder for cattle as well.

The pulses are normally grown in all the ecological situation of India i.e. from J&K to Kerala. Performance of pulses at two important point i.e. the area occupied and contribution in production is better in Central India as compared to other parts of the country. The Government is implementing seed minikit programme under various schemes of the Ministry of Agriculture. Seed minikits of different field and fodder crops are given to farmers including those belonging to below poverty line in order to introduce new varieties/hybrids and to encourage farmers for seed multiplication of various crops at grass root level. The seed minikits of oilseeds and maize are provided under Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM). National Food Security Mission (NFSM) provides seed minikits of rice, wheat and pulses in identified districts of the country. Macro Management of Agriculture (MMA) and Rashtriya Krishi Vikas Yojana (RKVY) also provide support for crop development, including supply of seed minikits as per priorities of the States in their work plan.

Seed minikits are meant for introduction and popularization of latest released/pre-released varieties and their propagation among the farmers. The Government has fixed a limit up to 10 year old varieties/hybrids will qualify for financial assistance under this programme. **(i)** In case of released varieties, only certified seed will be supplied in minikits. **(ii)** Hybrids of oilseed, pulse and maize crops are allowed for distribution under minikits. **(iii)** Though NSC will continue to be the nodal agency for production, procurement of seeds of varieties/hybrids identified for distribution in minikits, SFCI will also be producing and supplying minikits as per indents placed/allocation made directly by TMOP&M. The Committee will be meeting before the commencement of each crop season i.e. in April for Kharif and in August for Rabi/ Summer season programmes to: **a)** Review the requirements of the states, seed availability of identified varieties. **b)** Review performance of varieties/hybrids distributed in the states in the previous seasons/years under seed minikits distribution programmes. **c)** Formulate minikit distribution programme for the season **d)** Review availability and production programmes of breeder's foundation and certificate seed of newly released varieties and hybrids. **e)** Review the programmes of

the states for production of seeds of the varieties/hybrids found most promising under minikit programmes for general distribution to farmers. e) Identify the agencies amongst the SSCs, OILFEDS, KVKs, NGOs, private sector, cooperative and public sector agencies having necessary technological and infrastructure base to widen the seed production programmes. NSC will coordinate the progamme with these agencies. **iv)** Seed minikits will also contain seed treating chemicals, Rhizobium Culture (for legumes) and recommended package of practices for the variety or hybrid. Keeping to the above facts in mind the present study has been formulated with following specific objectives.

1 Objectives of the Study

The objectives of the study are as follows:

1. To assess the relevance and the requirement of seed minikits of pulses among the respondents
2. To compare the productivity of pulse seed minikits beneficiaries with the control respondents/non users
3. To suggest policy measures to address the efficient implementation of seed minikits.

2 Data and Methodology

The study confined to a prominent pulses growing State of India viz. Madhya Pradesh. All the major pulses viz. chickpea, lentil and black gram were taken in to consideration for the study on the basis of the distribution of seed minikits of pulses to the pulses growers. A district under rain fed and a district under irrigated condition were selected for the study having maximum area under the districts and number of seed minikits of pulses distributed by state agriculture department. Hence, Datia and Sagor districts were selected under rain fed and irrigated condition respectively, in Madhya Pradesh. A list of seed minikits beneficiaries of pulses in various villages of the selected districts were prepared and top 100 beneficiaries from each district have been selected for the study. (Table 1.4). 50 controls (non-beneficiaries) were considered of the same village having same size of land holding for the study also to draw relevant results. These selected respondents were further categorized into marginal (<2.5 acres), small (2.5–5 acres), medium (5-10 acres) and large (>10 acres) land holding categories.

3 Major Findings

➢ Madhya Pradesh had 23 per cent share of total pulses in gross cropped area (GCA). The cultivated of all the districts were found to produce pulses in their field. The share of total pulses to GCA was varying from to 9.6 (Khargone) to 42 (Panna) per cent in Madhya Pradesh.

➢ The area under rice and coarse cereals was found to be decreased by 3.9 and 30.9 per cent with annual average growth rate of 0.39 and 3.03 per cent, respectively, while area of wheat, total pulses, total food grain and other pulses, was found to be increased by 21.1 per cent with the annual average growth rate of 2.11, 17.6, 4.5 & 2.3 per cent during the period 2001-10. The production of rice, wheat, total pulses and total food grain was found to be increased by 11.30, 31.22, 25.34 & 21.31 per cent with the annual average growth rate of 1.13, 3.12, 2.53 & 2.13 per cent

per year, respectively, during the period 2001-10 while the production of total coarse cereals was found to be decreased by -15.93 per cent with the annual average growth rate of -1.59 per cent per year, respectively in Madhya Pradesh. Amongst different pulses viz. chickpea, blackgram, lentil, arhar and green gram the area was found to be increased by 23.1, 15.4, 9.4, 5.9 and 4.2 per cent per year during the period with the annual average growth of -2.31, -1.54, -0.94, -0.59 & -0.42 per cent per year respectively, during the period 2001 -10. The production

of all the pulses viz. chickpea, black gram, lentil, green gram, other pulses and arhar was found to be increased with the annual average growth rate of 2.86, 2.86, 1.83, 1.65, 0.91 and 0.05, per cent per year respectively during 2001-2010 in Madhya Pradesh. The yield of different pulses in Madhya Pradesh was also found to be increased with the annual average growth of 1.23 (chickpea), 1.08 (lentil), 1.76 (black gram), 1.32 (green gram) & 0.69 (other pulses) per cent excepted -0.55 (arhar) per cent per year during period 2001-10.

➢ During period 2010-17 the area of all the food grains i.e. rice, wheat, coarse cereals, total pulses and food grains was found to increased with 23.4, 15.2, 4.6, 13.2 & 14.2 per cent with annual average growth rate of 4.67, 3.05, 0.91, 2.64 & 2.83 per cent per year, respectively in Madhya Pradesh. The production of all the food grains was also found to be increased in this period (2010-17) in State. The production of rice, coarse cereal, wheat, pulses, and total food grain was found to be increased by 55.45, 27.20, 30.50, 27.95 & 32.32 per cent with annual average growth rate of 11.09, 5.44, 6.10, 5.59 and 6.46 per cent per year, respectively in this particular period in Madhya Pradesh. The yield of food grains was found to be increased with annual average growth of 9.01 (rice), 3.22 (wheat), 5.47 (coarse cereal), 3.69 (pulses) and 4.55 (food grain) per cent.

➢ Amongst different pulses cultivated by the farmers of Madhya Pradesh, the area of

chickpea, black gram, , arhar, green gram and other pulses was found to be increased with annual average growth rate of 1.39, 10.22, 23.91, 0.22 & 7.50 per cent per year, while the area of lentil was found to be decreased by the annual average growth rate of -2.20 per cent, respectively. The production of all the pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also found to be increased by 11.20, 51.98, 55.24, 57.89, 50.21 & 63.36 per cent, respectively with the annual average growth rate of 2.24, 10.40, 11.05, 11.58, 10.04 & 12.67 per cent, respectively during the period from 2010-17 in Madhya Pradesh. The yield of different pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also increased with annual average growth of 1.01, 11.45, 6.47, 1.51, 9.93 and 9.92 per cent per year, respectively during this period.

➢ The area of total pulses was found to be increased by 87.07 per cent from 22782 to 25976 thousand ha in the country during 2016-17 as compared 2006-07. Amongst different states the area of pulses was found to be increased maximum in Madhya Pradesh (19-23%) followed by Rajasthan (15-16%), Karnataka (9-10%) and other states (7-11%) to total area of the country in the year 2016-17 as compared to 2006-07. The production of pulses was found to be increased by 39.05 per

cent 13570 to 18870 thousand tonnes in the country in the period 2006-17 as compared to 2006-07. The production of pulses was found to be increased from 24 to 29, 9 to 13, 7 to 8, 3 to 4, 7 to 12 per cent in Madhya Pradesh, Rajasthan, Karnataka, Chhattisgarh and Uttar Pradesh. The yield of total pulses was found to be increased in all the pulses

growing States of the country during 2016-17 as compared to 2006-07 from 764 to 910 kg/ha (Madhya Pradesh), 561 to 651 kg/ha (Maharashtra), 364 to 570 (Rajasthan), 410 to 527 (Karnataka), 795 to 710 (Uttar Pradesh), 672 to 796 (Andhra Pradesh), 471 to 765kg/ha (Chhattisgarh), 651 to 914 (Gujarat), 418 to 529 (Orissa), 726 to 879 (Bihar) and 607 to 809 (Other States) The yield of total pulses was found to be increased 596 to 727 kg/ha in India in the year 2016-17 as compared 2006-07.

➢ The area of total pulses was found to be increased by 26.17 per cent from 4368 (2006-07) to 5511(2016-17) thousand ha in Madhya Pradesh. The percentage share of area of black gram and green gram to total area of pulses was found to be increased from 11 to 16, 2 to 3 and 7 to 10 per cent respectively, while percentage share of chickpea and lentil was found to be decreased from 60 to 53 & 12 to 10 per cent respectively.

➢ The production of total pulses was also found to be increased by 659.77 per cent from 4437 (2006-07) to 5151 (2016-17) in Madhya Pradesh. The contribution of all the pulses viz. lentil, black gram, arhar and other pulses to total production of pulses was found to be increased from 8 to 10, 5 to 9, 7 to 11 and 5 to 7 per cent respectively, except chickpea, which was decreased by 74 to 62 per cent in Madhya Pradesh. The production of green gram was found to be stagnate to 1 per cent to total area of pulses in both the period.

➢ The productivity of all the pulses was found to be increased in 2016-17 as compared to 2006-07. The productivity of all the pulses grown by the farmers viz. chickpea, lentil, black gram, green gram, arhar, other

pulses and total pulses was found to be increased from 842 to 1077, 422 to 930, 319 to 525, 297 to 364, 613 to 1043, 510 to 906 and 763 to 935 kg/ha respectively, in 2016-17 as compared to 2006-07 respectively in Madhya Pradesh.

➢ The area, production and yield of total pulses were found to be increased 26.2, 54.5 & 22.4 per cent in 2016-17 over the year 2006-07 in Madhya Pradesh. The area of total pulses was found to be increased in all the districts of Madhya Pradesh except Jhabua (-60.5%), Shajapur (-21.9%), Bhind (-20.7%), Narsinghpur (-19.8%), Sagar (-19.3%), Sidhi (-12.4%), Jabalpur (-10.9%), Raisen (-9.5%) and Chhatarpur (-3.5%) in the year 2016-17 as compared to the year 2006-07.

➢ The study confined to the Datia and Sagar districts of Madhya Pradesh and related to 116 marginal, 126 small, 41 medium and 17 large HHs reveals that the average size of these all HHs (300) comprised of 6 members, out of which 3 were found to be engaged in farming. The majority of HHs was found to be between 30 to 60 years (77.67%) and an average HH was have 34 years of experience in farming. The majority of HHs was found to be belong to OBC (40.00%) followed by SC (28.67%), general (23.67%) and (ST (7.67%) categories and primarily depends on

agriculture and allied activities for their livelihood. As for as secondary occupation of the HHs is concerned, the majority of the HHs was found to be engaged as agricultural labourers (46.85%) followed by non-agricultural labours (16.08%), salaried persons (13.29%), self business (13.29%), self services (5.59%) and agricultural and allied activities (2.80%). The annual income of an average HH from agriculture and allied activities (77.83%) was found to more as compared to non-agriculture activities (22.17%). The annual income of an average HH was found to be Rs. 144857/year, in which share of agriculture and allied activity (Rs. 112740/year) was found to be more as compared to non agriculture sources (Rs. 32117/year)

➢ An average household used to leased-in land of 2.41 acres. Leased-out land was not found in practice by the HHs in the area under study. An average HH was found to leased in land with a rent of Rs.7431/season, which was found to be varied from Rs. 6250 (marginal) to Rs.6594 (small) per season in the area under study. The cropping intensity of 198 per cent per year, which indicates that an average household used to cultivate crops in both the seasons in their net operated area as 90% area was found to be under irrigation.

➢ Out of total net operational holding 91.11, 92.39, 93.09 and 87.94 per cent of area was found to be irrigated under marginal, small, medium and large farmers in the area under study. Canal (37.09%) followed by bore-well (31.49%) and dug well (14.92%) were found to be major sources of irrigation. An average HH was found to invest Rs. 1738.13 per acre per year as water charges for irrigation through canal, which found to be varies from Rs. 1676.83 (medium) to 1822.35 (large) farmers.Out of total irrigated area, the 45.67 and 45.85 per cent of Gross Cropped Area (GCA) was found to be cultivated in kharif and rabi season respectively and out of total rain fed area only 4.23 and 4.24 percent of GCA was found to be cultivated in kharif and rabi season respectively.

➢ Black gram (15.15%), soybean (13.3%) and paddy (9.42%) were found to be major kharif crops, while wheat (25.84%) and chickpea (14.07%) were found to be major rabi crops in irrigated condition. Soybean (2.04%) and black gram (1.24%) in kharif and in chickpea (1.99%) in rabi season were found to be major crops grown under rain fed condition. An average HH found to obtain Rs. 176027/year as a gross farm income from cultivation of crops. He was found to receive Rs. 35112/year net income over cost of production (Rs. 4004/year) and labour cost (Rs. 3850/acre in a year. Amongst different categories of farms, large farmers (Rs.44748 /year) were found to received more value of output as compared to marginal (Rs. 42898/year), small (Rs. 41600/year) and medium (Rs.43589/year) farmers. It was also observed that an average HH was found to receive 7.71 q/acre of production of grains in a year which ranged between 7.30 q/year (marginal) to 8.16 q/year (large) and as the size of holding increases the value of output as well as production of crops increases in the area under study.

➢ Seed minikits were found to be distributed to all the respondents. The maximum number of seed minikit were found to be distributed to small farmers

(43.5%) followed by marginal (42.5%), medium (9%) and large (5%) respondents in the area under study. The majority of them cultivated pulses through line sowing followed by broadcasting method of sowing. The broadcasting method of sowing was found be adopted by more number of marginal (31.03%) as compared to large (11.76%) farmers and line sowing of method was more adopted by more number of large (88.24%) as compared to marginal (68.97%) farmers. The agricultural officers (89.66%) followed by farmer facilitator (6.47%) and fallow farmers (3.87%) used to play key role in making respondents aware with regard to distribution of seed minikits. Aadhar Card and copy of land records were found to be major documents to avail facility of seed minikits in the area under study.

➢ The cost of production of chickpea, lentil and black gram were found to be reduced from 18.67 (lentil) to 35.35 (chickpea) per cent after availing facilities of seed minikit programme. The net return was also found to be increased 39.22 (chickpea), 35.60 (lentil) and 81.72 (black gram) per cent after availing seed minikit facilities by the average beneficiaries farmers as compared to non-beneficiaries farmers. The net obtained price was also found to be increased 2.45 (chickpea), 5.55 (lentil) and 31.80 (black gram) per cent in average beneficiaries farmers as compared to non-beneficiaries farm.

➢ In Madhya Pradesh all the seed minikits of pulses were found to be distributed by the officers of agriculture department (Department of Farmer's Welfare and Agriculture Development) among different size of respondents. No other agency has been found to be involved in distribution of seed minikits of pulses in the State. The majority of respondents opined that the seed supplied in seed minikits were of short duration varieties (100%) having a remarkable yield difference (74%), better quality (73%) and it fetches more price (64%) as compare to their local varieties. The Madhya Pradesh only seed was found to be supplied in seed minikit of pulses programme. The majority of respondents reported that non availability of seed minikit on time (73%) was found to be major problem in available seed minikit. They were wants short duration varieties of pulses (44.39%) and arrangement of field demonstration in the villages (24.16%) for effectiveness of seed minikit programme. The majority of respondents suggested that the seed minikits should be supplied at minimum rate (25.78%) for betterment of the programme. They wanted about the information regarding knowledge about latest available varieties of pulses and their sources of availability (21.68%). The respondents also suggested that there should be proper monitoring and supervision of cultivation of crops under seed minikits programme after sowing (20.08%) and more publicity should be required among the farmers of the villages (17.74%) and produce under seed minikit programme should be distributed among other farmers of the villages (14.72%).

➢ Among the different types of pulses 68.5, 10.0 and 21.5 per cent of seed minikits of pulses were found to be related to chickpea, lentil and black gram respectively, in which

total transportation cost were found to be Rs. 1.27 (chickpea), 2.46 (lentil) & 5.00 (black gram) per kg incurred in transportation of seed from Agriculture office to their farm in the area under study. An average respondent was found to cover approximate 12 km. distance to avail the facilities. He purchased 55, 25 and 16 Kg. of chickpea, lentil and black gram seed respectively at price of Rs. 62, 51 & 95 from other sources for cultivation of pulses in their field. He was found to be used more their owned seed as compared to purchased seed from private dealers. He was found to be covered 8 to 10 km distance to purchase seed from private dealer in which Rs. 0.58 to 1.39 seed was involved as transportation cost.

➢ Out of total cost of cultivation incurred in production of chickpea, the maximum cost was found to be incurred in the field preparation (25.14%) followed by fertilizer and its application (17.77), harvesting and threshing (13.97%), farm yard manure (13.52%), seed and sowing (11.35%), bagging & transportation (6.60%), weeding (5.98%), irrigation (4.57%) and plant protection measure (1.11%), while in total cost of cultivation of lentil and black gram the maximum cost was found to be incurred in the field preparation followed by harvesting & threshing, seed/sowing, farm yard manure and others operations. As regards to labour used an average respondent was found to be maximum in harvesting & threshing followed by bagging & transport, irrigation, farm yard manure application, plant protection chemical, interculture, seed & sowing, and land preparation. Overall labourers engaged in different operations of chickpea, lentil and black gram were found to be increased by 12.82, 16.13 and 10.00 per cent, respectively under farms of seed minikits beneficiaries as compared to non-beneficiaries in the area under study.

➢ None of respondent was found to imposed financial liability to avail seed minikits facility in the area under study. The 16, 8 and 4 Kg. seed of chickpea, lentil and black gram, respectively were found to be provided to cultivated 0.5 acres of area in seed minikits programme during 2018-19 in the area under study. The 31.02, 49.71 and 51.89 per cent of chickpea, lentil and black gram seed out of 2.45, 1.71 and 2.12 q/HH seed produced was used by the chickpea, lentil and black gram growers respectively in the next year for the cultivation of crops.

➢ JG-14 (92.70%) was found to be major variety of chickpea distributed among chickpea growers in the area under study. The other varieties of chickpea which were distributed among the respondents were found to be JG-64(5.11%), JG-16(1.46%) and JG-73 (0.73%). IPL-316 (70.00%) was found to be major variety of lentil distributed among lentil growers, while other varieties distributed among respondents were found to be JL -4(20.00%), JL-3(5.00%) and JL-316 (5.00%). In case of black gram PU-31 (44.19%) was found to be major variety distributed among respondents, while Shekhar (18.60%), P-1 (18.60%), Azad (13.95%) and PU-1(4.65%) were found to be other others varieties distributed among the respondents.

➢ The most prominent channel followed by the beneficiaries for disposal of chickpea produce under seed minikit of

pulses programme was found to be village farmers (52.55%). They were also be found to disposed off their 34.31 and 13.14 per cent of chickpea produce obtained under seed minikit of pulses programme to hat market and APMC respectively. In case of lentil it was found that the maximum quantity of lentil disposed off through village farmers (50%) followed by village traders (30%), hat market (10%) and APMC (10%), while in case of black gram the highest quantity found to be disposed off through APMC (37.21%) followed by village farmers (3.23%), hat market (30.23%) and village traders (2.33%) There was no remarkable difference was found in different size of respondents. Although, large size of respondents were found to be sell 100 per cent production of blackgram in APMC, these findings were found to similar for all size of respondents.

4 Policy Implication

- Seed is considered to be the major input, while cultivation of crops therefore before distribution of seed minikits, result demonstrations are required to be laid down on the farmers field to transfer the technology in totality and major inputs other than seed should be clubbed and distributed among farming communities with seed minikits to generate real impact of the technology.
- The farmers should be exposed to crop cafeteria grown by the KVKs were different popular/improved varieties were found to be grown, so that farmers should be able to recognise different varieties of a particular crop with its peculiar characteristics and adopt varietal diversification for enhancing the efficiency of the resources being used on one hand and increasing the productivity on the other, which leads to doubling the income of the farmers.
- As of now, there is no mechanism for collection of seed produced through seed minikits by govt agencies and its distributions among non-beneficiaries farming community at affordable prices, with the result of it farmers are bound/forced to sell it in the local/APMC markets as grain instead of seed in the absence of proper supply/ value chain for the marketing of the seed causing reduced income. This not only leads to wastage of precious input on the one hand and without its distribution it slower down the pace of penetration (horizontal/vertical) of the improved technology among farming community on time and thereby increasing the time-leg for adoption of technology on the other incurring loss to the farming community in both ways. Sometimes the technology become old and looses its identity before its proper maturity due to introduction of new technology and in the absence of proper mechanism.

CHAPTER - I

INTRODUCTION

1.1 Background

The pulses are normally grown in all the ecological situation of India i.e. from J&K to Kanyakumari. Performance of pulses at two important point i.e. the area occupied and contribution in production is better in Central India as compared to other parts of the country. The Government is implementing seed minikit programme under various schemes of the Ministry of Agriculture. Seed minikits of different field and fodder crops are given to farmers including those belonging to below poverty line in order to introduce new varieties/hybrids and to encourage farmers for seed multiplication of various crops at grass root level. The seed minikits of oilseeds and maize are provided under Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM). National Food Security Mission (NFSM) provides seed minikits of rice, wheat and pulses in identified districts of the country. Macro Management of Agriculture (MMA) and Rashtriya Krishi Vikas Yojana (RKVY) also provide support for crop development, including supply of seed minikits as per priorities of the States in their work plan. (https://www. indiainfoline.com/ article/news-top-story/seed-mini-kit-programme-to-introduce-new-varieties-113102203107_1.html). The beneficiaries are requested to make necessary arrangements for conducting demonstrations at suitable locations ensuring that 25 per cent of these demonstrations are conducted on the fields belonging to scheduled castes and scheduled tribes' farmers. The women farmers also encouraged as beneficiaries for allotment of minikits to them.

The Technology Mission on Oilseeds was launched during 1986 by the Central Government to increase the production of oilseeds, to reduce import and to achieve self sufficiency in edible oils. Subsequently, pulses, oil palm and maize were also brought within the purview of the Mission during 1990-91, 1992 and 1995-96, respectively. The other schemes implemented under Technology Mission are Oilseeds Production Programme (OPP), National Pulses Development Project (NPDP), Accelerated Maize Development Programme (AMDP) and Oil Palm Development Programme (OPDP) and have been merged into one Centrally Sponsored Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize (ISOPOM) being implemented since April 2004. Under this Scheme, financial assistance is provided for purchase of breeder seeds, production of foundation seeds, production and distribution of certified seeds, plant protection chemicals and equipments, weedicides, etc. to encourage farmers to grow oilseeds and pulses (Nethrayini and Mundinamani 2013). Varietal Development programme of pulses got strengthened in 1967 with the initiation of All-India Co-ordinated Research Improvement Programme.

Table 1.1: Nutritive value of pulse

Constituents	Magnitudes
Protein	>20 -%
Carbohydrate	55 – 60%
Fat	>1.0%
Fibre	3.2%
Phosphorus	300 -500 mg/100 g
Iron	7 -10mg/100 g
Vitamin C	10 -15 mg/100 g
Calcium	69 -75mg/100g
Calorific value	343
Vitamin A	430 -489 IU

Pulses provide high quality protein complementing cereal proteins for predominantly substantial vegetarian population of the country. Although, being the largest pulses cultivating State in the Country, pulses area and production share to total foodgrain is only 23.38 & 9 and 44 & 24.25 per cent in the country and Madhya Pradesh, respectively. The cultivation of pulses builds up a mechanism to fix atmospheric nitrogen in their root nodules and thus meet their nitrogen requirements to a great extent.

Pulses are the important sources of phosphorus, carbohydrate, fibre minerals, vitamin c, riboflavin, calcium and essential amino acids are also major constituent (Table 1.1) and are popularly known as "Poor man's meat" and "rich man's vegetable", contribute significantly to the nutritional security of the country. Pulses are also a major source of carbohydrates, protein and other nutrients like phosphorus, iron, and calcium with calorific value of 343.

In India, pulses can be produced with a minimum use of resources and hence, it becomes less costly even than animal protein. In comparison to other vegetables, pulses are rich in protein, less expensive can be cultivated as an inter-crop and also as mixed crop. Pulses are mostly cultivated under rainfed conditions and do not require intensive irrigation facility and this is reason, pulses are grown in areas left after satisfying the demand for cereals/cash crops. Even in such conditions, pulses give better returns.

Table 1.2: Share of area under pulses crops in Madhya Pradesh

Particulars	Area (000 ha) TE-2017-18	% share of Total Area	Production (000 ton)TE -2017-18	% share of Total Production
Gram	3276.33	49.10	3834.41	53.61
Lentil	556.95	8.35	506.20	7.08
Urd	1320.67	19.79	893.89	12.50
Tur	638.67	9.57	715.52	10.00
Moong	405.33	6.07	230.91	3.23
Others	475.12	7.12	970.92	13.58
Total Pulses	**6673.07**	**100.00**	**7151.85**	**100.00**

Apart from this, pulses possess several other qualities such as these improve soil fertility and physical structure of the soil, fit in mixed/inter-cropping system, crop rotations and dry farming and provide green pods for vegetable and nutritious fodder for cattle as well.

The potential of pulses help to address future global food security, nutrition and environmental sustainability needs has been acknowledged through the UN declaration of the 2016 International Year of Pulses. Pulses are grown in all three seasons. The three crop seasons for the commodity are: i. Kharif – Arhar (Tur), Urd (Blackgram), Moong (Greengram), Lobia (Cowpea), Kulthi (Horsegram) and Moth; ii. Rabi – Gram, Lentil, Pea, Lathyrus and Rajmash iii. Summer – Greengram, Blackgram and Cowpea Pulses in India retrospect & prospects.

During 2017-18, pulses were cultivated over 29813.16 thousand ha of area and recorded the highest ever production of 25416.62 thousand tonnes at a productivity level of 853 kg/ha. Ten states occupied major area under pulses and contributing more than 90 per cent produce in pulses. These were Madhya Pradesh shared (25.09% & 31.91%), Rajasthan (17.88% & 13.40%), Maharashtra (14.12% & 13.17%), Karnataka (10.14% & 7.68%), Uttar Pradesh (7.59% & 8.66%), Andhra Pradesh (4.72% & 4.79%), Gujarat (3.05% & 3.63%), Tamil Nadu (2.77% & 3.29%), Jharkhand (2.66% & 2.19%) and Chhattisgarh (2.65% & 2.16%). Based on triennium ending 2017-18,out of total pulses area, area occupied under chickpea, Blackgram, pigeonpea, lentil and greengram was found to be 49.10, 19.79, 9.57, 8.35 and 6.07 per cent (Table 1.2), respectively in Madhya Pradesh with overall productivity of pulses (1084 kg/ha).

Improper sowing time, low seed rate, defective sowing method, insufficient irrigation, inadequate intercultural operations, sowing under area without proper management are major agronomic constraints (Ramakrishna *et al*., 2000 and Reddy, 2009) in cultivation of chickpea. Subsequently plants get comparatively less time to complete their lifecycle which, by and large forces maturity (Ramakrishna et al., 2000). Typically, late sown rabi pulses especially lentil and chick pea undergoes three distinct phases and considerable degrees of phenological modifications are bound to happen. This poses serious threat to realization of yield potential due to cold injuries. This phase is very important for creating source of channelizing the energy at later stage. In the last and most important phase lentil faces heat injury, resulting in early onset of reproductive phase, causing imbalance in resources and inputs, biotic stress and forced maturity (Joshi, 1998; Dixit *et al.* 2009; Reid *et al*., 2011 and Singh and Bhatt, 2013). An earlier study revealed that area under pulses in mostly predetermined, but as the irrigated area increases, pulses are relocated to rainfed areas and their area is replaced by cereals or some cash crop (Singh *et al*., 1995). In India, the irrigated area under pulses was only 12 per cent, while under wheat and paddy; it was more than 60 per cent of the total area (Reddy and Reddy, 2010).

Poor soil and agro-climatic conditions not only compel late sowing of legumes, leads to reduced length of growing period but also necessitate to sustain cold injuries at early vegetative phase which freeze all biological activities for prolonged period. A sudden rises in temperature after that, not only induces forced maturity but simultaneously invites several biotic stress viz., diseases and insects pests (Ali *et al*., 2012; Reddy, 2009 and Singh and Singh, 2008). Traditionally rabi pulses sowing were delayed up to last week of November and some time under extreme circumstances it goes up to the first fortnight of December, obviously due to reasons already explained (Singh *et al.,* 2011 and Ramakrishna *et al*., 2000).

Seed minikits are meant for introduction and popularization of latest released/pre-released varieties and their propagation among the farmers. The Government has fixed a limit up to 10 year old varieties/hybrids will qualify for financial assistance under this programme. **(i)** In case of released varieties, only certified seed will be supplied in minikits. **(ii)** Hybrids of oilseed, pulse and maize crops are allowed for distribution under minikits. **(iii)** Though NSC will continue to be the nodal agency for production, procurement of seeds of varieties/hybrids identified for distribution in minikits, SFCI will also be producing and supplying minikits as per indents placed/allocation made directly by TMOP&M. The Committee will be meeting before the commencement of each crop season i.e. in April for Kharif and in August for Rabi/ Summer season programmes to : **a)** Review the requirements of the states, seed availability of identified varieties. **b)** Review performance of varieties/hybrids distributed in the states in the previous seasons/years under seed minikits distribution programmes. **c)** Formulate minikit distribution programme for the season. **d)** Review availability and production programmes of breeder's foundation and certificate seed of newly released varieties and hybrids. **e)** Review the programmes of the states for production of seeds of the varieties/hybrids found most promising under minikit programmes for general distribution to farmers. e) Identify the agencies amongst the SSCs, OILFEDS, KVKs, NGOs, private sector, cooperative and public sector agencies having necessary technological and infrastructure base to widen the seed production programmes. NSC will coordinate the progamme with these agencies. **iv)** Seed minikits will also contain seed treating chemicals, Rhizobium Culture (for legumes) and recommended package of practices for the variety or hybrid. Keeping to the above facts in mind the present study has been formulated with following specific objectives.

1.2 Objectives of the Study

The objectives of the study are as follows:

1. To assess the relevance and the requirement of seed minikits of pulses among the respondents.
2. To compare the productivity of pulse seed minikits beneficiaries with the control respondents/non users.
3. To suggest policy measures to address the efficient implementation of seed minikits.

1.3 Data and Methodology

The sampling techniques, nature and types of data required for the investigation, tools and methods of data collection and concept used, while interpretation of the analyzed data for the study.

1.3.1 Sample Technique

The study confined to a prominent pulses growing State of India viz. Madhya Pradesh. All the major pulses viz. chickpea, lentil and black gram were taken in to consideration for the study on the basis of the distribution of seed minikits of pulses to the pulses growers. A district under rain fed and a district under irrigated condition were selected for the study having maximum area under the districts and number of seed minikits of pulses distributed by state agriculture department. Hence, Datia and Sagar districts were selected under rain fed and irrigated condition respectively, in Madhya Pradesh. (Table 1.3)

A list of seed mini kits of pulses distributed to the respondents in the various villages and blocks of the selected districts was prepared and top 100 beneficiaries in each district have been selected for the study. 50 controls (non-beneficiaries) were considered of the same village having same size of land holding for the study also to draw relevant results (Table 1.3). These selected respondents were further categorized into marginal (<2.5 acres), small (2.5–5 acres), medium (5-10 acres) and large (>10 acres) land holding categories.

Table 1.3: Selection of respondents under seed minikit of pulses in Madhya Pradesh during 2017-18

Selected Taluka/Block	Selected Villages	Non-Beneficiaries	Beneficiaries
Selected Villages in Datia District (Rainfed)			
Bhander	Ashtod, Astot, Baghpura, Bhander, Chadni, Dalputpur, Dhanpipri, Ghnshyampur, Gudaha, Jori, Kubariya, Noval, Pipraua Kala, Pyawan, Ramgarh, Sentol, Tatarpur and Vaagpura	25	28
Datia	Baswa, Dawaribhat, Devara, Durshumer, Imaliya, Jhadia, Kakroua, Kalyanpura Khurd, Kevlari, Khiriya Nai, Malkhanpur, Sadwara, Unav and Vikar	0	17
Indargarh	Dhanauli, Indargarh, Khairona, Kulet, Murguvan, Piproakala, Dariyapur, Joniya, Mahewa , Pachokara, Shyampahadi and Gurguwa	16	21
Sewda	Badokhari, Drushna, Durolipar, Gumanpura, Gyara, Kaserua, Mangroli, Marseni Bujurg, Vishor, Bhagupura, Dariyapur and Ram pura Khurd	9	34
Sub-Total		**50**	**100**
Selected Villages in Sagar District (Irrigated)			
Khurai	Banhat, Basari , Bilaiya, Gadhol Jagir, Hinayatpur, Jhariya, Karaiya Gujar, Karmpur, Khadesra(Khiriya Chitra), Khimlara , Lahatwas, Madiya Hundupat, Mala Suneti , Siloda , Lamethi and Nahtwas	20	32
Malthone	Agar Shirs, Atakila, Andela, Bamhori Hudda, Bamhorilal, Bandari, Belkheda, Chandrapur, Chowka Khurd, Dhimarai, Dughakal, Hannoda, Hanumatbahadi, Hardot, Itwa, Kalua, Kariya Gurjar Khadosara, Khatera, Khera, Kherai, Kila, Madawan , Madhvan Gouri, Madiyamafi, Malthone, Mandari, Mirgawali, Mudiya Gusai, Nau Dhana, Palthoni, Patikheda, Samspur, Semara Hata, Semara Ladhi, Seven and Tigara	30	68
Sub-Total		**50**	**100**
Grand Total		**100**	**200**

Fig. 1.1: Selected districts under study in Madhya Pradesh.

1.4 Nature and Sources of Data

The study is based on both primary and secondary data. The secondary data were collected from the office of District Statistics and respective Deputy Director Agriculture of Datia and Sagar Department of Farmers' Welfare and Agricultural Development, Govt. of Madhya Pradesh. The primary data were collected from the selected respondents through interview schedule provided by the coordinator 'Agricultural Development and Rural Transformation Centre' (ADRTC), 'Institute for Social and Economic Change' (ISEC), Bengaluru, which was pre-tested under the local conditions of the study area.

The district wise data on area, production and yield (productivity) were collected from official website of Directorate of Land Records, Madhya Pradesh (http://landrecords.mp.gov.in). To prepare crop maps, data pertaining to area, production and yield were collected from 2011-12 to 2015-16. To categorize districts into high and low area as well as high and low productivity, concept of bulk line production is used. 80 percent of the total production of the crop in the State is termed as bulk line production. Quinquennial average of production is used to calculate bulk line production cut-off. Districts were arranged in descending order based on quinquennial average production. The median area for these districts' quinquennial averages of area/yield was taken to be cut-off. The districts which had area/yield greater than or equal to median

area/yield qualified as high area/yield district and vice-versa being true. The following matrix was followed to categories districts into four zones for each crop considered in the maps.

Particulars	Yield	
Area	High	Low
High	High_Area -High_Yield	High_Area -Low_Yield
Low	Low_Area -High_Yield	Low_Area -Low_Yield

1.5 Analysis of the data

The following statistics tools were used for the study

a) Mean

The average of the variables used for the study.

Where

$\bar{X}$ = Mean of the variables

$\sum$ = Sum of scores (observation) of variables

n= Total number of respondents

b) Absolute Change = Value of the Current Year- Value of the Base Year

c) Relative Change (%)= (Value of the Current Year- Value of the Base Year)/ Value of the Base Yearx100

D) Cropping intensity

It is the ratio of net area sown to the total cropped area or the number of crops cultivated in a piece of land per annum, considered as cropping intensity.

Cropping intensity (%) = Gross Cropped Area/ Net Area Sownx100

e) Gross Return (Rs/acre)= Value of main product+Value of the by-product

f) Net Return (Rs/acre)=Gross Return- Total Cost of Cultivation

g) Cost of Cultivation (Rs/acre) = Total Material Cost and Total Labour Cost

h) Cost of Production (Q/acre) = Total cost of Cultivation (Rs/acre) /yield (q/acre)

i) Net income (Rs/acre)= Gross income- Total cost of cultivation

j) Average Annual Growth Rate (AAGR)

AAGR (%) = ((Relative Change)/ Number of years

k) Linear Equation = Y= bx+a

Where,

Y = Dependent Variable (Are, Production and Yield)

a= Constant

b= Regression coefficient

x= Independent Variable (Years)

1.6 Need of the study

In seed minikit programme incentive are given to producers for production of good quality seed and creation of seed hubs by distribution of the production received through these seed minikit to fallow farmers of the same locality, which acts as catalytic agent for increasing the production of pulses in the country. How for this particular programme served to the farmers and got success in increasing yield of pulses in Madhya Pradesh in the fundamental task of the study. The study focused on distribution of seed minikit of pulses, awareness of the programme, impact of programme on production, productivity with marketing of pulse's production received from these seed minikits in one of leading pulses producing State (M.P.) of the country.

The study address to the producers, researchers and policy makers of the country to acquaint them about the impact of seed minikits of pulses programme in producer's point of view. The investigation invisages total roadmap of seed minikit of pulses in the state includes adoption of newer varieties of pulses their adoption, incremental return obtained, constraints in the effectives implementation programme and suggestions their off with effective policy implications.

1.7 Limitation of the study

The study doesn't claim its completeness in all aspects and certainly had some limitations. The data related to the objectives of the study were collected from the selected respondents. The information provided by them are based on interview and as they don't keep any record of their farming practices. Therefore, the information provided by them is entirely based on their recall memory thus, there is possibility of certain biasness enter in the study.

1.8 Organization of the study

The study is organized into five chapters, **chapter I,** Introduction of the study and covers the background, objectives, need, data & methodology and limitation of the Study. Production of pulses in Madhya Pradesh is given in **chapter-II** the chapter highlighted (a) Area, production and yield of total food grains and pulses in Madhya Pradesh (b) Area, production and yield of pulses in different States of India (c) Share of area of total pulses in gross cropped area in Madhya Pradesh (d) Percentage share of area, production and yield of major pulses (e) Percentage contribution of area of major pulses to total pulses across districts in Madhya Pradesh (f) Changes in area, production and productivity of pulses across the district (g) Share of area, production and yield of various pulses across districts of Madhya Pradesh with summary of the chapter. **Chapter-III** deals with socio-economic characteristics and includes demographic profile, land use pattern, sources of irrigation, cropping pattern, value of output across different size of farms with summary of the chapter. Value of output of pulses & efficiency of seed minikits in Madhya Pradesh are presented in **Chapter-IV.** Number of seed minikits distributed, method of sowing, awareness of distribution, document submitted to avail seed minikits, criteria for farmer selection, productivity and net return from pulses, sources of distribution, respondents opinion, major problems and suggestions their off, purchased seed from seed minikits, share of cost of different pulses, labour used, financial aspects, varieties under seed Minikit and marketing channels are the major highlights of the chapter. Summary, Conclusion and Policy Implications of the study are given in **chapter -V**.

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CHAPTER - II

PRODUCTION OF PULSES IN MADHYA PRADESH

This chapter deals with the area production and yield of pulses in different States of India, district wise share of pulses in gross cropped area, share of individual pulse in major pulses growing districts in the State, district wise area, production and yield of major pulses in major pulses producing districts of Madhya Pradesh for the period of 2001-2017.

2.1 Area, Production and Yield of Total Food Grains and Pulses in Madhya Pradesh

The area, production and productivity of total food grains and pulses has been observed for the base and current year from 2001-17. The total period has been classified in two period viz. period-I (from year 2001-10) and period-II (from year 2010-17). The year TE 2003 and TE 2010 are considered as the base and the current year, respectively for period-I and TE2012 and TE 2017 as the base and current year, respectively for period-II. The relative change and annual average growth of area, production and productivity in these two period has been analyzed and presented in table 2.1 to 2.3. The area under rice and coarse cereals was found to be decreased by 3.9 and 30.3 per cent with annual average growth rate of 0.39 and 3.03 per cent, respectively, during the period 2001-10 (Table 2.1).

While area of wheat, total pulses, total food grain and other pulses, was found to be increased by 21.1 per cent with the annual average growth rate of 2.11, 17.6, 4.5 & 2.3 per cent during this particular period 2010 in Madhya Pradesh. Amongst different pulses viz. chickpea, blackgram, lentil, arhar and green gram the area was found to be increased by 23.1, 15.4, 9.4, 5.9 and 4.2 per cent per year during the period with the annual average growth of -2.31, -1.54, -0.94, -0.59 & -0.42 per cent per year respectively, during the period 2001 -10.

In the period 2010-17, area of all the food grains i.e. rice, wheat, coarse cereals, total pulses and food grains was found to increased with 23.4, 15.2, 4.6, 13.2 & 14.2 per cent with annual average growth rate of 4.67, 3.05, 0.91, 2.64 & 2.83 per cent per year, respectively in Madhya Pradesh. Amongst different pulses cultivated by farmers of Madhya Pradesh, the area of chickpea, black gram, , arhar, green gram and other pulses was found to be increased with annual average growth rate of 1.39, 10.22, 23.91, 0.22 & 7.50 per cent per year, while the area of lentil was found to be

Table 2.1 : Growth of area of different food grains vs pulses in Madhya Pradesh (000 ha.)

Particulars	The Base year	The current year	Absulate change	Relative Change %	Annual average growth rate
Period from 2001 -2010					
Rice	1712	1645	-67	-3.9	-0.39
Wheat	3454	4182	728	21.1	2.11
Coarse Cereals	2715	1893	-822	-30.3	-3.03
Chickpea	2334	2874	540	23.1	2.31
Lentil	485	531	46	9.4	0.94
Black gram	464	535	71	15.4	1.54
Green gram	87	91	4	4.2	0.42
Arhar	307	325	18	5.9	0.59
Other pulses	273	279	6	2.3	0.23
Total Pulses	3950	4645	695	17.6	1.76
Food Grains	11830	12364	534	4.5	0.45
Period from 2010 -2017					
Rice	1693	2088	396	23.4	4.67
Wheat	5169	5957	788	15.2	3.05
Coarse Cereals	1724	1802	79	4.6	0.91
Chickpea	2745	2935	190	6.9	1.39
Lentil	599	533	-66	-11.0	-2.20
Black gram	593	897	303	51.1	10.22
Green gram	79	174	95	119.6	23.91
Arhar	544	550	6	1.1	0.22
Other pulses	307	422	115	37.5	7.50
Total Pulses	4867	5511	643	13.2	2.64
Food Grains	13452	15358	1905	14.2	2.83

decreased by the annual average growth rate of -2.20 per cent, respectively (Table 2.1).

The production of rice, wheat, total pulses and total food grain was also found to be increased by 11.30, 31.22, 25.34 & 21.31 per cent with the annual average growth rate of 1.13, 3.12, 2.53 & 2.13 per cent per year, respectively, in Madhya Pradesh during the period 2001-10 while the production of total coarse cereals was found to be decreased by -15.93 per cent with the annual average growth rate of -1.59 per cent per year, in Madhya Pradesh. The production of all the pulses viz. chickpea, black gram, lentil, green gram, other pulses and arhar was found to be increased with the annual average growth rate of 2.86, 2.86, 1.83, 1.65, 0.91 and 0.05, per cent per year respectively during 2001-2010 in Madhya Pradesh (Table 2.2).

Table 2.2 : Growth of production of different food grain in Madhya Pradesh (000 tones)

Particulars	The Base year	The current year	Absulate change	Relative Change %	Annual average growth rate
Period from 2001 -2010					
Rice	1251	1411	159	11.30	1.13
Wheat	5257	7644	2386	31.22	3.12
Coarse Cereals	2360	2035	-324	-15.93	-1.59
Chickpea	1914	2682	768	28.64	2.86
Lentil	209	256	47	18.34	1.83
Black gram	140	196	56	28.62	2.86
Green gram	25	30	5	16.48	1.65
Arhar	216	217	1	0.46	0.05
Other pulses	123	135	12	9.11	0.91
Total Pulses	2627	3519	892	25.34	2.53
Food Grains	11495	14608	3113	21.31	2.13
Period from 2010 -2017					
Rice	2397	5379	2982	55.45	11.09
Wheat	13427	18445	5018	27.20	5.44
Coarse Cereals	2798	4025	1228	30.50	6.10
Chickpea	2809	3164	355	11.20	2.24
Lentil	238	496	258	51.98	10.40
Black gram	211	472	261	55.24	11.05
Green gram	26	61	36	57.89	11.58
Arhar	287	576	289	50.21	10.04
Other pulses	140	383	242	63.36	12.67
Total Pulses	3711	5151	1440	27.95	5.59
Food Grains	22332	32999	10667	32.32	6.46

The production of all the food grains was also found to be increased during 2010-17 in Madhya Pradesh. The production of rice, coarse cereal, wheat, pulses, and total food grain was found to be increased by 55.45, 27.20, 30.50, 27.95 & 32.32 per cent with annual average growth rate of 11.09, 5.44, 6.10, 5.59 and 6.46 per cent per year, respectively in this particular period in the State. The production of all the pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses were also found to be increased by 11.20, 51.98, 55.24, 57.89, 50.21 & 63.36 per cent, respectively with the annual average growth rate of 2.24, 10.40, 11.05, 11.58, 10.04 & 12.67 per cent, respectively during the period from 2010-17 in Madhya Pradesh (Table 2.2).

The yield of all the food grains viz. rice, wheat, coarse cereal, pulses and total

Table 2.3 : Growth in yield of different food grain in Madhya Pradesh (kg/ha.)

Particulars	The Base year	The current year	Absulate change	Relative Change %	Annual average growth rate
Period from 2001-2010					
Rice	731	858	127	14.75	1.48
Wheat	1522	1828	306	16.72	1.67
Coarse Cereals	869	1075	206	19.17	1.92
Chickpea	818	933	115	12.28	1.23
Lentil	430	482	52	10.81	1.08
Black gram	301	366	64	17.60	1.76
Green gram	290	335	44	13.22	1.32
Arhar	705	668	-37	-5.50	-0.55
Other pulses	451	484	33	6.88	0.69
Total Pulses	664	758	94	12.39	1.24
Food Grains	947	1130	183	16.20	1.62
Period from 2010-2017					
Rice	1416	2576	1160	45.03	9.01
Wheat	2598	3096	499	16.11	3.22
Coarse Cereals	1623	2234	611	27.33	5.47
Chickpea	1024	1078	54	5.05	1.01
Lentil	398	930	533	57.26	11.45
Black gram	356	526	170	32.37	6.47
Green gram	327	354	27	7.54	1.51
Arhar	526	1046	520	49.67	9.93
Other pulses	457	906	450	49.62	9.92
Total Pulses	762	935	172	18.43	3.69
Food Grains	1660	2149	489	22.74	4.55

The Base year = The average of first 3 Years, The current year = The average of last 3 years

food grain was found to be increased during 2001-10 with annual average growth rate of 1.48, 1.67, 1.92, 1.24 & 1.62 per cent per year, respectively in Madhya Pradesh. The yield of different pulses in Madhya Pradesh was also found to be increased with the annual average growth of 1.23 (chickpea), 1.08 (lentil), 1.76 (black gram), 1.32 (green gram) & 0.69 (other pulses) per cent excepted -0.55 (arhar) per cent per year during period 2001-10.

In period 2010 -17 the yield of food grains was found to be increased with annual average growth of 9.01 (rice), 3.22 (wheat), 5.47 (coarse cereal), 3.69 (pulses) and 4.55 (food grain) per cent. The yield of different pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also increased with annual average growth of 1.01, 11.45, 6.47, 1.51, 9.93 and 9.92 per cent per year, respectively during this period (Table 2.3).

2.2 Area, Production and Yield of Pulses in different States of India

The area of total pulses was found to be increased by 87.07 per cent from 22782 to 25976 thousand ha in the country during 2016-17 as compared 2006-07. Amongst

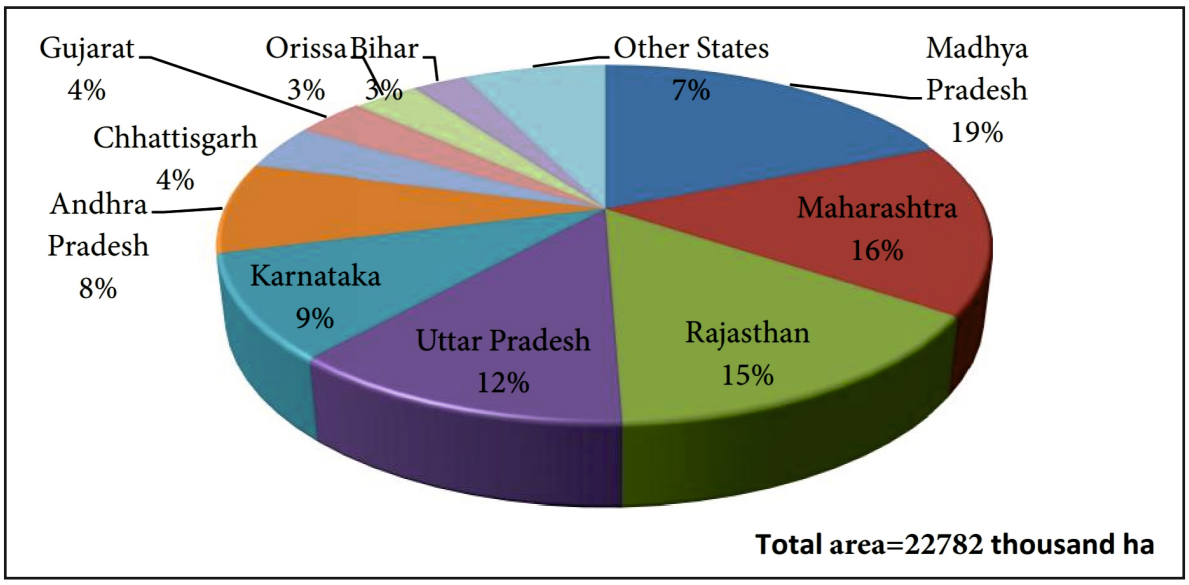

Fig. 2.1: Area of pulses in different States of India (2006-07)

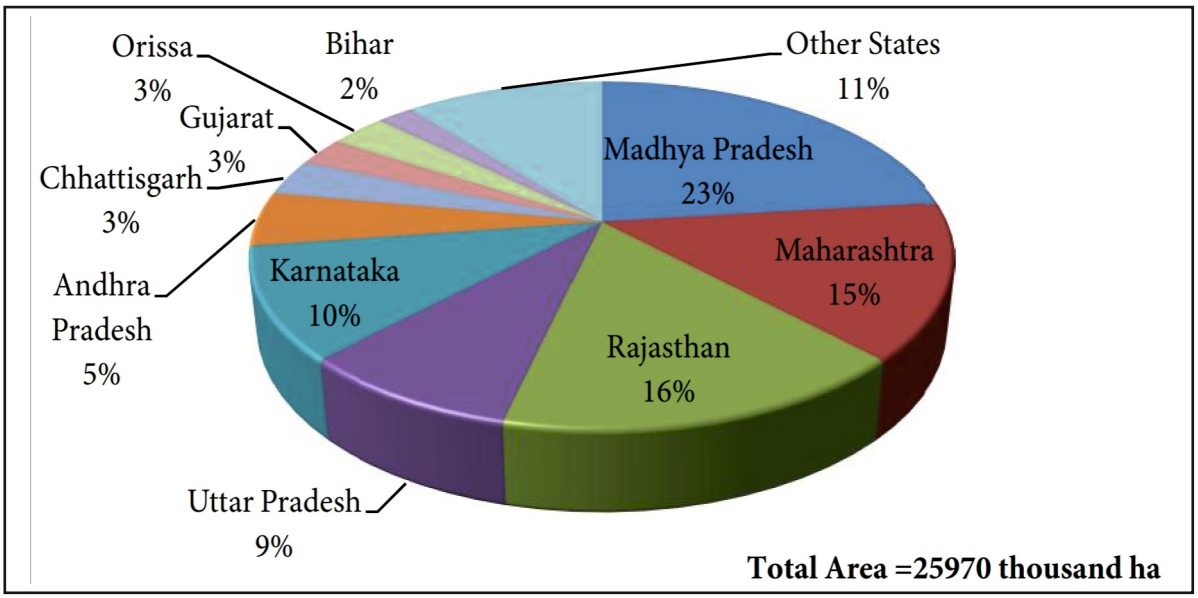

Fig. 2.2: Area of pulses in different States of India (2016-17)

different states the area of pulses was found to be increased maximum in Madhya Pradesh (19-23%) followed by Rajasthan (15-16%), Karnataka (9-10%) and other states (7-11%) to total area of the country in the year 2016-17 as compared to 2006-07 (Fig. 2.1 & 2.2).

Amongst the different states of the country the area of pulses was found to be decreased from 16 to 15, 12 to 9, 8 to 5, 4 to 3 and 3 to 2 percent to total area of the country in 2016-17 as compared to 2006-07 in Maharashtra, Uttar Pradesh, Andhra Pradesh, Chhattisgarh and Bihar states of India.

The production of pulses was found to be increased by 39.05 per cent, 13570 to 18870 thousand tonnes in the country in the period 2016-17 as compared to 2006-07 .

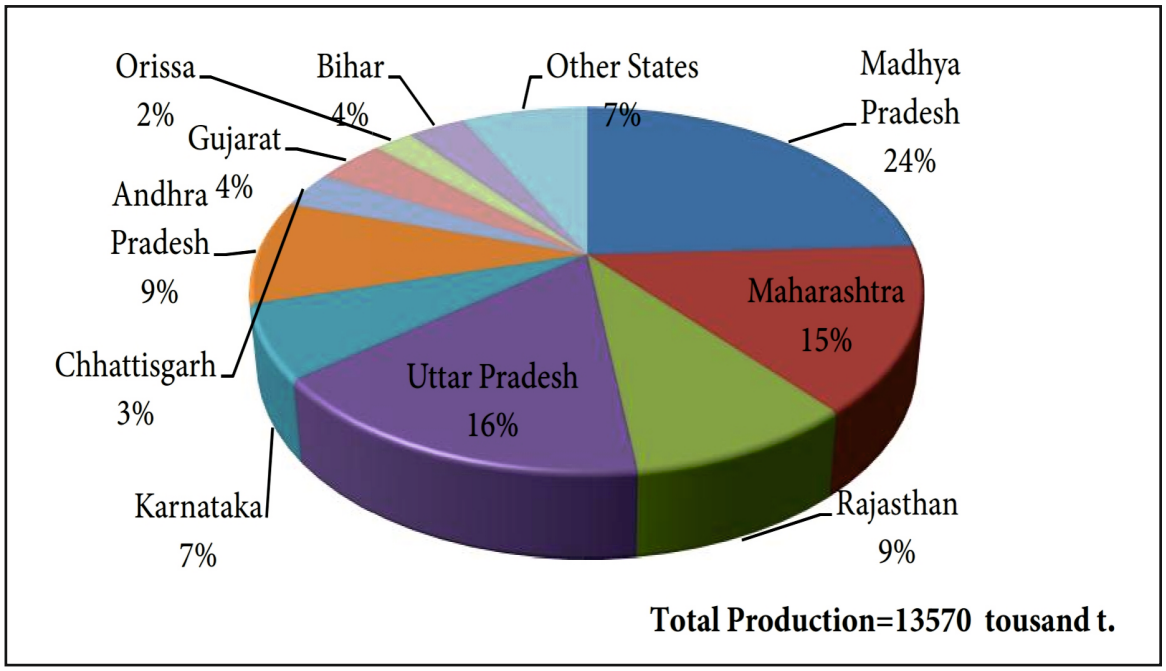

Fig. 2.3 : Production of pulses in different States of India 2006-07

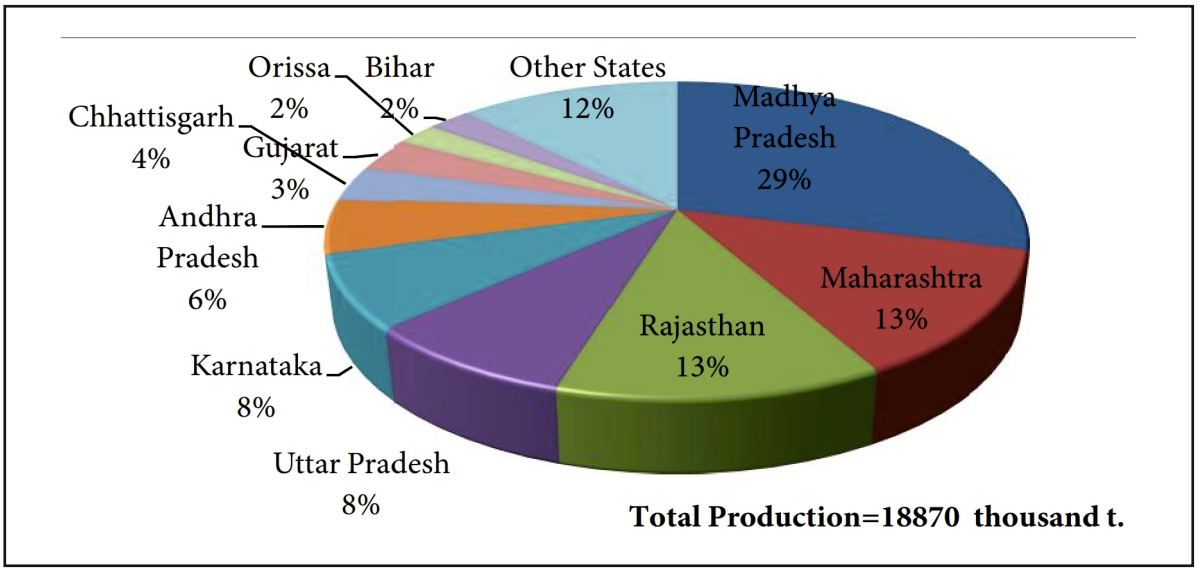

Fig. 2.4 : Production of pulses in different States of India 2016-17

The production of pulses was found to be increased from 24 to 29 , 9 to 13, 7 to 8, 3 to 4, 7 to 12 percent in Madhya Pradesh, Rajasthan, Karnataka, Chhattisgarh and Uttar Pradesh, while found to be decreased in Maharashtra (15-13%), Uttar Pradesh (16-8%), Andhra Pradesh (9-6%), Gujarat (4-3%) and Bihar (4-2%) to total production of pulses in India during the year 2016-17 as Compared to 2006-07. (Fig.2.3 & 2.4).

The yield of total pulses was found to be increased in all the pulses growing States of the country during 2016-17 as compared to 2006-07 from 764 to 910 kg/ha (Madhya Pradesh), 561 to 651 kg/ha (Maharashtra), 364 to 570 (Rajasthan), 410 to 527 (Karnataka), 672

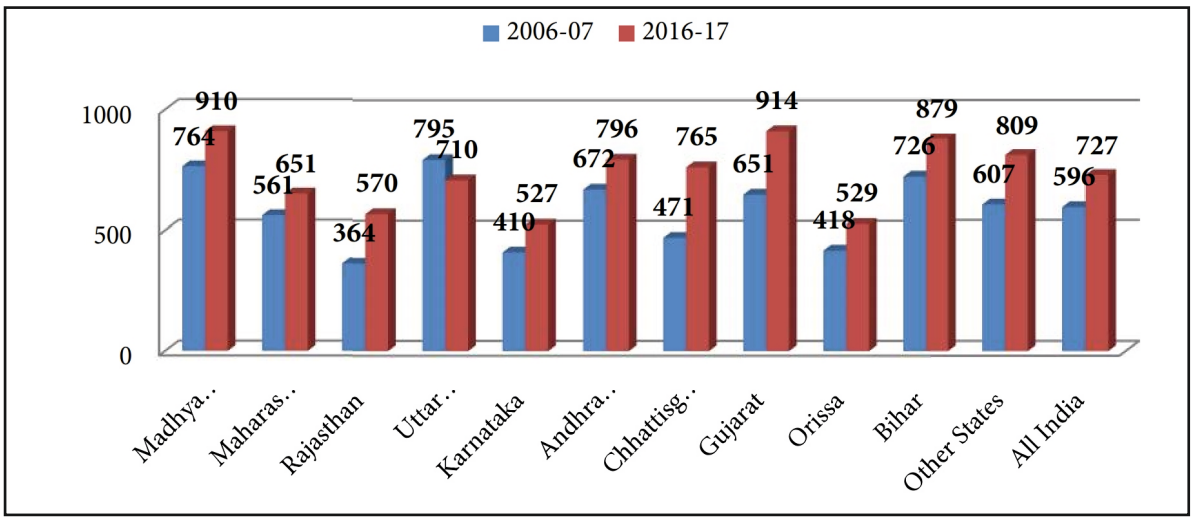

Fig. 2.5 : Yield of pulses in different States of India

to 796 (Andhra Pradesh), 775 to 710 (Uttar Pradesh), 471 to 765 (Chhattisgarh), 651 to 914 (Gujarat), 418 to 529 (Orissa), 726 to 879 (Bihar) and 607 to 809 (Other States) The yield of total pulses was found to be increased 596 to 727 kg/ha in India in the year 2016-17 as compared 2006-07 (Fig 2.5). The area, production and yield of total pulses were found to be increased with the magnitude of 142.16 thousand ha, 193.93 thousand ton & 16.34 kg/ha per year respectively in Madhya Pradesh (Fig. 2.5).

2.3 Share of Area of Total Pulses in Gross Cropped Area in Madhya Pradesh.

Madhya Pradesh had 23 per cent share of total pulses in gross cropped area (GCA). The cultivation of all the districts were found to produce pulses in their field. The share of total pulses to GCA was found to vary from to 9.6 (Khargone) to 42 (Panna) per cent in Madhya Pradesh (Table 2.4). The maximum share of total pulses to GCA was found in Panna (42%) followed by Datia (41.8%), Satna (40.9%), Damoh (40%), Narsingpur (37.4%), Ashoknagar (37%), Umariya (35.9%), Sidhi (35.1%), Jabalpur (34.5%), Alirajpur (33.8%), Dindori (33.6%), Vidisha (32.9%), Rewa (29.9%), Burhanpur (29.4%), Chhattarpur (29.1%), Raisen (28.9%), Bhopal (28.6%), Singroli (28.5%), Katni (28.2%), Tikamgarh (27.8%), Sagar (27.1%), Agar malwa (25.6%), Shahdol (25.2%), Mandala (24.3%), Rajgarh (21.6%), Shivpuri (20.9%), Dewas (20.6%), Seoni (19.6%), Anooppur (18.4%), Chhindwara (17.7%), Guna (17.7%), Indore (17.6%), Shajapur (17.3%), Dhar (17%), Sehore (16.6%), Ratlam (16.2%), Jhabua (15.9%), Hoshangabad (15.8%), Betul (15.2%), Neemuch (15.1%), Sheopur (14.3%), Balaghat (14.2%), Ujjain (14.1%), Mandsaur (14.1%), Gwalior (14%), Badwani (13%), Harda (12.9%), Bhind (12.3%), Morena (10.7%), Khandwa (10.6%) and Khargone (9.6%) districts of Madhya Pradesh (Table 2.4).

Table 2.4 : Share of total pulses in gross cropped area across district of Madhya Pradesh

Districts	Total pulses area (000 ha)	Gross Sown area (000 ha)	% Share of pulses to GSA
Panna	163	388.5	42.0
Datia	115	276	41.8
Satna	213	522	40.9
Damoh	212	530	40.0
Narsingpur	180	482	37.4
Ashoknagar	183	494	37.0
Umariya	50	140.5	35.9
Sidhi	81	231.5	35.1
Jabalpur	148	429.5	34.5
Alirajpur	72	211.5	33.8
Dindori	97	288.5	33.6
Vidisha	308	933.5	32.9
Rewa	154	516	29.9
Burhanpur	37	126.5	29.4
Chhattarpur	174	597.5	29.1
Raisen	201	695	28.9
Bhopal	68	236	28.6
Singroli	64	225	28.5
Katni	85	300	28.2
Tikamgarh	114	412	27.8
Sagar	245	905	27.1
Agar malwa	73	287	25.6
Shahdol	52	206.5	25.2
Mandala	78	321	24.3
Rajgarh	172	795	21.6
Shivpuri	144	689	20.9
Dewas	152	736.5	20.6
Seoni	112	570.5	19.6
Anooppur	36	193.5	18.4
Chhindwara	128	726	17.7
Guna	97	544.5	17.7
Indore	82	467.5	17.6
Shajapur	86	496.5	17.3
Dhar	138	814.5	17.0
Sehore	126	758	16.6
Ratlam	88	544.5	16.2
Jhabua	39	244.5	15.9
Hoshangabad	99	630	15.8
Betul	92	604.5	15.2
Neemuch	47	309.5	15.1
Sheopur	38	265	14.3
Balaghat	49	344.5	14.2
Ujjain	126	894	14.1
Mandsaur	86	609	14.1
Gwalior	39	281	14.0
Badwani	38	296	13.0
Harda	47	361.5	12.9
Bhind	49	401.5	12.3
Morena	43	397.5	10.7
Khandwa	48	454	10.6
Khargown	56	580	9.6
State	**5511**	**24096.00**	**22.9**

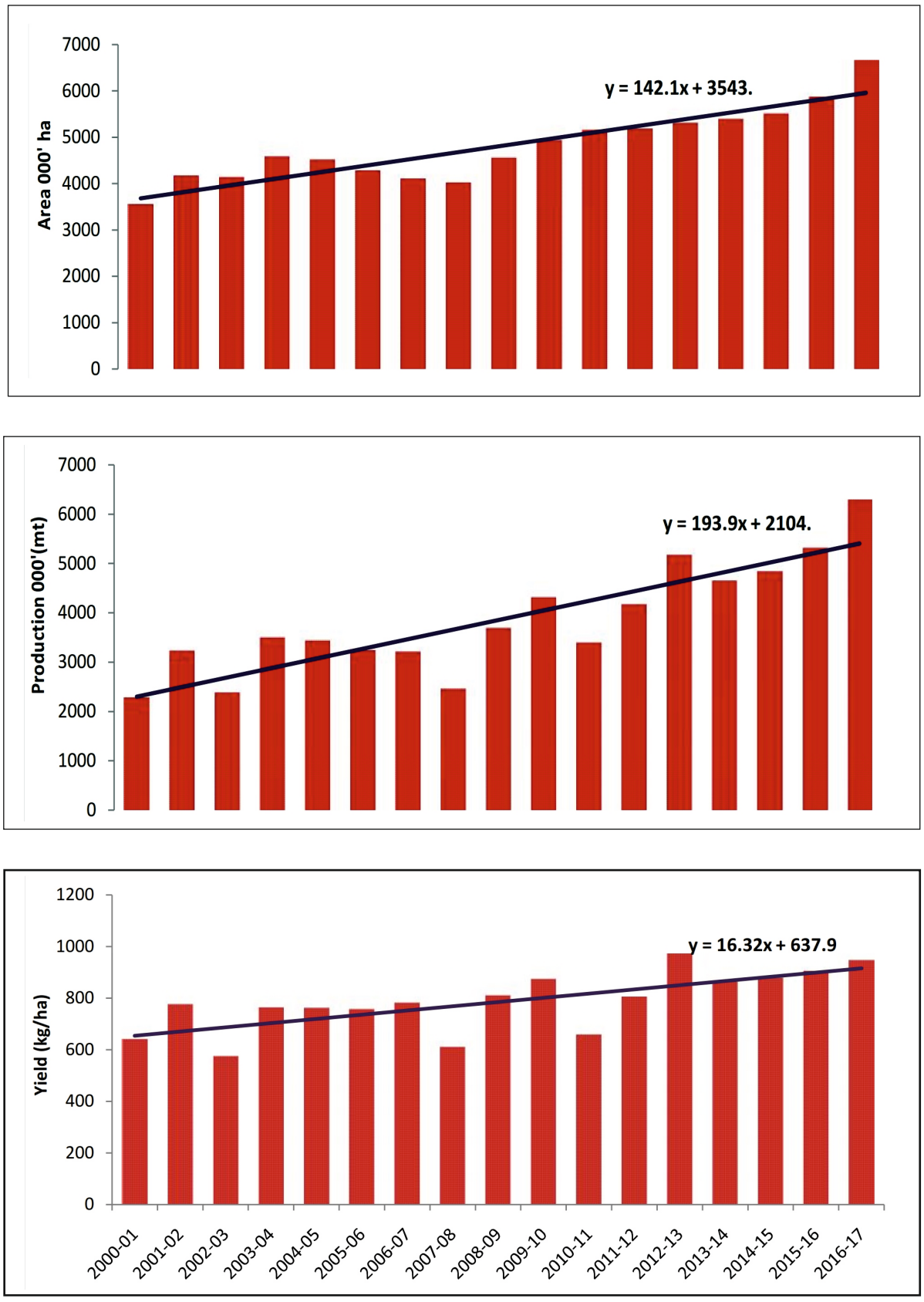

Fig. 2.6: Trend of area, production and yield of total pulses in Madhya Pradesh

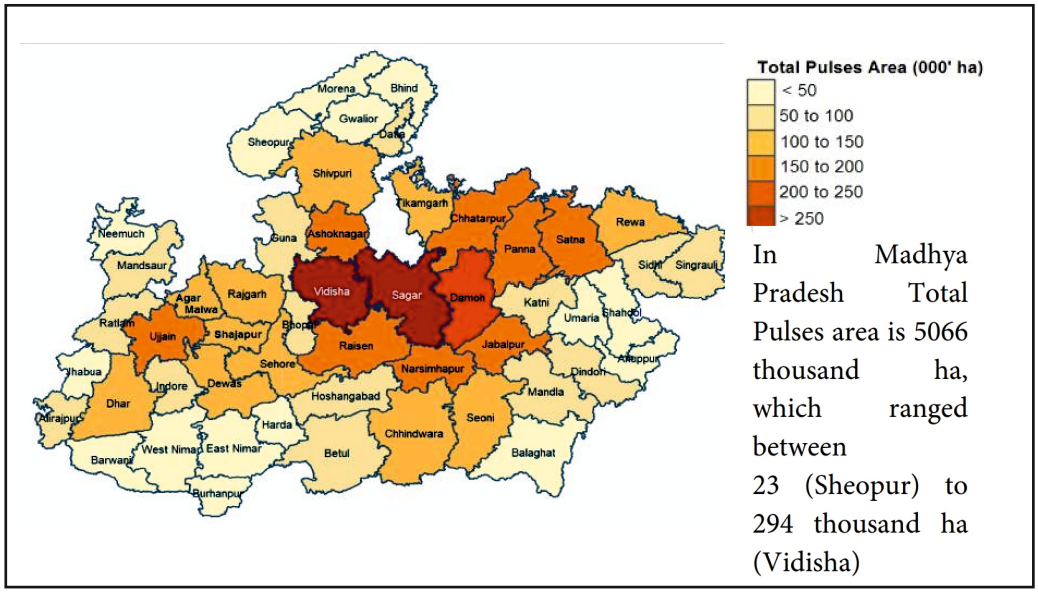

Fig. 2.7: Intensity of area of total pulses across districts of Madhya Pradesh

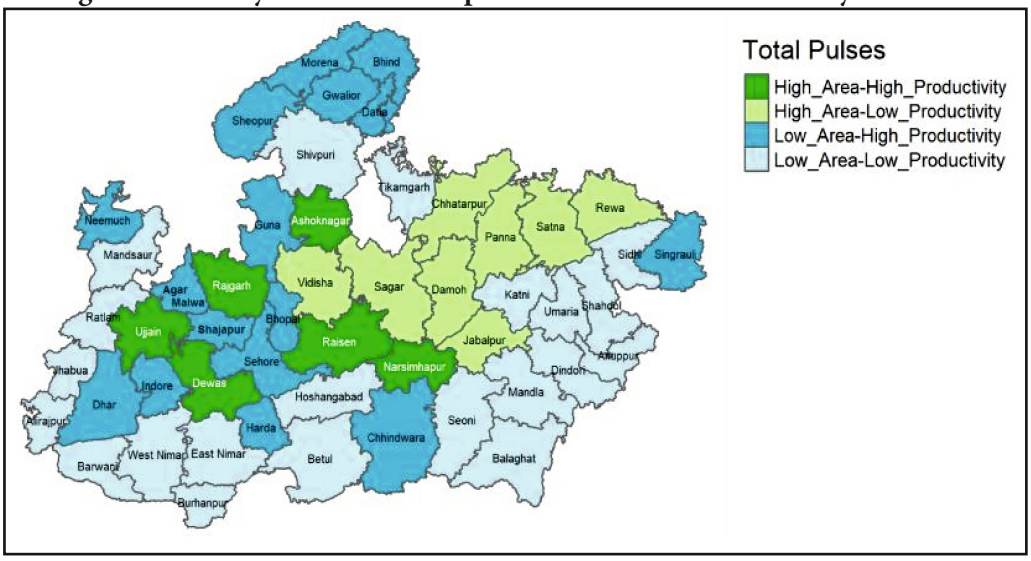

Fig. 2.8 : Classification of districts according to area-productivity of total pulses in Madhya Pradesh

Table 2.5: Characterization of classified districts according to area-productivity of total pulses in Madhya Pradesh

Area-Productivity Segments	Number of Districts	Area (000' ha)	Cumulative Area (000'ha)	Production (000' mt)	Cumulative Production (000'mt)	Productivity (Kg/ha)	Productivity Ranges (Kg/ha)
High Area-High Productivity	6	1125 (20.41)	1034	1239 (24.05)	1074	1101	945-1237
High Area-Low Productivity	8	1780 (32.29)	2670	1450 (28.15)	2331	815	584-898
Low Area-High Productivity	16	1138 (20.65)	3716	1318 (25.59)	3474	1158	928-1395
Low Area-Low Productivity	22	1469 (26.65)	5066	1144 (22.21)	4466	779	344-923
Total	**52**	**5511**		**5151**		**935**	-
Bulk line cutoffs	27	142		3613		928	-

The figures within parenthesis represents percentage to respective column total. The districts having area/productivity above bulk line falls under high category.

These data have been also clarified in high area-high productivity, high area-low productivity, low area-high productivity and low area-low productivity (Fig2.8 & Table 2.5)

2.4 Percentage share of area, production and yield of major pulses

The area, production and yield of major pulses in Madhya Pradesh were observed for the year 2006-07 and 2016-17 to analyze the percentage change in area, production and yield of different pulses during the period.

The area of total pulses was found to be increased by 26.17 per cent from 4368 (2006-07) to 5511(2016-17) thousand ha in Madhya Pradesh. The percentage share of area of black gram and green gram to total area of pulses was found to be increased from 11 to 16, 2 to 3 and 7 to 10 per cent respectively, while percentage share of chickpea and lentil was found to be decreased

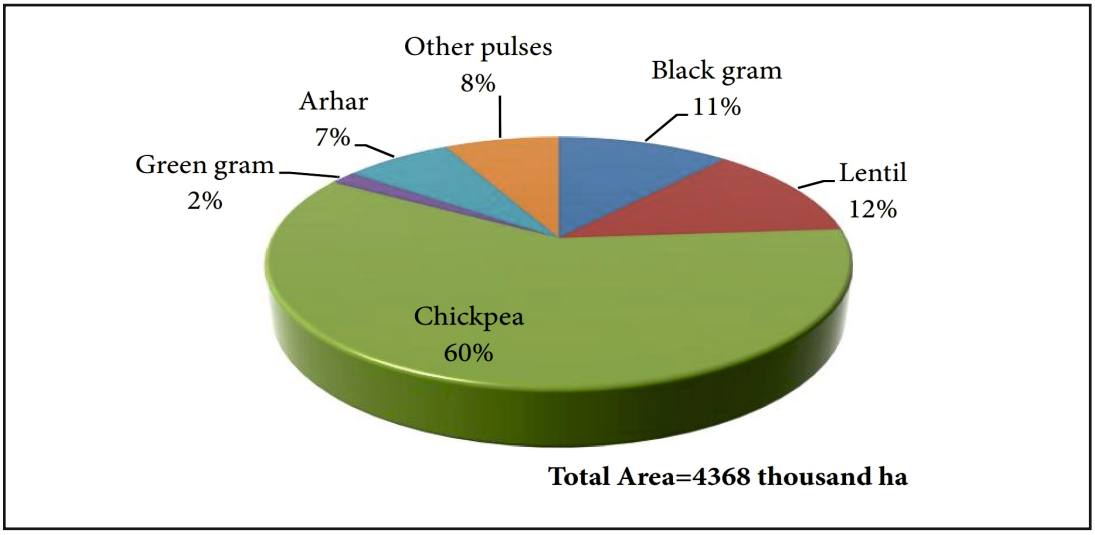

Fig. 2.9: Area of pulses in Madhya Pradesh (2006-07)

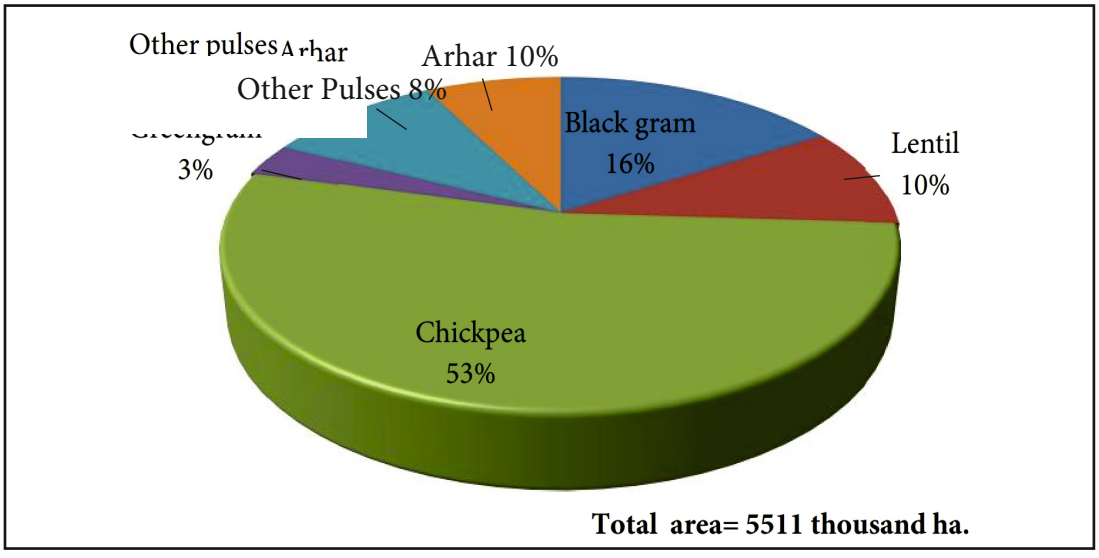

Fig. 2.10: Area of pulses in Madhya Pradesh (2016-17)

from 60 to 53 & 12 to 10 per cent respectively (Fig 2.10 & 2.9). The area of arhar was found to be stagnate, to 8 per cent to total area of pulses in both the period.

The production of total pulses was also found to be increased by 659.77 per cent from 4437 (2006-07) to 5151 (2016-17) in Madhya Pradesh. The contribution of all the pulses viz. lentil, black gram, arhar and other pulses to total pulses was found to be increased from 8 to 10, 5 to 9, 7 to 11 and 5 to 7 per cent respectively, except chickpea, which was decreased by 74 to 62 per cent in Madhya Pradesh (Fig. 2.11 & 2.12). The production of green gram was found to be stagnate to 1 per cent to total area of pulses in both the period. The productivity of all the pulses was found to be increased in 2016-17 as compared to 2006-07 (Fig. 2.13). The productivity of all the pulses grown by the farmers viz. chickpea, lentil, black gram, green gram, arhar, other pulses and total pulses was found to be increased from 842 to 1077, 422 to 930, 319 to 525, 297 to 364, 613 to 1043, 510 to 906 and 763 to 935 kg/ha respectively, in 2016-17 as compared to 2006-07 respectively in Madhya Pradesh.

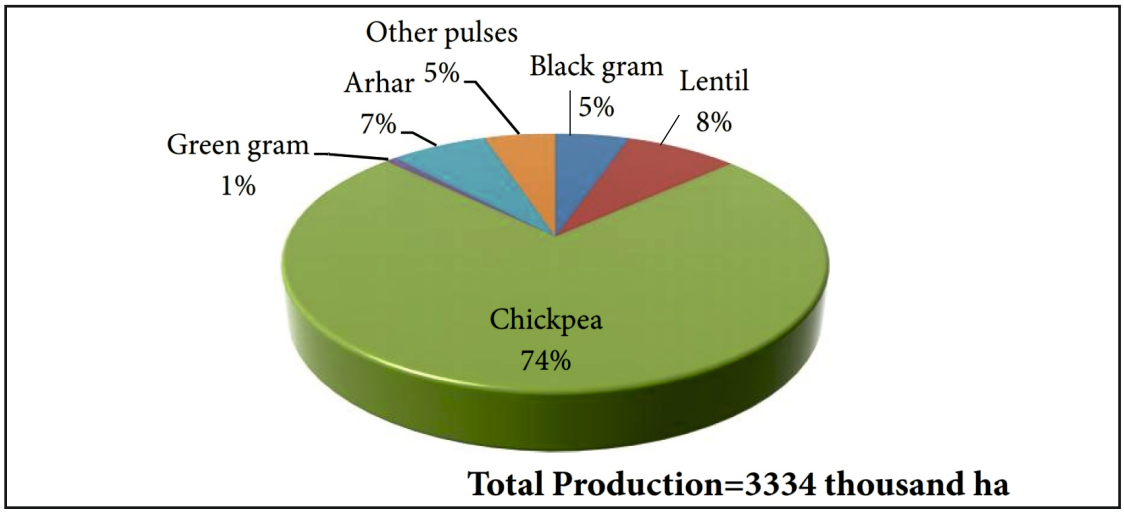

Fig. 2.11: Production of pulses in Madhya Pradesh (2006-07)

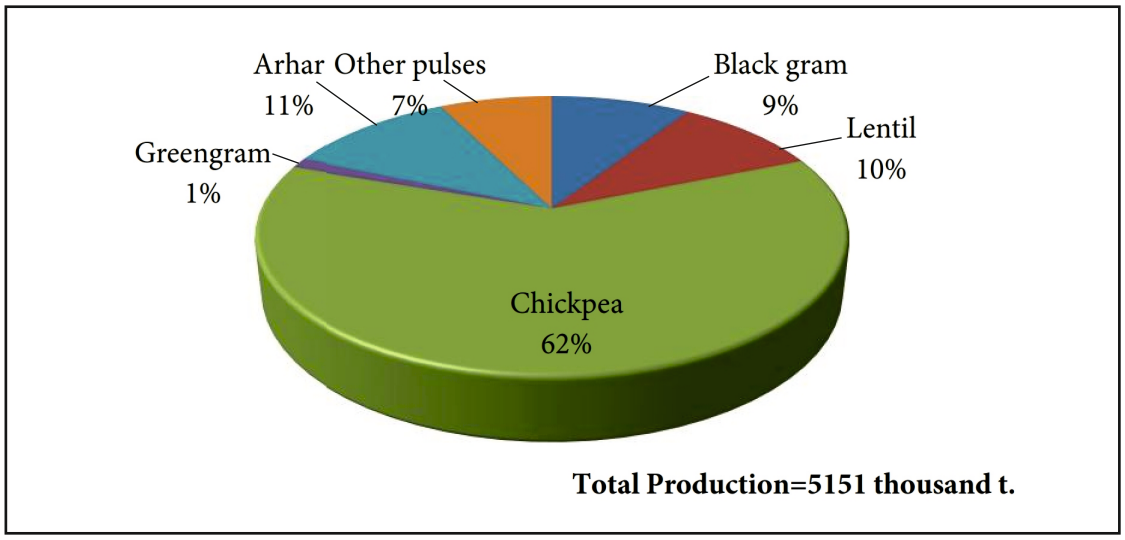

Fig. 2.12: Production of pulses in Madhya Pradesh (2016-17)

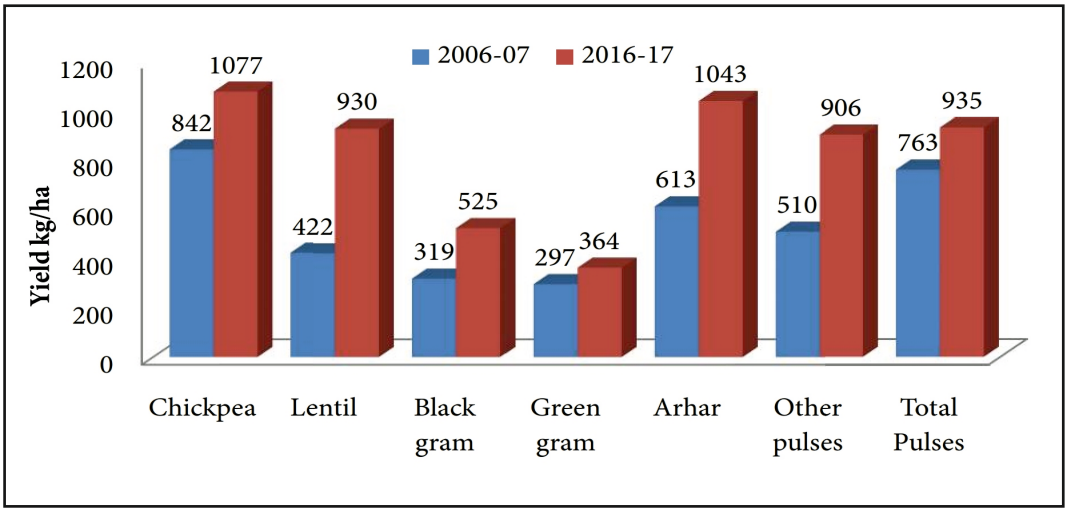

Fig. 2.13: Yield of pulses in Madhya Pradesh–kg/ha (2006-07 & 2016-17)

2.5 Percentage Contribution of Area of major Pulses to Total Pulses across Districts in Madhya Pradesh

The percentage contribution of area of various pulses viz. chickpea, lentil, blackgram, green gram and arhar to total pulses was analysed for the year 2006-07 and 2016-17 and presented in table 2.6 and 2.7 respectively.

2.5.1 Share to Total Pulses Area in the Year 2006-07

The concentration of Chickpea to total pulses was found in all districts of Madhya Pradesh, which varies from 89.4 (Guna) to 11.9 (Mandla) per cent across districts of Madhya Pradesh in 2006-07 (Table 2.6). Amongst all the districts, the percentage share of chickpea to total pulses were found to be maximum in Guna (89.4%) followed by Dewas (89%), Indore (87%), Ujjain (86.8%), Shajapur (85.3%), Sehore (83.6%), Damoh (80.3%), Rajgarh (79.6%), Hoshangabad (77.7%), Bhopal (75.3%), Harda (73.8%), Panna (71.8%), Ratlam (71.3%), Ashoknagar (69.4%), Sagar (66.7%), Shivpuri (66.1%), Vidisha (64.3%), Neemuch (63.7%), Narsinghpur (61.7%), Gwalior (61.6%), Dhar (61.2%), Raisen (60.1%), Satna (58.5%), Bhind (58.4%), Mandsaur (56.3%), Rewa (54.3%), Chhatarpur (52.2%), Seoni (51.5%), Morena (46.8%), Datia (46.2%), Khandwa (45.9%), Chhindwara (43%), Sidhi (41.2%), Jabalpur (39.8%), Katni (39.6%), Betul (38.5%), Balaghat (25.8%), Tikamgarh (24.7%), Burhanpur (24.3%), Jhabua (22.8%), Umaria (19.6%), Khargone (17.5%), Anuppur (17.3%), Shahdol (16.8%), Dindori (15.6%), Barwani (13.2%) and Mandla (11.9%) districts of Madhya Pradesh.

The concentration of area of lentil was also found in all the districts of Madhya Pradesh except in Barwani, Burhanpur, Jhabua and Khargone districts. The percentage share of lentil to total pulses across district in 2006-07 was found to more in Dindori (52.1%) followed by Anuppur (40.7%), Katni (35%), Mandla (32.6%),

Vidisha (24%), Jabalpur (23.9%), Sagar (22.7%), Rewa (20.9%), Satna (20.7%), Raisen (20%), Umaria (19.3%), Panna (18.4%), Bhind (18%), Seoni (12.9%), Narsinghpur (12.8%), Ashoknagar (11.5%), Datia (11.3%), Damoh (7.9%), Bhopal (7.5%), Sidhi (7.2%), Shivpuri (7%), Morena (6.7%), Chhatarpur (6.3%), Rajgarh (6%), Sehore (5.8%), Gwalior (5%), Shajapur (4.9%), Betul (4.7%), Hoshangabad (3.6%), Shahdol (3.6%), Tikamgarh (3.4%), Chhindwara (2.4%), Khandwa (2.2%), Guna (1.9%), Mandsaur (1.7%), Dhar (1.6%), Harda (0.9%), Ratlam (0.9%), Indore (0.6%), Neemuch (0.6%), Balaghat (0.4%), Ujjain (0.3%) and Dewas (0.2%) districts of Madhya Pradesh.

The concentration of black gram to total pulses was found in all the districts of Madhya Pradesh except in Harda district, which varies from 68.9 (Jhabua) to 0.1 (Dewas) per cent across districts of Madhya Pradesh in 2006-07. Amongst all the districts, the percentage share of Jhabua (68.9%), Tikamgarh (53.4%), Barwani (36.5%), Mandsaur (36.1%), Shahdol (28.7%), Gwalior (23.7%), Neemuch (21.6%), Chhatarpur (20.3%), Burhanpur (19.7%), Shivpuri (19.3%), Chhindwara (18.4%), Khargone (17.3%), Ashoknagar (16%), Dhar (14.5%), Anuppur (14.2%), Betul (13.8%), Jabalpur (13.7%), Ratlam (13.2%), Datia (11.7%), Satna (10.5%), Sidhi (10.5%), Umaria (10.5%), Khandwa (8.5%), Rewa (8.5%), Dindori (7%), Vidisha (7%), Damoh (6.9%), Seoni (6.6%), Narsinghpur (6.1%), Sagar (6%), Ujjain (6%), Katni (5.5%), Mandla (5.5%), Morena (5.5%), Balaghat (5.3%), Panna (3.9%), Shajapur (3.6%), Rajgarh (3%), Bhind (2.5%), Guna (2.5%), Indore (1%), Bhopal (0.6%), Raisen (0.6%), Hoshangabad (0.3%), Sehore (0.3%) and Dewas (0.1%) districts of Madhya Pradesh in the year 2006-07 (Table 2.6).

The concentration of area of green gram was also found in all the districts of Madhya Pradesh except in Annuppur, Dindori, Harda, Sehore, Mandla and Umarira. The percentage share of green gram to total pulses across district in 2006-07 was found to more in Barwani (28.1%) followed by Khargone (26.3%), Dhar (11.5%), Khandwa (9.5%), Morena (7%), Shivpuri (5.6%), Burhanpur (5.5%), Tikamgarh (4.8%), Bhind (4%), Rajgarh (3.8%), Chhatarpur (3%), Chhindwara (2.6%), Guna (2.4%), Rewa (2.3%), Betul (2.1%), Datia (2.1%), Jhabua (2%), Satna (1.7%), Mandsaur (1.2%), Sidhi (1.2%), Gwalior (0.9%), Panna (0.8%), Narsinghpur (0.7%), Balaghat (0.6%), Bhopal (0.6%), Seoni (0.6%), Jabalpur (0.5%), Raisen (0.5%), Ratlam (0.5%), Sagar (0.4%), Shajapur (0.4%), Ujjain (0.4%), Damoh (0.3%), Indore (0.3%), Katni (0.3%), Neemuch (0.3%), Shahdol (0.3%), Vidisha (0.3%), Ashoknagar (0.2%), Hoshangabad (0.2%) and Dewas (0.1%) districts of Madhya Pradesh.

The concentration of area of Arhar was also found in all the districts of Madhya Pradesh. which varies from 38.3 (Khargone) to 0.1 (Ashoknagar) per cent across districts of Madhya Pradesh in 2006-07. Amongst all the districts, the percentage share of Khargone (38.3%) followed by Shahdol (37.4%),

Table 2. 6 : Percentage to total pulses area in across districts of Madhya Pradesh (TE 2006-07)

DISTRICT	Chick pea	Lentil	Black gram	Green gram	Arhar
Anuppur	17.3	40.7	14.2	0.0	18.3
Ashoknagar	69.4	11.5	16.0	0.2	0.1
Balaghat	25.8	0.4	5.3	0.6	10.9
Barwani	13.2	0.0	36.5	28.1	18.9
Betul	38.5	4.7	13.8	2.1	34.3
Bhind	58.4	18.0	2.5	4.0	9.9
Bhopal	75.3	7.5	0.6	0.6	2.2
Burhanpur	24.3	0.0	19.7	5.5	35.7
Chhatarpur	52.2	6.3	20.3	3.0	4.4
Chhindwara	43.0	2.4	18.4	2.6	26.9
Damoh	80.3	7.9	6.9	0.3	1.4
Datia	46.2	11.3	11.7	2.1	2.2
Dewas	89.0	0.2	0.1	0.1	8.3
Dhar	61.2	1.6	14.5	11.5	6.1
Dindori	15.6	52.1	7.0	0.0	7.6
Guna	89.4	1.9	2.5	2.4	0.8
Gwalior	61.6	5.0	23.7	0.9	0.6
Harda	73.8	0.9	0.0	0.0	11.8
Hoshangabad	77.7	3.6	0.3	0.2	14.8
Indore	87.0	0.6	1.0	0.3	1.2
Jabalpur	39.8	23.9	13.7	0.5	4.8
Jhabua	22.8	0.0	68.9	2.0	5.1
Katni	39.6	35.0	5.5	0.3	8.8
Khandwa	45.9	2.2	8.5	9.5	31.5
Khargone	17.5	0.0	17.3	26.3	38.3
Mandla	11.9	32.6	5.5	0.0	8.4
Mandsaur	56.3	1.7	36.1	1.2	1.5
Morena	46.8	6.7	5.5	7.0	21.2
Narsinghpur	61.7	12.8	6.1	0.7	11.3
Neemuch	63.7	0.6	21.6	0.3	1.2
Panna	71.8	18.4	3.9	0.8	3.4
Raisen	60.1	20.0	0.6	0.5	9.6
Rajgarh	79.6	6.0	3.0	3.8	4.5
Ratlam	71.3	0.9	13.2	0.5	1.3
Rewa	54.3	20.9	8.5	2.3	11.6
Sagar	66.7	22.7	6.0	0.4	1.1
Satna	58.5	20.7	10.5	1.7	7.7
Sehore	83.6	5.8	0.3	0.1	6.9
Seoni	51.5	12.9	6.6	0.6	7.7
Shahdol	16.8	3.6	28.7	0.3	37.4
Shajapur	85.3	4.9	3.6	0.4	2.6
Sheopur kalan	0.0	0.0	0.0	0.0	0.0
Shivpuri	66.1	7.0	19.3	5.6	0.5
Sidhi	41.2	7.2	10.5	1.2	34.9
Tikamgarh	24.7	3.4	53.4	4.8	0.3
Ujjain	86.8	0.3	6.0	0.4	1.1
Umaria	19.6	19.3	10.5	0.0	17.7
Vidisha	64.3	24.0	7.0	0.3	0.3
State Total	**59.6**	**12.3**	**11.5**	**1.8**	**7.2**

Burhanpur (35.7%), Sidhi (34.9%), Betul (34.3%), Khandwa (31.5%), Chhindwara (26.9%), Morena (21.2%), Barwani (18.9%), Anuppur (18.3%), Umaria (17.7%), Hoshangabad (14.8%), Harda (11.8%), Rewa (11.6%), Narsinghpur (11.3%), Balaghat (10.9%), Bhind (9.9%), Raisen (9.6%), Katni (8.8%), Mandla (8.4%), Dewas (8.3%), Satna (7.7%), Seoni (7.7%), Dindori (7.6%), Sehore (6.9%), Dhar (6.1%), Jhabua (5.1%), Jabalpur (4.8%), Rajgarh (4.5%), Chhatarpur (4.4%), Panna (3.4%), Shajapur (2.6%), Bhopal (2.2%), Datia (2.2%), Mandsaur (1.5%), Damoh (1.4%), Ratlam (1.3%), Indore (1.2%), Neemuch (1.2%), Sagar (1.1%), Ujjain (1.1%), Guna (0.8%), Gwalior (0.6%), Shivpuri (0.5%), Tikamgarh (0.3%), Vidisha (0.3%) and Ashoknagar (0.1%) districts of Madhya Pradesh.

2.5.2 Share to Total Pulses Area in the Year 2016-17

The concentration of chickpea to total pulses was found in all the districts of Madhya Pradesh and it varies from 13.7 (Alirajpur) to 94.92 (Indore) per cent to total pulses. The percentage share of chickpea in total pulses was found to be more in Indore (94.92%) followed by Dewas (91.35%), Ujjain (91.34%), Dhar (81.83%), Ratlam (80.93%), Shajapur (80.07%), Sehore (79.43%), Neemuch (77.95%), Sheopurkala (75.1%), Bhopal (71.1%), Guna (71.1%), Aagar (70.21%), Harda (67.79%), Rajgarh (67.6%), Mandsaur (67.34%), Jhabua (62.39%), Gwalior (61.63%), Betul (60.05%), Hoshangabad (59.37%), Raisen (58.47%), Bhind (56.89%), Shivpuri (56.7%), Burhanpur (56.35%), Damoh (55.85%), Vidisha (54.33%), Katni (53.87%), Balaghat (52.34%), Sagar (51.93%), Chhindwara (51.05%), Ashoknagar (49.84%), Khandwa (48.53%), Khargone (48.14%), Morena (46.95%), Panna (42.69%), Satna (41.49%), Singroli (40.51%), Barwani (40.34%), Seoni (40.22%), Rewa (37.45%), Narsinghpur (37.01%), Jabalpur (36.88%), Sidhi (36.5%), Datia (31.88%), Dindori (31.83%), Shahdol (30.5%), Anuppur (28.76%), Mandla (27.54%), Chattarpur (27.4%), Umaria (26.29%), Tikamgarh (19.46%) and Alirajpur (13.7%).

The concentration of lentil to total pulses was also found in all districts of Madhya Pradesh excepted Burhanpur district. The percentage share of lentil to total pulses across district in 2016-17 was found to more in Dindori (29.98%) followed by Umaria (27.74%), Mandla (26.58%), Rewa (24.77%), Anuppur (22.5%), Satna (22.27%), Narsinghpur (19.02%), Katni (18.9%), Rajgarh (17.55%), Sagar (16.77%), Panna (16.12%), Seoni (15.81%), Jabalpur (14.16%), Vidisha (12.42%), Damoh (10.35%), Sidhi (9.55%), Shajapur (9.51%), Singroli (9.34%), Raisen (9.22%), Bhind (8.93%), Shahdol (8.08%), Ashoknagar (6.48%), Bhopal (6.3%), Aagar (5.45%), Mandsaur (4.94%), Chattarpur (4.83%), Gwalior (4.83%), Chhindwara (4.72%), Morena (3.91%), Datia (3.82%), Shivpuri (3.69%), Neemuch (3.65%), Khandwa (3.38%), Tikamgarh (3.28%), Sehore (3.18%), Betul (2.61%), Hoshangabad (1.87%), Ratlam (1.7%), Guna (0.82%), Balaghat (0.53%), Harda (0.35%), Indore (0.31%), Dhar (0.28%), Jhabua (0.24%), Ujjain (0.24%), Dewas (0.23%), Sheopurkala (0.21%), Barwani (0.03%), Alirajpur (0.02%) and Khargone (0.01)

The concentration of black gram to total pulses was found in all the districts of Madhya Pradesh and it varies from 0.24 (Indore) to 74.74 (Alirajpur) per cent (Table 2.7). The percentage share of black gram in total pulses was found to be more in Alirajpur (74.74%) followed by Tikamgarh (68.88%), Chattarpur (49.96%), Ashoknagar (39.88%), Datia (31.67%), Shivpuri (30.31%), Vidisha (25.36%), Shahdol (24.44%), Barwani (22.86%), Jhabua (22.22%), Mandsaur (19.76%), Guna (19.52%), Damoh (16.93%), Anuppur (16.84%), Neemuch (16.63%), Sagar (16.19%), Aagar (15.34%), Jabalpur (15.17%), Khandwa (15.14%), Gwalior (14.61%), Sheopurkala (13.23%), Umaria (12.18%), Burhanpur (11.82%), Singroli (11.76%), Satna (11.72%), Dindori (10.56%), Harda (10.26%), Betul (10.05%), Sidhi (9.92%), Chhindwara (9.87%), Ratlam (9.62%), Seoni (9.59%), Rewa (9.28%), Panna (9.1%), Khargone (8.67%), Bhind (8.31%), Raisen (8.29%), Rajgarh (7.75%), Narsinghpur (7.62%), Katni (6.85%), Bhopal (6.74%), Morena (5.86%), Balaghat (5.62%), Dhar (4.42%), Hoshangabad (4.02%), Mandla (3.91%), Shajapur (3.91%), Sehore (2.35%), Ujjain (2.22%), Dewas (1.42%) and Indore (0.24%),

The concentration of green gram to total pulses was also found in all the districts of Madhya Pradesh and it varies from 0.06 (Mandla) to 20.76 (Hoshangabad) per cent to total pulses. The percentage share of green gram to total pulses was found to be more in Hoshangabad (20.76%) followed by Barwani (17.79%), Harda (17.43%), Khandwa (13.57%), Khargone (11.97%), Sidhi (10.16%), Sehore (6.53%), Bhind (5.47%), Dhar (5%), Morena (3.98%), Rewa (3.96%), Gwalior (3.94%), Raisen (3.81%), Shivpuri (3.77%), Bhopal (3.7%), Tikamgarh (3.63%), Chattarpur (3.45%), Satna (3.08%), Sheopurkala (2.91%), Jabalpur (2.76%), Burhanpur (2.69%), Chhindwara (2.65%), Aagar (2.45%), Jhabua (2.44%), Guna (2.28%), Datia (2.26%), Damoh (1.96%), Betul (1.9%), Narsinghpur (1.83%), Alirajpur (1.82%), Shahdol (1.73%), Rajgarh (1.72%), Sagar (1.63%), Vidisha (1.5%), Singroli (1.48%), Ratlam (1.36%), Mandsaur (1.22%), Panna (1.13%), Katni (0.89%), Dewas (0.82%), Neemuch (0.75%), Seoni (0.58%), Ashoknagar (0.57%), Anuppur (0.56%), Indore (0.55%), Shajapur (0.53%), Balaghat (0.51%), Ujjain (0.4%), Umaria (0.4%), Dindori (0.1%) and Mandla (0.06%) districts of Madhya Pradesh.

The concentration of arhar to total pulses was also found in all the districts of Madhya Pradesh and it varies from 0.13 (Tikamgarh) to 37.94 (Morena) per cent in the year 2016-17. The percentage share of black gram in total pulses was found to be more in Morena (37.94%) followed by Singroli (34.65%), Sidhi (30.86%), Shahdol (30.7%), Khargone (28.23%), Umaria (26.05%), Anuppur (24.55%), Rewa (23.32%), Narsinghpur (23.15%), Betul (21.85%), Satna (19.45%), Burhanpur (19.07%), Chhindwara (18.95%), Khandwa (18.89%), Balaghat (16.36%), Barwani (15.98%), Raisen (14.54%), Seoni (13.88%), Hoshangabad (11.81%), Katni (11.05%), Panna (10.88%), Jhabua (10.79%), Mandla (9.61%), Dindori (9.48%), Bhind (9.23%), Damoh (8.84%), Jabalpur (8.56%), Sheopurkala (8.2%),

Table 2.7 : Percentage to total pulses area in across districts of Madhya Pradesh 2016-17

Districts	Chickpea	Lentil	Black gram	Green gram	Arhar
Aagar	70.21	5.45	15.34	2.45	5.45
Alirajpur	13.70	0.02	74.74	1.82	7.48
Anuppur	28.76	22.50	16.84	0.56	24.55
Ashoknagar	49.84	6.48	39.88	0.57	1.53
Balaghat	52.34	0.53	5.62	0.51	16.36
Barwani	40.34	0.03	22.86	17.79	15.98
Betul	60.05	2.61	10.05	1.90	21.85
Bhind	56.89	8.93	8.31	5.47	9.23
Bhopal	71.10	6.30	6.74	3.70	6.59
Burhanpur	56.35	0.00	11.82	2.69	19.07
Chattarpur	27.40	4.83	49.96	3.45	5.29
Chhindwara	51.05	4.72	9.87	2.65	18.95
Damoh	55.85	10.35	16.93	1.96	8.84
Datia	31.88	3.82	31.67	2.26	3.38
Dewas	91.35	0.23	1.42	0.82	4.65
Dhar	81.83	0.28	4.42	5.00	3.84
Dindori	31.83	29.98	10.56	0.10	9.48
Guna	71.10	0.82	19.52	2.28	3.83
Gwalior	61.63	4.83	14.61	3.94	6.23
Harda	67.79	0.35	10.26	17.43	2.46
Hoshangabad	59.37	1.87	4.02	20.76	11.81
Indore	94.92	0.31	0.24	0.55	2.97
Jabalpur	36.88	14.16	15.17	2.76	8.56
Jhabua	62.39	0.24	22.22	2.44	10.79
Katni	53.87	18.90	6.85	0.89	11.05
Khandwa	48.53	3.38	15.14	13.57	18.89
Khargone	48.14	0.01	8.67	11.97	28.23
Mandla	27.54	26.58	3.91	0.06	9.61
Mandsaur	67.34	4.94	19.76	1.22	3.08
Morena	46.95	3.91	5.86	3.98	37.94
Narsinghpur	37.01	19.02	7.62	1.83	23.15
Neemuch	77.95	3.65	16.63	0.75	0.86
Panna	42.69	16.12	9.10	1.13	10.88
Raisen	58.47	9.22	8.29	3.81	14.54
Rajgarh	67.60	17.55	7.75	1.72	2.91
Ratlam	80.93	1.70	9.62	1.36	2.38
Rewa	37.45	24.77	9.28	3.96	23.32
Sagar	51.93	16.77	16.19	1.63	4.20
Satna	41.49	22.27	11.72	3.08	19.45
Sehore	79.43	3.18	2.35	6.53	6.28
Seoni	40.22	15.81	9.59	0.58	13.88
Shahdol	30.50	8.08	24.44	1.73	30.70
Shajapur	80.07	9.51	3.91	0.53	4.38
Sheopurkala	75.10	0.21	13.23	2.91	8.20
Shivpuri	56.70	3.69	30.31	3.77	2.40
Sidhi	36.50	9.55	9.92	10.16	30.86
Singroli	40.51	9.34	11.76	1.48	34.65
Tikamgarh	19.46	3.28	68.88	3.63	0.13
Ujjain	91.34	0.24	2.22	0.40	2.50
Umaria	26.29	27.74	12.18	0.40	26.05
Vidisha	54.33	12.42	25.36	1.50	1.51
State total	**53.26**	**9.67**	**16.27**	**3.15**	**9.98**

Alirajpur (7.48%), Bhopal (6.59%), Sehore (6.28%), Gwalior (6.23%), Aagar (5.45%), Chattarpur (5.29%), Dewas (4.65%), Shajapur (4.38%), Sagar (4.2%), Dhar (3.84%), Guna (3.83%), Datia (3.38%), Mandsaur (3.08%), Indore (2.97%), Rajgarh (2.91%), Ujjain (2.5%), Harda (2.46%), Shivpuri (2.4%), Ratlam (2.38%), Ashoknagar (1.53%), Vidisha (1.51%), Neemuch (0.86%) and Tikamgarh (0.13%) districts of Madhya Pradesh.

2.6 Changes in Area, Pproduction and Productivity of Pulses across the District

A district wise analysis of area, production and yield of pulses in 2006-07 and 2016-17 was taken into consideration to know the percentage change in 2016-17 to the year 2006-07 in different districts of Madhya Pradesh and presented in table 2.8.

It is observed from the data that the area, production and yield of total pulses were found to be increased 26.2, 54.5 & 22.4 percent in 2016-17 over the year 2006-07 in Madhya Pradesh. The area of total pulses was found to be increased in all the districts of Madhya Pradesh except Jhabua (-60.5%), Shajapur (-21.9%), Bhind (-20.7%), Narsinghpur (-19.8%), Sagar (-19.3%), Sidhi (-12.4%), Jabalpur (-10.9%), Raisen (-9.5%) and Chhatarpur (-3.5%) in the year 2016-17 as compared to the year 2006-07. The area of pulses was found to be increased more in Burhanpur (243.6%), Dhar (149%), Shahdol (143.2%), Dindori (137.3%), Indore (122.4%), Morena (118.9%), Rajgarh (90.9%), Balaghat (85.7%), Mandla (82.3%), Anuppur (78.3%), Harda (71.7%), Umaria (70.9%), Katni (68.7%), Chhindwara (67.3%), Barwani (65.5%), Shivpuri (58.1%), Mandsaur (56.6%), Khandwa (52.9%), Dewas (52.2%), Hoshangabad (51.2%), Khargone (47.4%), Bhopal (45.1%) and Rewa (33.7%), Datia (32.1%), Satna (31.2%), Ratlam (31%), Seoni (28.1%), Panna (26.4%), Sehore (25.2%), Guna (24.7%), Neemuch (19.9%), Betul (18.9%), Gwalior (7.9%), Ujjain (7.5%), Damoh (2%), Ashoknagar (1.9%), Vidisha (1.5%) and Tikamgarh (1%) in the year 2016-17 as compared to 2006-07.

The production of pulses was also found to be increased in all the districts of Madhya Pradesh except Tikamgarh (-28.7%), Bhind (-21%), Jhabua (-18.3%), Narsinghpur (-14.3%) and Sagar (-5.1%) in 2016-17 over the year 2006-07. The production of pulses was found to be increased maximum in Dindori (481.7%) followed by Barwani (435.7%), Mandla (393.8%), Balaghat (338%), Shahdol (258.9%), Dhar (248%), Anuppur (243.1%), Katni (235.8%), Morena (221.7%), Burhanpur (206.7%), Indore (201.6%), Khargone (172.1%), Mandsaur (138.4%), Umaria (124.9%), Satna (106.3%), Rajgarh (93.8%), Dewas (92.9%), Khandwa (79.4%),

Table 2.8 : Change in area, production and yield of pulses in different districts of Madhya Pradesh

Particulars	Area (000 HA)			Production (000 MT)			Yield (Kg/ha)		
	2006-07	2016-17	% change	2006-07	2016-17	% change	2006-07	2016-17	% change
Aagar	0.0	73	100	0.0	81	100	0	1101	100
Alirajpur	0.0	72	100	0.0	43	100	0	605	100
Anuppur	20.0	36	78.3	6.9	24	243.1	347	668	92.4
Ashoknagar	179.3	183	1.9	147.0	166	12.7	820	907	10.6
Balaghat	26.3	49	85.7	10.6	46	338.0	401	946	135.8
Barwani	23.3	38	65.5	6.8	36	435.7	292	946	223.8
Betul	77.4	92	18.9	45.5	79	73.0	588	855	45.4
Bhind	62.2	49	-20.7	56.8	45	-21.0	914	911	-0.3
Bhopal	46.5	68	45.1	39.8	68	72.1	855	1014	18.6
Burhanpur	10.8	37	243.6	14.6	45	206.7	1345	1200	-10.7
Chhatarpur	180.3	174	-3.5	117.8	130	10.4	653	748	14.5
Chhindwara	76.6	128	67.3	82.9	139	67.4	1081	1082	0.1
Damoh	207.9	212	2.0	157.6	170	8.1	758	804	6.0
Datia	87.3	115	32.1	60.2	105	75.0	689	914	32.5
Dewas	99.5	152	52.2	111.8	216	92.9	1124	1424	26.7
Dhar	55.5	138	149.0	37.9	132	248.0	683	955	39.8
Dindori	40.9	97	137.3	13.9	81	481.7	339	831	145.1
Guna	77.4	97	24.7	67.6	109	61.9	873	1134	29.9
Gwalior	36.5	39	7.9	34.6	38	10.8	949	974	2.7
Harda	27.2	47	71.7	33.9	37	9.8	1245	796	-36.0
Hoshangabad	65.8	99	51.2	73.4	83	13.5	1116	838	-24.9
Indore	37.1	82	122.4	31.7	96	201.6	856	1161	35.6
Jabalpur	166.5	148	-10.9	113.1	127	12.4	679	857	26.2
Jhabua	98.6	39	-60.5	47.8	39	-18.3	485	1003	106.8
Katni	50.2	85	68.7	25.2	85	235.8	503	1001	99.0
Khandwa	31.3	48	52.9	23.7	43	79.4	756	887	17.3
Khargone	38.0	56	47.4	19.7	54	172.1	519	958	84.6
Mandla	42.8	78	82.3	13.1	65	393.8	307	831	170.9
Mandsaur	54.9	86	56.6	32.2	77	138.4	586	892	52.2
Morena	19.5	43	118.9	18.1	58	221.7	928	1364	46.9
Narsinghpur	225.0	180	-19.8	219.6	188	-14.3	976	1043	6.8
Neemuch	38.9	47	19.9	31.3	43	37.2	805	921	14.4
Panna	129.1	163	26.4	81.3	139	71.5	630	855	35.7
Raisen	222.0	201	-9.5	192.5	206	6.9	867	1025	18.2
Rajgarh	89.9	172	90.9	96.8	188	93.8	1077	1093	1.5
Ratlam	67.4	88	31.0	46.4	77	65.8	688	870	26.5
Rewa	115.3	154	33.7	73.7	119	61.5	639	772	20.8
Sagar	303.8	245	-19.3	215.0	204	-5.1	708	832	17.6
Satna	162.6	213	31.2	84.7	175	106.3	521	819	57.3
Sehore	100.5	126	25.2	97.1	139	43.6	967	1109	14.7
Seoni	87.2	112	28.1	48.5	82	68.4	557	732	31.5
Shahdol	21.4	52	143.2	12.8	46	258.9	599	884	47.6
Shajapur	109.7	86	-21.9	97.9	107	9.3	892	1250	40.0
Sheopur Kalan	0.0	38	0.0	0.0	37	0.0	0	970	0.0
Shivpuri	91.0	144	58.1	79.1	121	52.9	870	841	-3.3
Sidhi	92.7	81	-12.4	47.1	64	36.6	508	793	55.9
Singroli	0.0	64	0.0	0.0	78	0.0	0	1212	0.0
Tikamgarh	113.3	114	1.0	56.8	40	-28.7	501	354	-29.4
Ujjain	117.1	126	7.5	107.0	144	34.3	913	1141	24.9
Umaria	29.5	50	70.9	17.8	40	124.9	604	795	31.6
Vidisha	303.1	308	1.5	275.8	288	4.3	910	936	2.8
State Total	**4368.0**	**5511**	**26.2**	**3334.2**	**5151**	**54.5**	**763**	**935**	**22.4**

Datia (75%), Betul (73%), Bhopal (72.1%), Panna (71.5%), Seoni (68.4%), Chhindwara (67.4%), Ratlam (65.8%), Guna (61.9%), Rewa (61.5%), Shivpuri (52.9%), Sehore (43.6%), Neemuch (37.2%), Sidhi (36.6%), Ujjain (34.3%), Hoshangabad (13.5%), Ashoknagar (12.7%), Jabalpur (12.4%), Gwalior (10.8%), Chhatarpur (10.4%), Harda (9.8%), Shajapur (9.3%), Damoh (8.1%), Raisen (6.9%) and Vidisha (4.3%) district of Madhya Pradesh in the year 2016-17 over the year 2006-07.

The yield of pulses was found to be increased in all the districts of Madhya Pradesh except Harda (-36%), Tikamgarh (-29.4%), Hoshangabad (-24.9%), Burhanpur (-10.7%), Shivpuri (-3.3%) and Bhind (-0.3%) in the year 2016-17 over the year 2006-07. The yield of pulses was found to be increased maximum in Barwani (223.8%) followed by Mandla (170.9%), Dindori (145.1%), Balaghat (135.8%), Jhabua (106.8%), Katni (99%), Anuppur (92.4%), Khargone (84.6%), Satna (57.3%), Sidhi (55.9%), Mandsaur (52.2%), Shahdol (47.6%), Morena (46.9%), Betul (45.4%), Shajapur (40%), Dhar (39.8%), Panna (35.7%), Indore (35.6%), Datia (32.5%), Umaria (31.6%), Seoni (31.5%), Guna (29.9%), Dewas (26.7%), Ratlam (26.5%), Jabalpur (26.2%), Ujjain (24.9%), Rewa (20.8%), Bhopal (18.6%), Raisen (18.2%), Sagar (17.6%), Khandwa (17.3%), Sehore (14.7%), Chhatarpur (14.5%), Neemuch (14.4%), Ashoknagar (10.6%), Narsinghpur (6.8%), Damoh (6%), Vidisha (2.8%), Gwalior (2.7%), Rajgarh (1.5%) and Chhindwara (0.1%) in the year 2016-17 over the year 2006-07.

2.7 Share of area, production and yield of various pulses across districts of Madhya Pradesh

The area, production and yield of Chickpea, Lentil, Black gram, Green gram and Arhar across districts of Madhya Pradesh were observed in the study for the year 2016-17.

2.7.1 Chickpea

The farmers of Madhya Pradesh cultivated chickpea in 2935 thousand ha of cultivated area. The maximum area of chickpea was found in Vidisha (5.69%) followed by Dewas (4.72%), Sagar (4.34%), Damoh (4.03%), Raisen (4%), Rajgarh (3.95%), Ujjain (3.92%), Dhar (3.85%), Sehore (3.4%), Ashoknagar (3.1%), Satna (3.02%), Shivpuri (2.78%), Indore (2.67%), Ratlam (2.44%), and Panna (2.37%) districts. (Table 2.9)

The cultivators of Madhya Pradesh produced 3164 thousand ton of chickpea for the State. The maximum production of chickpea was found to be produced from Dewas (6.47%) followed by Vidisha (5.85%), Raisen (4.46%), Rajgarh (4.4%), Ujjain (4.3%), Sehore (3.85%), Dhar (3.71%), Sagar (3.53%), Damoh (3.4%),

Table 2.9 : Area, production and yield of chickpea across districts of Madhya Pradesh (2016-17)

Particulars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Vidisha	167	5.69	185	5.85	1111	3.13
Dewas	138	4.72	205	6.47	1427	32.50
Sagar	127	4.34	112	3.53	791	-26.55
Damoh	118	4.03	108	3.40	815	-24.33
Raisen	117	4.00	141	4.46	1200	11.44
Rajgarh	116	3.95	139	4.40	1200	11.42
Ujjain	115	3.92	136	4.30	1182	9.77
Dhar	113	3.85	117	3.71	1038	-3.63
Sehore	100	3.40	122	3.85	1219	13.21
Ashoknagar	91	3.10	103	3.27	1156	7.30
Satna	89	3.02	95	3.00	1046	-2.90
Shivpuri	82	2.78	91	2.88	1111	3.19
Indore	78	2.67	92	2.92	1182	9.74
Ratlam	72	2.44	64	2.03	904	-16.04
Panna	70	2.37	60	1.89	846	-21.43
Other districts	1313	44.75	1371	43.34	1044	-3.06
State total	**2935**	**100.00**	**3164**	**100.00**	**1077**	**0.00**

Ashoknagar (3.27%), Satna (3%), Indore (2.92%), Shivpuri (2.88%), Ratlam (2.03%) and Panna (1.89%) districts.

The average yield of chickpea was found to be 1077 kg/ha in Madhya Pradesh, which was found more than the average of the State in Dewas (32.5%) followed by Sehore (13.21%), Raisen (11.44%), Rajgarh (11.42%), Ujjain (9.77%), Indore (9.74%), Ashoknagar (7.3%), Shivpuri (3.19%) and Vidisha (3.13%) districts, while recorded less than the average of the state Sagar (-26.55%), Damoh (-24.33%), Panna (-21.43%), Ratlam (-16.04%), Dhar (-3.63%), and Satna (-2.9%) district.

2.7.2 Lentil

The farmers of Madhya Pradesh cultivated lentil in 533 thousand ha of cultivated area. The maximum area of lentil was found in Satna (8.91%) followed by Sagar (7.72%), Vidisha (7.17%), Rewa (7.17%), Narsinghpur (6.44%), Rajgarh (5.65%), Dindori (5.46%), Panna (4.94%), Damoh (4.12%), Jabalpur (3.94%), Mandla (3.89%), Raisen (3.47%), Seoni (3.31%), Katni (3%) and Umaria (2.63%) districts. (Table 2.10)

Table 2.10 : Area, production and yield of lentil across districts of Madhya Pradesh (2016-17)

Particulars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Satna	48	8.91	38	7.68	782	-15.93
Sagar	41	7.72	39	7.81	919	-1.22
Vidisha	38	7.17	35	7.02	904	-2.83
Rewa	38	7.17	34	6.77	886	-4.71
Narsinghpur	34	6.44	31	6.21	866	-6.92
Rajgarh	30	5.65	33	6.73	971	4.42
Dindori	29	5.46	28	5.73	928	-0.20
Panna	26	4.94	29	5.87	1115	19.85
Damoh	22	4.12	18	3.68	822	-11.63
Jabalpur	21	3.94	22	4.34	1035	11.29
Mandla	21	3.89	17	3.44	812	-12.70
Raisen	19	3.47	20	3.96	1001	7.63
Seoni	18	3.31	14	2.75	782	-15.92
Katni	16	3.00	17	3.37	1020	9.63
Umaria	14	2.63	13	2.58	919	-1.23
Other districts	118	22.17	109	22.07	768	-17.42
State total	**533**	**100.00**	**496**	**100.00**	**930**	**0.00**

The cultivators of Madhya Pradesh produced 496 thousand tone of lentil for the State. The maximum production of lentil was found to be produced from Sagar (6.47%) followed by Sagar (7.81%) followed by Satna (7.68%), Vidisha (7.02%), Rewa (6.77%), Rajgarh (6.73%), Narsinghpur (6.21%), Panna (5.87%), Dindori (5.73%), Jabalpur (4.34%), Raisen (3.96%), Damoh (3.68%), Mandla (3.44%), Katni (3.37%), Seoni (2.75%) and Umaria (2.58%) districts.

The average yield of lentil was found to be 930 kg/ha in Madhya Pradesh, which was found more than the average of the State in Panna (19.85%) followed by Jabalpur (11.29%), Katni (9.63%), Raisen (7.63%), Rajgarh (4.42%) districts while recorded less than the average of the state Satna (-15.93%), Seoni (-15.92%), Mandla (-12.7%), Damoh (-11.63%), Narsinghpur (-6.92%), Rewa (-4.71%), Vidisha (-2.83%), Umaria (-1.23%), Sagar (-1.22%) and Dindori (-0.2%) districts.

2.7.3 Black Gram

The farmers of Madhya Pradesh were found to cultivate black gram in 897 thousand ha of cultivated area. The maximum area of black gram was found in Chattarpur (9.69%) followed by Tikamgarh (8.79%), Vidisha (8.7%), Ashoknagar (8.13%), Alirajpur (5.96%), Shivpuri (4.86%), Sagar (4.43%), Datia (4.07%), Damoh (4%), Satna (2.79%), Jabalpur (2.51%), Guna (2.1%), Mandsaur (1.9%), Raisen (1.86%) and Panna (1.66%) districts. The cultivators

Table 2.11 : Area, production and yield of black gram across districts of Madhya Pradesh (2016-17)

Particulars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Chattarpur	87	9.69	65	13.8	745	41.98
Tikamgarh	79	8.79	19	4.1	253	-51.80
Vidisha	78	8.70	51	10.8	648	23.47
Ashoknagar	73	8.13	43	9.1	587	11.94
Alirajpur	53	5.96	28	5.9	512	-2.46
Shivpuri	44	4.86	18	3.9	425	-19.01
Sagar	40	4.43	22	4.6	592	12.94
Datia	37	4.07	15	3.2	388	-26.12
Damoh	36	4.00	17	3.7	465	-11.39
Satna	25	2.79	8	1.8	320	-38.99
Jabalpur	23	2.51	13	2.7	558	6.47
Guna	19	2.10	12	2.5	611	16.56
Mandsaur	17	1.90	11	2.3	615	17.29
Raisen	17	1.86	6	1.3	378	-27.97
Panna	15	1.66	9	1.9	576	9.80
Other districts	246	27.42	128	27.1	521	-0.76
State total	**897**	**100.00**	**472**	**100.0**	**525**	**0.00**

of Madhya Pradesh produced 472 thousand tone of blackgram for the State.

The maximum production of blackgram was found to be produced from Chattarpur (13.8%) followed by Vidisha (10.8%), Ashoknagar (9.1%), Alirajpur (5.9%), Sagar (4.6%), Tikamgarh (4.1%), Shivpuri (3.9%), Damoh (3.7%), Datia (3.2%), Jabalpur (2.7%), Guna (2.5%), Mandsaur (2.3%), Panna (1.9%), Satna (1.8%) and Raisen (1.3%) districts. (Table 2.11)

The average yield of blackgram was found to be 525 kg/ha in Madhya Pradesh, which was found to be more than the State average Chattarpur (41.98%) followed by Vidisha (23.47%), Mandsaur (17.29%), Guna (16.56%), Sagar (12.94%), Ashoknagar (11.94%), Panna (9.8%), Jabalpur (6.47%) districts, while recorded less than the average of the state in Tikamgarh (-51.8%), Satna (-38.99%), Raisen (-27.97%), Datia (-26.12%), Shivpuri (-19.01%), Damoh (-11.39%) and Alirajpur (-2.46%) districts.

2.7.4 Green Gram

The farmers of Madhya Pradesh cultivated green gram in 173.8 thousand ha of cultivated area. The maximum area of green gram was found in Hoshangabad (11.88%) followed by Sidhi (4.75%), Sehore (4.73%), Harda (4.69%), Raisen (4.4%), Dhar (3.97%), Barwani (3.94%), Khargone (3.86%), Satna

Table 2.12 : Area, production and yield of green gram across districts of Madhya Pradesh (2016-17)

Particulars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Hoshangabad	20.7	11.88	7.3	11.89	473.4	30.24
Sidhi	8.3	4.75	3.0	4.87	352.5	-3.03
Sehore	8.2	4.73	3.5	5.69	407.0	11.97
Harda	8.2	4.69	2.9	4.69	330.9	-8.98
Raisen	7.7	4.40	1.7	2.79	292.5	-19.53
Dhar	6.9	3.97	4.2	6.77	567.5	56.12
Barwani	6.9	3.94	2.0	3.33	299.0	-17.74
Khargone	6.7	3.86	2.3	3.74	330.0	-9.22
Satna	6.6	3.78	1.4	2.35	225.5	-37.96
Khandwa	6.5	3.74	1.7	2.75	276.5	-23.93
Rewa	6.1	3.51	1.7	2.70	269.0	-26.00
Chattarpur	6.0	3.45	2.2	3.53	406.5	11.83
Shivpuri	5.4	3.12	1.5	2.39	267.0	-26.55
Vidisha	4.6	2.65	1.3	2.13	316.5	-12.93
Damoh	4.2	2.39	1.3	2.18	356.0	-2.06
Other districts	55.3	31.80	21.9	35.59	395.7	8.86
State total	**173.8**	**100.00**	**61.4**	**100.00**	**363.5**	**0.00**

(3.78%), Khandwa (3.74%), Rewa (3.51%), Chattarpur (3.45%), Shivpuri (3.12%), Vidisha (2.65%) and Damoh (2.39%) districts. (Table 2.12).

The cultivators of Madhya Pradesh produced 61.4 thousand tone of green gram for the State. The maximum production of green gram was found to be produced from Hoshangabad (11.89%) followed by Dhar (6.77%), Sehore (5.69%), Sidhi (4.87%), Harda (4.69%), Khargone (3.74%), Chattarpur (3.53%), Barwani (3.33%), Raisen (2.79%), Khandwa (2.75%), Rewa (2.7%), Shivpuri (2.39%), Satna (2.35%), Damoh (2.18%) and Vidisha (2.13%) districts.

The average yield of green gram was found to be 363.5 kg/ha in Madhya Pradesh, which was found more than the average of the state in from Dhar (56.12%) followed by Hoshangabad (30.24%), Sehore (11.97%), Chattarpur (11.83%), districts while recorded less than the average of the state Satna (-37.96%), Shivpuri (-26.55%), Rewa (-26%), Khandwa (-23.93%), Raisen (-19.53%), Barwani (-17.74%), Vidisha (-12.93%), Khargone (-9.22%), Harda (-8.98%), Sidhi (-3.03%) and Damoh (-2.06%) districts.

2.7.5 Arhar

The farmers of Madhya Pradesh cultivated arhar in 550.2 thousand ha of cultivated area. The maximum area of arhar was found in Narsinghpur (7.59%) followed

by Satna (7.54%), Rewa (6.53%), Raisen (5.31%), Sidhi (4.55%), Chhindwara (4.42%), Singroli (4.04%), Betul (3.65%), Damoh (3.41%), Panna (3.23%), Morena (2.94%), Shahdol (2.9%), Khargone (2.87%), Seoni (2.82%) and Umaria (2.39%) districts. (Table 2.13).

The cultivators of Madhya Pradesh produced 575.5 thousand tone of arhar for the State. The maximum production of arhar was found to be produced from Narsinghpur (10.12%) followed by Chhindwara (8.13%), Singroli (6.65%), Morena (5.6%), Satna (4.83%), Raisen (4.38%), Rewa (4.35%), Sidhi (4.34%), Seoni (3.45%), Betul (3.09%), Damoh (2.89%), Khargone (2.86%), Panna (2.53%), Shahdol (2.28%) and Umaria (1.55%) districts.

The average yield of arhar was found to be 1043 kg/ha in Madhya Pradesh, which was found more than the average of the State in Chhindwara (70.67%) followed by Morena (69.79%), Singroli (64.55%), Narsinghpur (32.17%), Seoni (23.49%), Khargone (7.72%), Damoh (0.53%), districts, while recorded less than the average of the state Umaria (-34.47%), Rewa (-32.53%), Raisen (-25.5%), Satna (-23.8%), Panna (-21.52%), Shahdol (-21.24%), Betul (-14.78%) and Sidhi (-5.99%) districts.

Table 2.13 : Area, production and yield of arhar across districts of Madhya Pradesh (2016-17)

Part iculars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Narsinghpur	41.8	7.59	58.2	10.12	1378.5	32.17
Satna	41.5	7.54	27.8	4.83	794.8	-23.80
Rewa	36.0	6.53	25.0	4.35	703.7	-32.53
Raisen	29.2	5.31	25.2	4.38	777.0	-25.50
Sidhi	25.1	4.55	25.0	4.34	980.5	-5.99
Chhindwara	24.3	4.42	46.8	8.13	1780.1	70.67
Singroli	22.3	4.04	38.3	6.65	1716.3	64.55
Betul	20.1	3.65	17.8	3.09	888.8	-14.78
Damoh	18.8	3.41	16.6	2.89	1048.5	0.53
Panna	17.8	3.23	14.6	2.53	818.5	-21.52
Morena	16.2	2.94	32.2	5.60	1771.0	69.79
Shahdol	16.0	2.90	13.1	2.28	821.5	-21.24
Khargone	15.8	2.87	16.4	2.86	1123.5	7.72
Seoni	15.5	2.82	19.9	3.45	1288.0	23.49
Umaria	13.2	2.39	8.9	1.55	683.5	-34.47
Other districts	196.7	35.75	167.9	29.18	853.7	-18.15
State total	**550.2**	**100.00**	**575.5**	**100.00**	**1043.0**	**0.00**

2.7.6 Total Pulses

The farmers of Madhya Pradesh cultivated total pulses in 5511 thousand ha of cultivated area. The maximum area of total pulses was found in Vidisha (5.58%) followed by Sagar (4.45%), Satna (3.87%), Damoh (3.85%), Raisen (3.64%), Ashoknagar (3.32%), Narsinghpur (3.27%), Chattarpur (3.16%), Rajgarh (3.11%), Panna (2.96%), Rewa (2.8%), Dewas (2.75%), Jabalpur (2.69%), Shivpuri (2.61%) and Dhar (2.51%) districts. (Table 2.14)

The cultivators of Madhya Pradesh produced 5151 thousand tone of total pulses for the State. The maximum production of total pulses was found to be produced from Vidisha (5.59%) followed by Dewas (4.19%), Raisen (4%), Sagar (3.96%), Narsinghpur (3.65%), Rajgarh (3.64%), Satna (3.39%), Damoh (3.31%), Ashoknagar (3.22%), Panna (2.71%), Dhar (2.56%), Chattarpur (2.53%), Jabalpur (2.47%), Shivpuri (2.35%) and Rewa (2.31%) districts.

The average yield of total pulses was found to be 935 kg/ha in Madhya Pradesh, which was found more than the average of the state in from Dewas (52.36%) followed by Rajgarh (16.94%), Narsinghpur (11.58%), Raisen (9.7%), Dhar (2.19%) and Vidisha (0.11%), districts while recorded less than the average of the state Chattarpur (-19.97%), Rewa (-17.37%), Damoh

Table 2.14 : Area, production and yield of total pulses across districts of Madhya Pradesh (2016-17)

Particulars	Area		Production		Yield	
	000' Ha.	% to State	000' t	% to State	Kg/Ha.	% difference to State
Vidisha	308	5.58	288	5.59	936	0.11
Sagar	245	4.45	204	3.96	832	-11.00
Satna	213	3.87	175	3.39	819	-12.32
Damoh	212	3.85	170	3.31	804	-14.01
Raisen	201	3.64	206	4.00	1025	9.70
Ashoknagar	183	3.32	166	3.22	907	-3.00
Narsinghpur	180	3.27	188	3.65	1043	11.58
Chattarpur	174	3.16	130	2.53	748	-19.97
Rajgarh	172	3.11	188	3.64	1093	16.94
Panna	163	2.96	139	2.71	855	-8.55
Rewa	154	2.80	119	2.31	772	-17.37
Dewas	152	2.75	216	4.19	1424	52.36
Jabalpur	148	2.69	127	2.47	857	-8.29
Shivpuri	144	2.61	121	2.35	841	-10.01
Dhar	138	2.51	132	2.56	955	2.19
Other districts	2637	47.86	2473	48.01	938	0.32
State total	**5511**	**100.00**	**5151**	**100.00**	**935**	**0.00**

(-14.01%), Satna (-12.32%), Sagar (-11%), Shivpuri (-10.01%), Panna (-8.55%), Jabalpur (-8.29%) and Ashoknagar (-3%) districts.

2.8 Summary of the Chapter

Madhya Pradesh had 23 per cent share of total pulses in gross cropped area (GCA). The cultivated of all the districts were found to produce pulses in their field. The share of total pulses to GCA was varying from to 9.6 (Khargone) to 42 (Panna) per cent in Madhya Pradesh.

The area under rice and coarse cereals was found to be decreased by 3.9 and 30.9 per cent with annual average growth rate of 0.39 and 3.03 per cent, respectively, while area of wheat, total pulses, total food grain and other pulses, was found to be increased by 21.1 per cent with the annual average growth rate of 2.11, 17.6, 4.5 & 2.3 per cent during the period 2001-10. The production of rice, wheat, total pulses and total food grain was found to be increased by 11.30, 31.22, 25.34 & 21.31 per cent with the annual average growth rate of 1.13, 3.12, 2.53 & 2.13 per cent per year, respectively, during the period 2001-10 while the production of total coarse cereals was found to be decreased by -15.93 per cent with the annual average growth rate of -1.59 per cent per year, respectively in Madhya Pradesh. Amongst different pulses viz. chickpea, blackgram, lentil, arhar and green gram the area was found to be increased by 23.1, 15.4, 9.4, 5.9 and 4.2 per cent per year during the period with the annual average growth of -2.31, -1.54, -0.94, -0.59 & -0.42 per cent per year respectively, during the period 2001 -10. The production of all the pulses viz. chickpea, black gram, lentil, green gram, other pulses and arhar was found to be increased with the annual average growth rate of 2.86, 2.86, 1.83, 1.65, 0.91 and 0.05, per cent per year respectively during 2001-2010 in Madhya Pradesh. The yield of different pulses in Madhya Pradesh was also found to be increased with the annual average growth of 1.23 (chickpea), 1.08 (lentil), 1.76 (black gram), 1.32 (green gram) & 0.69 (other pulses) per cent excepted -0.55 (arhar) per cent per year during period 2001-10.

During period 2010-17 the area of all the food grains i.e. rice, wheat, coarse cereals, total pulses and food grains was found to increased with 23.4, 15.2, 4.6, 13.2 & 14.2 per cent with annual average growth rate of 4.67, 3.05, 0.91, 2.64 & 2.83 per cent per year, respectively in Madhya Pradesh. The production of all the food grains was also found to be increased in this period (2010-17) in State. The production of rice, coarse cereal, wheat, pulses, and total food grain was found to be increased by 55.45, 27.20, 30.50, 27.95 & 32.32 per cent with annual average growth rate of 11.09, 5.44, 6.10, 5.59 and 6.46 per cent per year, respectively in this particular period in Madhya Pradesh. The yield of food grains was found to be increased with annual average growth of 9.01 (rice), 3.22 (wheat), 5.47 (coarse cereal), 3.69 (pulses) and 4.55 (food grain) per cent.

➢ Amongst different pulses cultivated by the farmers of Madhya Pradesh, the area of chickpea, black gram, , arhar, green gram and other pulses was found to be increased with annual average growth rate of 1.39, 10.22, 23.91, 0.22 & 7.50 per cent per year, while the area of lentil was found to be decreased by the annual average growth rate of -2.20 per cent, respectively. The production of all the pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also found to be increased by 11.20, 51.98, 55.24, 57.89, 50.21 & 63.36 per cent, respectively with the annual average growth rate of 2.24, 10.40, 11.05, 11.58, 10.04 & 12.67 per cent, respectively during the period from 2010-17 in Madhya Pradesh. The yield of different pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also increased with annual average growth of 1.01, 11.45, 6.47, 1.51, 9.93 and 9.92 per cent per year, respectively during this period.

The area of total pulses was found to be increased by 87.07 per cent from 22782 to 25976 thousand ha in the country during 2016-17 as compared 2006-07. Amongst different states the area of pulses was found to be increased maximum in Madhya Pradesh (19-23%) followed by Rajasthan (15-16%), Karnataka (9-10%) and other states (7-11%) to total area of the country in the year 2016-17 as compared to 2006-07. The production of pulses was found to be increased by 39.05 per cent 13570 to 18870 thousand tonnes in the country in the period 2006-17 as compared to 2006-07. The production of pulses was found to be increased from 24 to 29, 9 to 13, 7 to 8, 3 to 4, 7 to 12 percent in Madhya Pradesh, Rajasthan, Karnataka, Chhattisgarh and Uttar Pradesh. The yield of total pulses was found to be increased in all the pulses growing States of the country during 2016-17 as compared to 2006-07 from 764 to 910 kg/ha (Madhya Pradesh), 561 to 651 kg/ha (Maharashtra), 364 to 570 (Rajasthan), 410 to 527 (Karnataka), 672 to 796 (Andhra Pradesh), 471 to 765kg/ha (Chhattisgarh), 651 to 914 (Gujarat), 418 to 529 (Orissa), 726 to 879 (Bihar) and 607 to 809 (Other States) The yield of total pulses was found to be increased 596 to 727 kg/ha in India in the year 2016-17 as compared 2006-07.

The area of total pulses was found to be increased by 26.17 per cent from 4368 (2006-07) to 5511(2016-17) thousand ha in Madhya Pradesh. The percentage share of area of black gram and green gram to total area of pulses was found to be increased from 11 to 16, 2 to 3 and 7 to 10 per cent respectively, while percentage share of chickpea and lentil was found to be decreased from 60 to 53 & 12 to 10 per cent respectively.

The production of total pulses was also found to be increased by 659.77 per cent from 4437 (2006-07) to 5151 (2016-17) in Madhya Pradesh. The contribution of all the pulses viz. lentil, black gram, arhar and other pulses to total production of pulses was found to be increased

from 8 to 10, 5 to 9, 7 to 11 and 5 to 7 per cent respectively, except chickpea, which was decreased by 74 to 62 per cent in Madhya Pradesh. The production of green gram was found to be stagnate to 1 per cent to total area of pulses in both the period.

The productivity of all the pulses was found to be increased in 2016-17 as compared to 2006-07. The productivity of all the pulses grown by the farmers viz. chickpea, lentil, black gram, green gram, arhar, other pulses and total pulses was found to be increased from 842 to 1077, 422 to 930, 319 to 525, 297 to 364, 613 to 1043, 510 to 906 and 763 to 935 kg/ha respectively, in 2016-17 as compared to 2006-07 respectively in Madhya Pradesh.

The area, production and yield of total pulses were found to be increased 26.2, 54.5 & 22.4 per cent in 2016-17 over the year 2006-07 in Madhya Pradesh. The area of total pulses was found to be increased in all the districts of Madhya Pradesh except Jhabua (-60.5%), Shajapur (-21.9%), Bhind (-20.7%), Narsinghpur (-19.8%), Sagar (-19.3%), Sidhi (-12.4%), Jabalpur (-10.9%), Raisen (-9.5%) and Chhatarpur (-3.5%) in the year 2016-17 as compared to the year 2006-07.

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CHAPTER - III

SOCIO-ECONOMIC CHARACTERISTICS AND VALUE OF OUTPUT OF PULSES

This chapter deals with the socio-economic characteristics of sample HHs. Its includes demographic profile of the selected farmers with their land use pattern, cropping intensity, sources of irrigation, cropping pattern under irrigated and rain fed conditions along with value of products.

3.1 Demographic Profile

The total 300 households were selected for the study, out of which small respondents (126) were found to be maximum followed by marginal (116), medium (41) and large respondents (17). The average size of the family of HHs comprised of 6 members (Table 3.1).

Table 3.1: Demographic profile of the selected farmers (% of households)

Characteristics		Marginal	Small	Medium	Large	Total
No of HH		116	126	41	17	300
Household size (numbers)		6	6	7	7	6.19
Gender of Respondent	Male	85.34	93.65	90.24	94.12	90.00
	Female	14.66	6.35	9.76	5.88	10.00
Age of the Respondent	<30	5.17	6.35	4.88	11.76	6.00
	30-60	79.31	76.98	73.17	82.35	77.67
	>60	15.52	16.67	21.95	5.88	16.33
Education status of Respondent, number of years of education	Illiterate	12.93	11.9	7.32	5.88	11.33
	Up to Primary (5)	70.69	68.25	85.37	76.47	72.00
	Up to Middle (8)	6.03	10.32	0.00	0.00	6.67
	Up to Matric (10)	6.03	3.97	0.00	5.88	4.33
	Up to + 2	3.45	3.17	4.88	0.00	3.33
	Up to graduate	0.00	1.59	0.00	5.88	1.00
	Above graduate	0.86	0.79	2.44	5.88	1.33
Average members of family doing farming		3	3	3	3	3
Average years of farming experience		33	35	36	32	34
Caste	SC	37.93	22.22	29.27	11.76	28.67
	ST	12.07	6.35	0.00	5.88	7.67
	OBC	28.45	46.03	48.78	52.94	40.00
	General	21.55	25.4	21.95	29.41	23.67

The majority of respondents were found to be male (90%) as compared to female (10%) The majority of HHs were found to be between the age group of 30-60 years (77.67 %). The majority of them were found to be literate up to primary education (72%). Out of 6.19 members in average size of family, 3 members were found to be engaged in farming. An average HH was found to have 34.20 years experience in farming. The majority of HHs were found to belong to OBC (40%) followed by Schedule Caste (28.67%), General (23.67%) and Schedule Tribe (7.67%) categories (Table 3.1).

Table 3.2: Demographic profile of the selected farmers (% of households)

Particulars		Marginal	Small	Medium	Large	Total
Main occupation of respondent	Agriculture and allied	98	99	100	100	99.00
	Others (Agricultural labour, Salaried & Pensioners)	2	1	0	0	1.00
Subsidiary occupation of respondent	Agriculture and allied	1	5	0	0	2.80
	Agricultural labour	46	47	25	0	46.85
	Self business	6	12	33	43	13.29
	Self services	4	5	8	14	5.59
	Non -agricultural labour	21	8	17	0	16.08
	Salaried	17	8	8	0	13.29
	Pensioners	1	3	0	0	2.10
	HH works	0	2	0	0	0.70
	Others	4	10	8	43	9.09
Average Annual Income (%)	Agriculture and allied	65.29	77.17	83.03	92.14	77.83
	Non -agricultural Sources	34.71	22.83	16.97	7.86	22.17
	Total Income	100	100	100	100	100
Average Annual Income (Rs)	Agriculture and allied	48341	112098	184403	384100	112740
	Non -agricultural Sources	25698	33171	37682	32786	32117
	Total Income	**74039**	**145269**	**222085**	**416886**	144857

Note: Marginal farmer: 0-2.5 acres; Small Farmers: 2.51-5.00 acres; Medium:5.01-10.00 acres; Large:>10 acres

The 99 per cent of the HHs were found to be primarily depends on agriculture and allied activities for their livelihoods. As for as secondary occupation of the HHs is concerned, the majority of the HHs were found to be engaged as agricultural labourers (46.85%) followed by non-agricultural labours (16.08%), salaried persons (13.29%), self business (13.29%), self services (5.59%) and agricultural and allied activities (2.80%).

The annual income of an average HH from agriculture and allied activities (77.83%) was found to more as compared to non-agriculture activities (22.17%). The annual income of an average HH was found to be Rs. 144857/year, in which share of agriculture and allied activity (Rs. 112740/year) was found to be more as compared to non agriculture sources (Rs. 32117/year).

3.2 Land use Pattern

An average size of operational holding was found to be 4.10 acres, out of which non-cultivable land was found to be 0.01 acres. An average household used to leased-in land of 2.41 acres. Leased-out land was not found in practice by the HHs in the area under study (Table 3.3). An average net operated area, net irrigated area and gross cropped area per household was found to be 4.10, 3.74 and 8.12 acres, respectively with cropping intensity of 198 per cent per year, which indicates that an average household used to cultivate crops in both the seasons in their net operated area as 91% area was found to be under irrigation.

Table 3.3: Characteristics of operational holdings (acres per household)

Farm size	Owned land	Non cultivable	Leased - in	Leased -out	Average Rental (Rs/acre)	NOA	Net Irrigated area	GCA	Cropping intensity
Marginal	1.79	0.00	0.01	0.00	6250	1.80	1.64	3.54	197
Small	3.53	0.01	0.16	0.00	6594	3.68	3.40	7.3	198
Medium	4.84	0.01	2.41	0.00	6428	7.24	6.74	14.41	199
Large	8.11	0.00	7.15	0.00	6386	15.26	13.42	30.28	198
Total	**3.30**	**0.01**	**0.81**	**0.00**	**7431**	**4.10**	**3.74**	**8.12**	**198**

Note: NOA: Net Operated Area; GCA: Gross Cropped Area

On an average net operational area of marginal, small, medium and large respondents was found to be 1.80, 3.68. 7.24 and 15.26 acres, out of which area under leased in land was found to be 0.01, 0.16, 2.41 and 7.15 acres, respectively. An average HH was found to leased in land with a rent of Rs.7431/season, which was found to be varied from Rs. 6250 (marginal) to Rs.6594 (small) per season in the area under study.

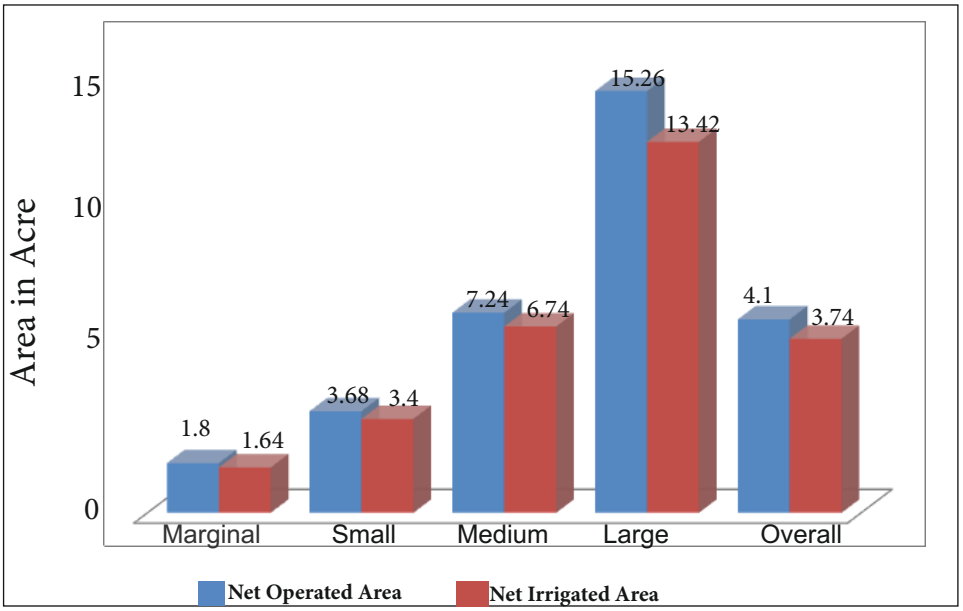

Fig. 3.1: Area under irrigation in different size of operational holding

Out of total net operational holding 91.11, 92.39, 93.09 and 87.94 per cent of area was found to be irrigated under marginal, small, medium and large farmers in the area under study (Fig.3.1).

3.3 Sources of Irrigation

Canal (37.09%) followed by bore-well (31.49%) and dug well (14.92%) were found to be major sources of irrigation. The 90.10 per cent of the total operated holding of the HHs was found to be irrigated and rest 9.90 per cent was found to be rain fed in the area under study (Table 3.4).

At overall level, an average HH was found to invest Rs. 1738.13 per acre per year as water charges for irrigation through canal, which found to be varies from Rs. 1676.83 (medium) to 1822.35 (large) farmers. Canal was found to be a major source of irrigation in medium (53.70%) and large (60.22%) farms, while bore well was found to be a major source of irrigation in marginal (37.82%) and small farms (36.26%).

Table 3.4: Sources of irrigation to net operated area across size of farms (%)

Farm size	Dug well	Bore well	Canal	Others	Rain fed area	Average Water Charges (Rs/acre)	Total operated area
Marginal	13.51	37.82	32.74	7.06	9.10	1728.28	100
Small	19.02	36.26	31.54	5.61	7.75	1755.79	100
Medium	8.01	33.02	53.70	5.27	6.97	1676.83	100
Large	10.79	12.33	60.22	4.63	12.03	1822.35	100
Total	**14.92**	**31.49**	**37.09**	**6.61**	**9.90**	**1738.13**	**100**

3.4 Cropping Pattern

Out of gross cropped area (GCA) 91.52 was found to be irrigated by different sources of irrigation in the area under study (Table 3.5). Out of total irrigated area, the 45.67 and 45.85 per cent of Gross Cropped Area (GCA) was found to be cultivated in kharif and rabi season respectively and out of total rain fed area only 4.23 and 4.24 per cent of GCA was found to be cultivated in kharif and rabi season respectively.

Black gram (15.15%), soybean (13.3%) and paddy (9.42%) were found to be major kharif crops, while wheat (25.84%) and chickpea (14.07%) were found to be major rabi crops in irrigated condition (Fig. 3.2). Soybean (2.04%) and black gram (1.24%) in kharif and in chickpea (1.99%) in rabi season were found to be major crops grown under rain fed condition (Fig. 3.3). The HHs were also found to cultivated green gram, sesame, groundnut and bajra in kharif and lentil, rapeseed & mustard, field pea in rabi as a minor crops in both the situations in area under study.

3.5 Value of Output

An average HH found to obtained Rs. 176027/year as a gross farm income from cultivation of crops. He was found to received Rs. 35112/year net income over cost of production (Rs. 4004/year) and labour cost (Rs. 3850/acre in a year (Table 3.6).

Table 3.5: Cropping pattern of selected farmers for the reference year 2018-19 (%)

Particulars	Marginal	Small	Medium	Large	Overa ll
Irrigated Area (Acre)					
Paddy	6.21	7.47	10.76	14.76	9.42
Soybean	14.45	16.80	12.74	7.77	13.30
Black gram	19.42	15.75	12.52	14.67	15.15
Green gram	0.75	0.67	3.27	0.68	1.26
Sesame	2.49	2.05	2.96	3.63	2.63
Groundnut	1.02	0.41	3.18	0.53	1.16
Jowar	0.15	0.50	1.96	0.24	0.71
Bajara	1.44	2.26	2.36	1.85	2.02
Others	0.00	0.03	0.05	0.00	0.02
Wheat	25.30	27.57	28.72	22.14	25.84
Chickpea	17.23	12.63	14.01	15.31	14.07
Lentil	1.90	3.46	2.96	1.75	2.67
R & M	0.96	2.13	2.72	2.33	2.07
Field pea	0.24	0.46	1.60	2.41	1.08
Others	0.10	0.04	0.18	0.19	0.11
Irrigated Kharif	45.93	45.94	49.82	44.13	45.67
Irrigated Rabi	45.72	46.29	50.18	44.13	45.85
Total Irrigated	**91.65**	**92.24**	**100.00**	**88.27**	**91.52**
Rain-fed Area (Acre)					
Paddy	0.12	0.22	0.00	0.43	0.19
Soybean	2.31	1.36	2.13	3.11	2.04
Black gram	1.40	1.09	1.36	1.36	1.24
Green gram	0.00	0.14	0.09	0.00	0.07
Sesame	0.00	0.61	0.00	1.17	0.48
Jowar	0.00	0.11	0.18	0.00	0.08
Bajara	0.00	0.33	0.00	0.00	0.12
Wheat	1.95	1.03	0.36	0.00	0.80
Chickpea	1.95	1.63	1.67	3.15	1.99
Lentil	0.49	0.69	1.00	0.39	0.65
R & M	0.00	0.56	0.36	0.39	0.38
Field pea	0.12	0.00	0.18	1.75	0.43
Rain -fed Kharif	3.84	3.86	3.76	6.06	4.23
Rain -fed Rabi	4.51	3.91	3.58	5.67	4.24
Total Rain -fed	**8.35**	**7.76**	**7.34**	**11.73**	**8.48**
Overall GCA	**100.00 (3.54)**	**100.00 (7.3)**	**107.34 (14.41)**	**100.00 (30.28)**	**100.00 (8.12)**

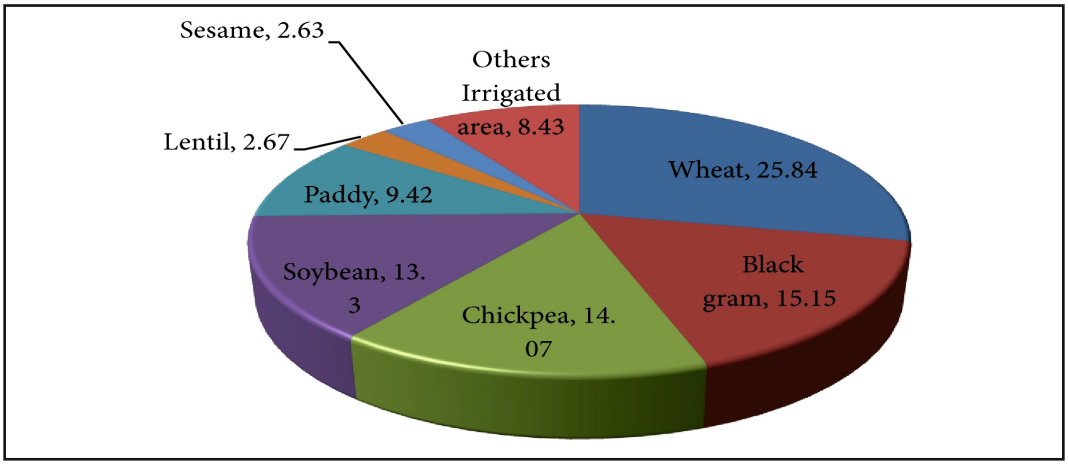

Fig. 3.2: Major crop grown by respondents in irrigated condition

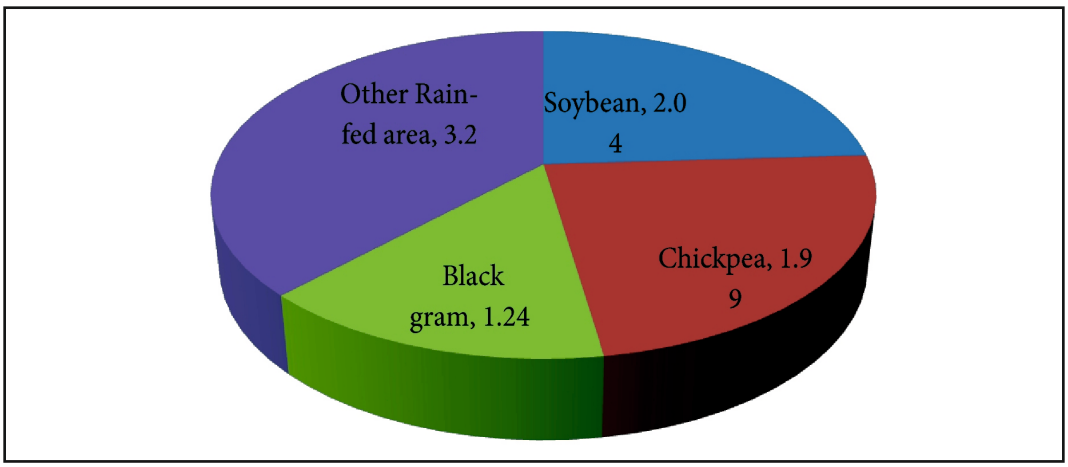

Fig. 3.3 : Major crop grown by respondents in rain-fed condition

Table 3.6: Value of output, cost and net returns across size of farms (Rs)

Farm Size	Production (q/acre)			Value of output (main + by-product) (Rs/acre)	Cost of production (Rs/acre)		Net returns (Farm business income) (Rs/acre)	Gross Farm income from cultivated area (Rs) per hh
	Irrigated	Rainfed	Total		Material cost	Labour cost		
Marginal	7.49	5.12	7.30	42898	4252	3943	34703	77221
Small	7.71	4.69	7.48	41600	3804	3689	34107	153159
Medium	8.24	4.23	7.97	43589	4218	4020	35351	315724
Large	8.81	3.25	8.16	44748	3917	3869	36963	682804
Overall	**8.03**	**4.25**	**7.71**	**42965**	**4004**	**3850**	**35112**	**176027**

Amongst different categories of farms, large farmers (Rs.44748 /year) were found to received more value of output as compared to marginal (Rs. 42898/year), small (Rs. 41600/year) and medium (Rs.43589/year) farmers. It was also observed

that an average HH was found to receive 7.71 q/acre of production of grains in a year which ranged between 7.30 q/year (marginal) to 8.16 q/year (large) reveals that as the size of holding increases the value of output as well as production of crops increases in the area under study.

3.6 Summary of the Chapter

The study confined to the Datia and Sagar districts of Madhya Pradesh and related to 116 marginal, 126 small, 41 medium and 17 large HHs reveals that the average size of these all HHs (300) comprised of 6 members, out of which 3 were found to be engaged in farming. The majority of HHs was found to be between 30 to 60 years (77.67%) and an average HH was have 34 years of experience in farming. The majority of HHs were found to be belong to OBC (40.00%) followed by SC (28.67%), general (23.67%) and (ST (7.67%) categories and primarily depends on agriculture and allied activities for their livelihood. As for as secondary occupation of the HHs is concerned, the majority of the HHs was found to be engaged as agricultural labourers (46.85%) followed by non-agricultural labours (16.08%), salaried persons (13.29%), self business (13.29%), self services (5.59%) and agricultural and allied activities (2.80%). The annual income of an average HH from agriculture and allied activities (77.83%) was found to more as compared to non-agriculture activities (22.17%). The annual income of an average HH was found to be Rs. 144857/year, in which share of agriculture and allied activity (Rs. 112740/year) was found to be more as compared to non agriculture sources (Rs. 32117/year)

An average household used to leased-in land of 2.43 acres. Leased-out land was not found in practice by the HHs in the area under study. An average HH was found to leased in land with a rent of Rs.7431/season, which was found to be varied from Rs. 6250 (marginal) to Rs.6594 (small) per season in the area under study. The cropping intensity of 198 per cent per year, which indicates that an average household used to cultivate crops in both the seasons in their net operated area as 90% area was found to be under irrigation.

Out of total net operational holding 91.11, 92.39, 93.09 and 87.94 per cent of area was found to be irrigated under marginal, small, medium and large farmers in the area under study. Canal (37.09%) followed by bore-well (31.49%) and dug well (14.92%) were found to be major sources of irrigation. An average HH was found to invest Rs. 1738.13 per acre per year as water charges for irrigation through canal, which found to be varies from Rs. 1676.83 (medium) to 1822.35 (large) farmers. Out of total irrigated area, the 45.67 and 45.85 per cent of Gross Cropped Area (GCA) was found to be cultivated in kharif and rabi season respectively and out of total rain fed area only 4.23 and 4.24 per cent of GCA was found to be cultivated in kharif and rabi season respectively.

Black gram (15.15%), soybean (13.3%) and paddy (9.42%) were found to be major kharif crops, while wheat (25.84%) and chickpea (14.07%) were found to be major rabi crops in irrigated condition. Soybean (2.04%) and black gram (1.24%) in kharif and in chickpea (1.99%) in rabi season were found to be major crops grown under rain fed condition. An average HH

found to obtain Rs. 176027/year as a gross farm income from cultivation of crops. He was found to receive Rs. 35112/year net income over cost of production (Rs. 4004/year) and labour cost (Rs. 3850/acre in a year. Amongst different categories of farms, large farmers (Rs.44748 /year) were found to received more value of output as compared to marginal (Rs. 42898/year), small (Rs. 41600/year) and medium (Rs.43589/year) farmers. It was also observed that an average HH was found to receive 7.71 q/acre of production of grains in a year which ranged between 7.30 q/year (marginal) to 8.16 q/year (large) and as the size of holding increases the value of output as well as production of crops increases in the area under study.

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CHAPTER - IV

EFFICIENCY OF SEED MINIKITS IN MADHYA PRADESH

This chapter deals with the numbers of seed minikit distributed, method of sowing, awareness seed minikits of pulses programme among households, documents submitted by them to avail facility, criteria for farmers' selection, productivity and returns with and without seed minikits, distribution seed minikits by different agencies, farmers' opinion regarding seed minikits programme, major problems faced by the farmers in availing the seed minikits and their suggestions, cost incurred and labour used in different operations in cultivation of major pulses, varieties provided under seed minikits and disposal of produce obtained from seed minikits.

4.1 Number of Seed Minikits Distributed

The 200 minikits were found to be distributed among respondents of different size of farms during the year 2017 and 2018. The maximum number of seed minikit were found to be distributed to small farmers (43.5%) followed by marginal (42.5%), medium (9%) and large (5%) respondents in the area under study (Table 4.1). The maximum seed minikits (85.5%) were found to be distributed during the year 2018 as compared to the year 2017 (14.5%).

Table 4.1: Number of seed minikit distributed across size of farms

Particulars	2017	2018	Total
Marginal	14 (48.28)	71 (41.52)	85 (42.5)
Small	14 (48.28)	73 (42.69)	87 (43.5)
Medium	1 (3.45)	17 (9.94)	18 (9)
Large	0 (0)	10 (5.85)	10 (5)
Overall	**29 (100)/14.5/**	**171 (100)/85.5/**	**200 (100)/100/**

Figures in parenthesis shows percentage to overall, while in slashes shows percentage to total

4.2 Method of Sowing

The majority of farmers were found to be cultivated pulses through line sowing (72%) followed by broadcasting (28%) in the area under study. The broadcasting method of sowing was found be adopted by more number of marginal (31.03%) as compared to large (11.76%) farmers and line sowing of method was more adopted by more number of large (88.24%) as compared to marginal (68.97%) farmers (Table 4.2).

Table 4.2: Methods of sowing in cultivation of pulses across size of farms (%)

Method	Marginal	Small	Medium	Large	Overall
Broadcasting	31.03	29.37	21.95	11.76	28.00
Line Sown	68.97	70.63	78.05	88.24	72.00
Total	**100**	**100**	**100**	**100**	**100**

4.3 Awareness of Distribution of Seed Minikits

The agricultural officers (89.66%) followed by farmer facilitator (6.47%) and fallow farmers (3.87%) used to play key role in making respondents aware with regards to distribution of seed minikits. (Table 4.3).

Table 4.3 : Awareness regarding distribution of Seed Minikit (%)

Source	Marginal	Small	Medium	Large	Overall
Agriculture Officer	90.22	90.00	88.89	84.62	89.66
Farmer Facilitator	5.43	5.00	11.11	15.38	6.47
Fellow Farmer	4.34	5.00	0.00	0.00	3.87
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

4.4 Documents Submitted to Avail Seed Minikits

Aadhar Card and copy of land records were found to be major documents to avail facility of seed minikits in the area under study. Some of the farmers also found to submit their bank pass book to availed seed minikit facility in the area under study (Table 4.4).

Table 4.4: Documents submitted to avail Seed Minikit (Numbers)

Documents	Marginal	Small	Medium	Large	Total
Aadhar Card /Pahani (Land records)	70 (82.35)	71 (81.61)	17 (94.44)	9 (90)	167 (83.50)
Bank Passbook	15 (17.65)	16 (18.39)	1 (5.56)	1 (10)	33 (16.50)
Overall	**85 (100)**	**87 (100)**	**18 (100)**	**10 (100)**	**200 (100)**

Note: Figures in parentheses shows percentage of the respective total

4.5 Criteria for Farmer's Selection

All the categories of farmers such as SC/ST, Marginal/Small farmers come under below poverty line and women were found to be selected under seed minikits distribution programme. 49 and 31 per cent of farmer were found to be related to marginal/ small and Schedule Caste/Schedule Tribe categories, while 1 and 8 % of farmers related to below poverty line and women categories respectively. 11 per cent of interested farmers were also found as seed minikit beneficiaries in the study area. (Table 4.5).

Table 4.5 : Number of farmers selected under seed minikits of pulses programm

Farmers	Marginal	Small	Medium	Large	Total
Any Interested Farmers	2 (2.35)	11 (12.64)	6 (33.33)	3 (30)	22 (11)
SC/ST	34 (40)	23 (26.44)	4 (22.22)	1 (10)	62 (31)
Marginal/Small	44 (51.76)	42 (48.28)	8 (44.44)	4 (40)	98 (49)
BPL	1 (1.18)	1 (1.15)	0 (0)	0 (0)	2 (1)
Women	4 (4.71)	10 (11.49)	0 (0)	2 (20)	16 (8)
Overall	**85 (100)**	**87 (100)**	**18 (100)**	**10 (100)**	**200 (100)**

Figures in parenthesis shows percentage to total

4.6 Productivity and Net Return from Pulses

The productivity and net return obtained from various pulses viz. chickpea, lentil and black gram cultivated by cultivators in seed minikit (beneficiaries) and without seed minikit (non- beneficiaries) were also analyzed and presented in Table 4.6. It is observed from the data that on an average the cost of cultivation of chickpea was found to be reduced by 23.67 per cent from Rs. 5489 to Rs. 4190 per acre of an average beneficiaries farm as compared to non-beneficiaries farm. The net return was found to be increased by 40.01 per cent from Rs. 17381 to Rs. 12414 per acre after availing seed minikit facility by the

Table 4.6 : Productivity and net returns obtain from cultivation of chickpea under with and without Seed Minikits

Farm Size	Area under pulses (acres)		Value of Output (Rs/acre)		Cost of Cultivation (Rs/ acre.)		Net Returns (Rs/acre)		Net price obtained (Rs/quintal)	
	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK
Marginal	0.65	0.75	21325 (18.1)	18056	4230 (-31.23)	6151	17095 (43.6)	11905	4440 (1.05)	4394
Small	1.08	0.95	22173 (18.53)	18706	4272 (-25.56)	5739	17901 (38.04)	12968	4545 (2.99)	4413
Medium	2.28	1.97	21752 (17.72)	18477	4140 (-25.28)	5541	17612 (36.15)	12936	4388 (-1.48)	4454
Large	5.80	5.29	21074 (29.31)	16297	4055 (-14.79)	4759	17019 (47.5)	11538	4447 (6.39)	4180
Overall	**1.24**	**1.43**	**21571 (20.49)**	**17902**	**4190 (-23.67)**	**5489**	**17381 (40.01)**	**12414**	**4455 (2.04)**	**4366**

SMK: Seed Minikit, Figures in parenthesis show percentage change over without seed minikits

beneficiary as compared to non-beneficiary. The net price received by an average beneficiary was also found to be increased by 2.0 per cent from Rs. 4455 to Rs. 4366 per quintal as compared to non-beneficiary (Table 4.6). It was also observed that the cost of cultivation of chickpea was found to be decreased with decreased size of farm from Rs. 4230 (marginal) to 4055 (large) on an average size of beneficiaries farm.

The cost of cultivation of lentil was also found decreased by 0.95 per cent from Rs. 4321 to Rs. 4280 per acre in case of an average beneficiaries farm as compared to non-beneficiaries farm, while the net return was found to be increased by 19.61 per cent from Rs. 15203 to Rs. 12711 per acre. The net price received was found to be increased by 5.55 per cent from Rs. 3947 to Rs. 4166 per quintal (Table 4.7). It was also observed as the size of holding increases the cost of cultivation of lentil was found to be decreased with size of farm from Rs. 5048 (marginal) to Rs. 3867 per acre (large) on an average beneficiaries farm.

Table 4.7 : Productivity and net returns obtain from cultivation of lentil under with and without Seed Minikits

Farm Size	Area under pulses (acres)		Value of Output (Rs/acre)		Cost of Cultivation (Rs/ acre .)		Net Returns (Rs/acre)		Net price obtained (Rs/quintal)	
	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK
Marginal	0.07	0.11	19286 (43.01)	13486	5048 (26.2)	4000	14238 (50.09)	9486	4211 (11.52)	3776
Small	0.25	0.43	19307 (19.15)	16204	3837 (-11.57)	4339	15470 (30.38)	11865	4157 (4.21)	3989
Medium	0.53	0.53	19979 (9.37)	18268	4968 (14.55)	4337	15011 (7.75)	13931	4190 (6.18)	3946
Large	0.45	0.93	19556 (4.45)	18723	3867 (-12.41)	4415	15689 (9.65)	14308	4093 (4.25)	3926
Overall	**0.21**	**0.39**	**19483 (14.39)**	**17032**	**4280 (-0.95)**	**4321**	**15203 (19.61)**	**12711**	**4166 (5.55)**	**3947**

SMK: Seed Minikit, Figures in parenthesis show percentage change over without seed minikits

The cost of cultivation of black gram was found to be decreased by 12.89 per cent from Rs. 2537 to Rs. 2210 per acre on an average beneficiaries farm as compare to non-beneficiaries farm, while the net return was found to be increased by 71.53 per cent from Rs.15407 to Rs. 8982 per acre after availing seed minikit facilities by an average beneficiary farmer as compare to non-beneficiary farmer. The net price obtained by an average beneficiary farmer was also found

to be 8.68 per cent increased from Rs. 3743 to Rs. 3444 per quintal as compare to non-beneficiary farmer. As the size of holding increased the average cost of cultivation of black gram in an average beneficiary farm was found to be decreased with increase size of farm from Rs. 2827 (marginal) to Rs. 1734 per acre (large) (Table 4.8).

Table 4.8 : Productivity and net returns obtain from cultivation of black gram under with and without Seed Minikits

Farm Size	Area under pulses (acres)		Value of Output (Rs/acre)		Cost of Cultivation (Rs/ acre.)		Net Returns (Rs/acre)		Net price obtained (Rs/quintal)	
	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK	SMK	Without SMK
Marginal	0.72	0.80	17438 (35.02)	12915	2827 (- 3.02)	2915	14611 (46.11)	10000	3644 (-7.58)	3943
Small	1.13	1.46	17979 (63.91)	10969	2295 (-18.5)	2816	15683 (92.38)	8152	3779 (16.24)	3251
Medium	1.85	1.88	17993 (65.56)	10868	1705 (-23.92)	2241	16289 (88.81)	8627	3880 (21.67)	3189
Large	6.12	3.04	17011 (34.05)	12690	1734 (-11.17)	1952	15278 (42.28)	10738	3713 (-5.9)	3946
Overall	**1.27**	**1.46**	**17617 (52.94)**	**11519**	**2210 (-12.89)**	**2537**	**15407 (71.53)**	**8982**	**3743 (8.68)**	**3444**

SMK: Seed Minikit, Figures in parenthesis show percentage change over without seed minikits

4.7 Sources of Distribution of Seed Minikits

In Madhya Pradesh all the seed minikits of pulses were found to be distributed by the officers of agriculture department (Department of Farmer's Welfare and Agriculture Development) among different size of respondents. No other agency has been found to be involved in distribution of seed minikits of pulses in the State. (Table 4.9).

Table 4.9 : Sources of distribution Seed Minikit

Agency	Marginal	Small	Medium	Large	Total
KVK	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)
Agricultural Departments	85 (42.50)	87 (43.50)	18 (9.00)	10 (5.00)	200 (100)
Gram Panchayat	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)
Total	**85 (100.00)**	**87 (100.00)**	**18 (100.00)**	**10 (100.00)**	**200 (100.00)**

Note: Figures in parentheses are percentage of the respective total

4.8 Respondent's Opinion Regarding Seed Minikits

Respondents opinion regarding seed supply, quality of seed supplied and its distribution were observed and presented in table 4.10. It is observed from the data that majority of respondents opined that the seed supplied in seed minikits were of short duration varieties (100%) having a remarkable yield difference (95.00%), better quality (77.50%) and it fetches more price (64.00%) as compare to their local varieties. The 77.50 per cent of the respondents were found to identify the variety of crops and 56.50% were opined that yield is better than the local variety.

Table 4.10 : Respondents opinion regarding quality of seed supplied and distribution of Seed Minikit (%)

Particulars	Marginal	Small	Medium	Large	Overall
Distribution of Seed Minikit					
a. Yield Difference	94.12	95.40	100.00	90.00	95.00
b. Quality difference	75.29	77.01	83.33	90.00	77.50
c. More profitable	62.35	63.22	72.22	70.00	64.00
d. Short duration of crop	100.00	100.00	100.00	100.00	100.00
Quality of Seed Supplied					
Identify variety of the crop	71.76	83.91	83.33	60.00	77.50
Yield is better	55.29	59.77	50.00	50.00	56.50
Supervision of the field by expert	30.59	55.17	66.67	60.00	46.00
Support to seed distribution	61.18	82.76	83.33	70.00	73.00
Seed Supplied					
Sufficient Quantity of Seed	85.42	12.50	2.08	0.00	100

The 46 per cent respondents opined that there must be supervison of field by the experts in the period of cultivation of crop especially at the time of sowing. The 73 per cent respondents suggested for quality seed distribution by the agriculture department. The cent percent respondents reported that they want seed in sufficient quantity so that they able to cultivate the crop minimum in an acre.

4.9 Content of the Seed Minikit

It is found during the time of investigation that only seed was supplied in seed minikit of pulses programme and no

Table 4.11 : Content with seed in the Seed Minikit (%)

Farm Size	PPC	PSB Culture (100gms)	Rhizobium (100gms)	Others	None
Marginal	0.00	0.00	0.00	0.00	0.00
Small	0.00	0.00	0.00	0.00	0.00
Medium	0.00	0.00	0.00	0.00	0.00
Large	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

other inputs viz. plant protection chemicals (PPC), phosphate solubilizing Bacteria (PSB) and rhizobium culture, fertilizer etc. were provided in seed minikit of pulses programme in the study area. (Table 4.11).

4.10 Major Problems Faced by the Respondents

Poor quality of seed (27%) & non availability of seed minikits on time (73%) were found to be major problems reported by the respondents in availing in the seed minkits in the area under study (Table 4.12).

Table 4.12 : Major problems faced by respondents in availing the Seed Minikit (%)

Particulars	Marginal	Small	Medium	Large	Overall
Poor quality of Seed	23.53	29.89	33.33	20.00	27.00
Non-availability of seed minikit in time	76.47	70.11	66.67	80.00	73.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

4.11 Improvement in Effectiveness of Scheme

The majority of respondents wants short duration varieties of pulses (44.39%) and arrangement of field demonstration in the villages (24.16%) for effectiveness of seed minikit programme. Some of the respondents were reported that more advertisement needed (12.64%) for effectiveness of the programme. Some of the respondents also wants that seed germination test should be made compulsory (18.81%) in the respondents fields for better plant population in the field (Table 4.13).

Table 4.13 : Measures to improve the effectiveness of the scheme (%)

Particulars	Marginal	Small	Medium	Large	Overall
Short duration variety	42.56	38.62	47.18	49.21	44.39
More Advertisement	14.84	10.93	13.55	11.25	12.64
Field demonstration with full packages of practices of pulses production	24.33	18.54	26.34	27.41	24.16
Seed Germination test should be compulsory	18.27	31.91	12.93	12.13	18.81
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

4.12 Suggestions to Improve of Scheme

The majority of respondents suggested that the seed minikits should be supplied at minimum rate (25.78%) for betterment of the programme. They wanted about the information regarding knowledge about latest available varieties of pulses and their sources of availability (21.68%). The respondents also suggested that there should be proper monitoring and supervision of cultivation of crops under seed minikits programme after sowing (20.08%) and more publicity should be required among the farmers of the villages (17.74%) and produce under seed minikit programme should be distributed among other farmers of the villages (14.72%) (Table 4.14).

Table 4.14 : Respondents suggestions to improve the reach of the scheme (%)

Particulars	Marginal	Small	Medium	Large	Overall
Disseminate the knowledge about latest available varieties of pulses and their sources of availability	14.34	19.91	25.95	26.53	21.68
Minikits should be supply at Minimum rate	33.28	31.02	20.07	18.76	25.78
Proper monitoring/supervision cultivation of crops	23.69	21.67	10.08	24.88	20.08
Enhanced publicity among the farmers of the village	16.93	17.46	24.39	12.18	17.74
Produce of the Beneficiaries should be distributed among other farmers	11.76	9.94	19.51	17.65	14.72
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

4.13 Purchased Seed from Seed Minikits

Among the different types of pulses 68.5, 10.0 and 21.5 per cent of seed minikits of pulses were found to be related to chickpea, lentil and black gram respectively, in which total transportation cost were found to be Rs. 1.27 (chickpea), 2.55 (lentil) & 4.91 (black gram) per kg incurred in transportation of seed from Agriculture office to their farm in the area under study. An average respondent was found to cover approximate 12 km. distance to avail the facilities (Table 4.15).

Table 4.15 : Seed purchased by the farmer under Seed Minikits programme

Crop	Quantity (kgs)	Price (Rs/ kg)	Source of purchase from RSK/DAFW (%)	Distance from farm (kms)	Transport ation Cost (Rs/ kg)
Chickpea	16	0	68.5	12	1.27
Lentil	8	0	10	11	2.55
Black Gram	4	0	21.5	12	4.91

Note: RSK: Raitha Samparka Kendra & DAFW-Department of Agriculture and Farmers welfare

An average respondent related to without seed minikits reported that he purchased 55, 25 and 16 Kg. of chickpea, lentil and black gram seed respectively at price of Rs. 62, 51 & 95 from other sources for cultivation of pulses in their field (Table 4.16).

Table 4.16 : Seed purchased by the farmer from other sources of non-beneficiaries

Crop	Quantity (kgs)	Price (Rs/kg)	Source of purchase (%)		Distance from farm (kms)	Transportation Cost (Rs/Kg)
			Seed Owned	Dealer Private		
Chickpea	55	62	65	35	10	0.58
Lentil	25	51	60	40	8	1.12
Black Gram	16	93	49	44	10	1.39

He was found to be used more their owned seed as compared to purchased seed from private dealers. He was found to be covered 8 to 10 km distance to purchase seed from private dealer in which Rs. 0.58 to 1.39 seed was involved as transportation cost.

4.14 Share of Cost of Pulses Crops

Percentage share of different operation in cost of cultivation of pulses production related to chickpea, lentil and black gram was observed and presented in table 4.17, 4.18 and 4.19. It is observed from the data that out of total cost incurred in cultivation of chickpea the maximum cost was found to be incurred in the field preparation (25.14%) followed by fertilizer and its application (17.77), harvesting and threshing (13.97%), farm yard manure (13.52%), seed and sowing (11.35%), bagging & transportation (6.60%), weeding (5.98%), irrigation (4.57%) and plant protection measure (1.11%) (Table 4.17).

Table 4.17 : Operational use cost of cultivation of chickpea across size of farms (%)

Particulars	Marginal	Small	Medium	Large	Overall
Field Preparation	24.25	25.79	25.89	24.81	25.14
Seed/Sowing	10.98	11.50	11.74	11.85	11.35
Farm Yard Manure	14.55	13.33	12.04	11.02	13.52
Irrigation	4.50	4.48	4.67	5.51	4.57
Fertilizers	17.11	17.91	19.26	18.19	17.77
Plant Protection	1.65	0.44	1.05	2.48	1.11
Weeding	6.57	5.58	5.93	5.19	5.98
Harvesting & Threshing	13.86	14.29	13.09	14.06	13.97
Bagging & Transportation	6.53	6.69	6.32	6.89	6.60
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

As the size of farms increases the expenditure on field preparation, seed/sowing, fertilizer application, harvesting & threshing and bagging & transportation were found to be increase, while expenditure in farm yard manure and weeding were found to be decreases in cultivation of chickpea in the area under study.

In total cost of cultivation of lentil the maximum cost was found to be incurred in the field preparation (20.64%) followed by harvesting & threshing (20.32%), seed/sowing (15.77%), irrigation (9.08%), plant protection (8.09%), farm yard manure, (7.85%), and bagging & transportation (7.76%) fertilizers (5.7%) and weeding (4.79%) (Table 4.18).

As the size of farm increased the expenditure incurred in seed & sowing, fertilizers application, weeding, and bagging & transportation were found to be increase, while expenditure on irrigation, plant protection chemical were found to be decrease in cultivation of lentil in the area under study.

Table 4.18 : Operational use cost of cultivation of lentil across size of farms (%)

Particulars	Marginal	Small	Medium	Large	Overall
Field Preparation	20.77	21.78	0.0	20.52	20.64
Seed/Sowing	15.18	15.85	0.0	20.52	15.77
Farm yard manure	8.07	7.45	0.0	8.79	7.85
Irrigation	9.69	8.4	0.0	8.79	9.08
Fertilizers	5.33	6.11	0.0	5.64	5.7
Plant Protection	10.34	4.97	0.0	9.02	8.09
Weeding	2.85	6.02	0.0	3.28	4.79
Harvesting & Threshing	19.7	21.78	0.0	14.65	20.32
Bagging & Transportation	**8.07**	**7.64**	0.0	8.79	7.76
Total	**100**	**100**	0.0	**100**	**100**

In total cost of cultivation of black gram the maximum cost was found to be incurred in the field preparation (19.79%) followed by harvesting & threshing (18.4%), seed/sowing (14.21%), farm yard manure (11.68%), fertilizers (10.58%), weeding (8.23%), plant protection (7.03%), bagging & transportation (6.68%) and irrigation (3.4%) (Table 4.19).

As the size of farm increased the percentage of expenditure to total coat of cultivation on seed & sowing and fertilizer were found to be decreased, while expenditure on farm yard manure, weeding, plant protection chemical, harvesting & threshing and bagging & transportation were found to be increase in cultivation of black gram in the area under study.

Table 4.19 : Operational use cost of cultivation of black gram across size of farms (%)

Particulars	Marginal	Small	Medium	Large	Overall
Field Preparation	19.92	19.5	21.28	16.46	19.79
Seed/Sowing	15.54	14.54	14.04	13.71	14.21
Farm yard manure	9.42	10.6	14.02	13.71	11.68
Irrigation	3.81	2.78	2.23	5.49	3.4
Fertilizers	12.4	10.1	8.93	10.97	10.58
Weeding	4.94	10.72	12.28	13.71	8.23
Plant Protection	6.62	7.54	7.37	6.75	7.03
Harvesting & Threshing	19.3	16.95	**15.39**	**13.71**	18.4
Bagging & Transportation	8.05	7.27	4.46	5.49	6.68
Total	**100**	**100**	**100**	**100**	**100**

4.15 Human Labour Days

Human labour used in different operations in cultivation of major pulses viz. chickpea, lentil and black gram was also

Table 4.20 : Use of human labour by activities (No. of labour per acre)

Particulars	SMK			Without SMK		
	Chickpea	Lentil	Black Gram	Chickpea	Lentil	Black Gram
Land Preparation	2	2	2	2	2	2
Seed/Sowing	2	2	2	2	1	1
FYM	3	3	3	4	3	3
Major and Minor Nutrients	2	2	2	2	1	1
Irrigation	4	2	2	3	2	2
Plant Protection	2	2	2	2	2	2
Weeding	4	2	2	3	2	3
Harvesting and Threshing	12	11	11	12	10	10
Bagging & Transportation	4	4	4	4	3	3
Total	**35**	**30**	**31**	**34**	**26**	**27**
Percentage increased over without SMK	**2.94**	**15.40**	**14.82**			

Note: SMK: Seed Minikit

observed for beneficiaries (seed minikits) and non-beneficiaries (without seed minikits) respondents presented in table 4.20.

It is observed from the data that an average respondent was found to be used maximum labourous in harvesting & threshing followed by bagging & transport, irrigation, farm yard manure application, plant protection chemical, interculture, seed & sowing, and land preparation. Overall labourours engaged in different operations of chickpea, lentil and black gram were found to be increased by 2.94, 15.40 and 14.82 per cent, respectively under farms of seed minikit beneficiaries as compared to non-beneficiaries in the area under study.

4.16 Financial Details

None of respondent was found to imposed financial liability to avail seed minikit facility in the area under study (Table 4.21).

Table 4.21 : Financial details of Seed Minikit

Farm Size	Amount Charged (Rs/Kit)	Amount Reimbursed (Rs/Kit)	Reimbursed Through (Rs/Kit)		Duration of Reimbursement (months)
Marginal	Nil	Nil	Nil	Nil	Nil
Small	Nil	Nil	Nil	Nil	Nil
Medium	Nil	Nil	Nil	Nil	Nil
Large	Nil	Nil	Nil	Nil	Nil
Total	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**

4.17 Details of Seed Minikit

The detail of seed minikit provided for production of pulses is given in table 4.22. It is observed form the table that 16, 8 and 4 Kg. seed of chickpea, lentil and black gram, respectively were found to be provided to cultivated 0.5 acres of area in seed minikit programme during 2018-19 in the area under study.

The 31.02, 49.71 and 51.89 per cent of chickpea, lentil and black gram seed out of 2.45, 1.71 and 2.12 q/HH seed produced was used by the chickpea, lentil and black gram growers respectively in the next year for the cultivation of crops.

Table 4.22 : Details of Seed Minikit provided for different pulses

Particulars	Quantity (kgs/hh)	Area acres	Output Produced from seed Minikits (q/HH)	Output used as seed (q/HH)
Chickpea	16	0.5	2.45	0.76 (31.02)
lentil	8	0.5	1.71	0.85 (49.71)
Black gram	4	0.5	2.12	1.1 (51.89)

4.18 Details of Varieties of Seed Minikit

Out of 200 seed minikits of pulses 137(68.50%), 43(21.50%) and 20(10.00%) were found to be of chickpea, lentil and black gram in the area under study. Out of 137 seed minikits of chickpea, the maximum were found to be distributed to marginal (44.53%) followed by small (37.96%), medium (11.68%) and large (5.84%) size of farmers (Table 4.23).

Out of 43 seed minikits of black gram the maximum were found to be distributed to marginal (55.81%) followed by small (37.21%) medium (4.65%) and large (2.33%) size of farmers. Out of 20 seed minikits of lentil the maximum were found to be distributed to marginal (50.00%) followed by small (45.00%), medium (0.00%) and large (5.00%). JG-14 (92.70%) was found to be major variety of chickpea distributed among chickpea growers in the area under study. The other varieties of chickpea which were distributed among the respondents were found to be JG-64(5.11%), JG-16(1.46%) and JG-73 (0.73%) (Table 4.23).

Table 4.23 : Details of varieties of Seed Minikit provided for Chickpea

Particulars	JG-14	JG-16	JG-64	JG-73	Total
Marginal	48	1	2	1	52 (37.96)
Small	58	1	2	0	61 (44.53)
Medium	13	0	3	0	16 (11.68)
Large	8	0	0	0	8 (5.84)
Total	**127**	**2**	**7**	**1**	**137 (100)**

Table 4.24: Details of varieties of Seed Minikit provided for Lentil

Particulars	IPL-316	JL-3	JL-4	JLS316	Total
Marginal	7	1	1	1	10 (50)
Small	6	0	3	0	9 (45)
Medium	0	0	0	0	0 (0)
Large	1	0	0	0	1 (5)
Total	**14**	**1**	**4**	**1**	**20 (100)**

IPL-316 (70.00%) was found to be major variety of lentil distributed among lentil growers, while other varieties distributed among respondents were found to be JL -4(20.00%), JL-3(5.00%) and JL-316 (5.00%) (Table 4.24).

In case of black gram PU-31 (44.19%) was found to be major variety distributed among respondents, while Shekhar (18.60%), P-1 (18.60%), Azad (13.95%) and PU-1(4.65%) were found to be other others varieties distributed among the respondents (Table 4.25).

4.19 Disposal of produced

The most prominent channel followed by the beneficiaries for disposal of chickpea produce under seed minikit of pulses programme was found to be village farmers (52.55%). They were also be found to disposed off their 34.31 and 13.14 percent of chickpea produce obtained under seed minikit of pulses programme to hat market and APMC respectively.

In total produce of chickpea, which was found to be disposed of by all the farmers through hat market the share of marginal farmers (40.38%) was found to be maximum as compared to small (31.15%), medium (37.50%) and large (12.50%) farmers, while produce of chickpea disposed off though APMC the share of large farmers (37.50%) was found to be more

Table 4.25 : Details of varieties of Seed Minikit provided for Black Gram

Particulars	AZAD	P-1	PU-1	PU-31	Shekhar	Total
Marginal	1	5	0	14	4	24 (55.81)
Small	4	3	2	5	2	16 (37.21)
Medium	1	0	0	0	1	2 (4.65)
Large	0	0	0	0	1	1 (2.33)
Total	**6**	**8**	**2**	**19**	**8**	**43 (100)**

Table 4.26 : Marketing channels through which pulses sold by the selected households (percentage of output)

Particulars	V Farmers	Hat Market	V Traders	APMC
Chickpea				
Marginal	50.00	40.38	0.00	9.62
Small	55.74	31.15	0.00	13.11
Medium	50.00	37.50	0.00	12.50
Large	50.00	12.50	0.00	37.50
Total	**52.55**	**34.31**	**0.00**	**13.14**
Lentil				
Marginal	30.00	10.00	40.00	20.00
Small	66.67	11.11	22.22	0.00
Medium	0.00	0.00	0.00	0.00
Large	100.00	0.00	0.00	0.00
Total	**50.00**	**10.00**	**30.00**	**10.00**
Black Gram				
Marginal	34.78	34.78	4.35	26.09
Small	23.53	29.41	0.00	47.06
Medium	50.00	0.00	0.00	50.00
Large	0.00	0.00	0.00	100.00
Total	**30.23**	**30.23**	**2.33**	**37.21**

as compare to small (13.11%), medium (12.50%) and marginal farmers (9.62%). Approximately half of the chickpea produced arrived under seed minikit of pulses programme was found to be sold to village farmers across size of farms (Table 4.26).

In case of lentil it was found that the maximum quantity of lentil disposed off through village farmers (50%) followed by village traders (30%), hat market (10%) and APMC (10%), while in case of black gram the highest quantity found to be disposed off through APMC (37.21%) followed by village farmers (3.23%), hat market (30.23%) and village traders (2.33%) There was no remarkable difference was found in different size of respondents. Although, large size of respondents were found to be sell 100 per cent production of blackgram in APMC, these findings were found to similar for all size of respondents (Table 4.26).

2.20 Summary of the Chapter

Seed minikits were found to be distributed to all the respondents. The maximum number of seed minikit were found to be distributed to small farmers (43.5%) followed by marginal (42.5%), medium (9%) and large (5%) respondents in the area under study. The majority of them cultivated pulses through line sowing followed by broadcasting method of sowing. The broadcasting method of sowing was found be adopted by more number of marginal (31.03%) as compared to large (11.76%) farmers and line sowing of method

was more adopted by more number of large (88.24%) as compared to marginal (68.97%) farmers. The agricultural officers (89.66%) followed by farmer facilitator (6.47%) and fallow farmers (3.87%) used to play key role in making respondents aware with regard to distribution of seed minikits. Aadhar Card and copy of land records were found to be major documents to avail facility of seed minikits in the area under study.

The cost of production of chickpea, lentil and black gram were found to be reduced from 18.67 (lentil) to 35.35 (chickpea) per cent after availing facilities of seed minikit programme. The net return was also found to be increased 39.22 (chickpea), 35.60 (lentil) and 81.72 (black gram) per cent after availing seed minikit facilities by the average beneficiaries farmers as compared to non-beneficiaries farmers. The net obtained price was also found to be increased 2.45 (chickpea), 5.55 (lentil) and 31.80 (black gram) per cent in average beneficiaries farmers as compared to non-beneficiaries farm.

In Madhya Pradesh all the seed minikits of pulses were found to be distributed by the officers of agriculture department (Department of Farmer's Welfare and Agriculture Development) among different size of respondents. No other agency has been found to be involved in distribution of seed minikits of pulses in the State. The majority of respondents opined that the seed supplied in seed minikits were of short duration varieties (100%) having a remarkable yield difference (74%), better quality (73%) and it fetches more price (64%) as compare to their local varieties. The Madhya Pradesh only seed was found to be supplied in seed minikit of pulses programme. The majority of respondents reported that non availability of seed minikit on time (73%) was found to be major problem in available seed minikit. They were wants short duration varieties of pulses (44.39%) and arrangement of field demonstration in the villages (24.16%) for effectiveness of seed minikit programme. The majority of respondents suggested that the seed minikits should be supplied at minimum rate (25.78%) for betterment of the programme. They wanted about the information regarding knowledge about latest available varieties of pulses and their sources of availability (21.68%). The respondents also suggested that there should be proper monitoring and supervision of cultivation of crops under seed minikits programme after sowing (20.08%) and more publicity should be required among the farmers of the villages (17.74%) and produce under seed minikit programme should be distributed among other farmers of the villages (14.72%).

Among the different types of pulses 68.5, 10.0 and 21.5 per cent of seed minikits of pulses were found to be related to chickpea, lentil and black gram respectively, in which total transportation cost were found to be Rs. 1.27 (chickpea), 2.46 (lentil) & 5.00 (black gram) per kg incurred in transportation of seed from Agriculture office to their farm in the area under study. An average respondent was found to cover approximate 12 km. distance to avail the facilities. He purchased 55, 25 and 16 Kg. of chickpea, lentil and black gram seed respectively at price of Rs. 62, 51 & 95 from other sources for cultivation of pulses in their field. He was found to be used more their owned seed as compared to purchased seed from private dealers. He was found to be covered 8 to 10 km distance to purchase seed from private dealer in which Rs. 0.58 to 1.39 seed was involved as transportation cost.

Out of total cost of cultivation incurred in production of chickpea, the maximum cost was found to be incurred in the field preparation (25.14%) followed by fertilizer and its application (17.77), harvesting and threshing (13.97%), farm yard manure (13.52%), seed and sowing (11.35%), bagging & transportation (6.60%), weeding (5.98%), irrigation (4.57%) and plant protection measure (1.11%), while in total cost of cultivation of lentil and black gram the maximum cost was found to be incurred in the field preparation followed by harvesting & threshing, seed/sowing, farm yard manure and others operations. As regards to labour used an average respondent was found to be maximum in harvesting & threshing followed by bagging & transport, irrigation, farm yard manure application, plant protection chemical, interculture, seed & sowing, and land preparation. Overall labourers engaged in different operations of chickpea, lentil and black gram were found to be increased by 12.82, 16.13 and 10.00 per cent, respectively under farms of seed minikits beneficiaries as compared to non-beneficiaries in the area under study.

None of respondent was found to imposed financial liability to avail seed minikits facility in the area under study. The 16, 8 and 4 Kg. seed of chickpea, lentil and black gram, respectively were found to be provided to cultivated 0.5 acres of area in seed minikits programme during 2018-19 in the area under study. The 31.02, 49.71 and 51.89 per cent of chickpea, lentil and black gram seed out of 2.45, 1.71 and 2.12 q/HH seed produced was used by the chickpea, lentil and black gram growers respectively in the next year for the cultivation of crops.

JG-14 (92.70%) was found to be major variety of chickpea distributed among chickpea growers in the area under study. The other varieties of chickpea which were distributed among the respondents were found to be JG-64(5.11%), JG-16(1.46%) and JG-73 (0.73%). IPL-316 (70.00%) was found to be major variety of lentil distributed among lentil growers, while other varieties distributed among respondents were found to be JL -4(20.00%), JL-3(5.00%) and JL-316 (5.00%). In case of black gram PU-31 (44.19%) was found to be major variety distributed among respondents, while Shekhar (18.60%), P-1 (18.60%), Azad (13.95%) and PU-1(4.65%) were found to be others varieties distributed among the respondents.

The most prominent channel followed by the beneficiaries for disposal of chickpea produce under seed minikit of pulses programme was found to be village farmers (52.55%). They were also be found to disposed off their 34.31 and 13.14 per cent of chickpea produce obtained under seed minikit of pulses programme to hat market and APMC respectively. In case of lentil it was found that the maximum quantity of lentil disposed off through village farmers (50%) followed by village traders (30%), hat market (10%) and APMC (10%), while in case of black gram the highest quantity found to be disposed off through APMC (37.21%) followed by village farmers (3.23%), hat market (30.23%) and village traders (2.33%) There was no remarkable difference was found in different size of respondents. Although, large size of respondents were found to be sell 100 per cent production of lentil in APMC, these findings were found to similar for all size of respondents .

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CHAPTER - V

SUMMARY, CONCLUSIONS AND POLICY IMPLICATION

5.1 Major findings

➢ Madhya Pradesh had 23 per cent share of total pulses in gross cropped area (GCA). The cultivated of all the districts were found to produce pulses in their field. The share of total pulses to GCA was varying from to 9.6 (Khargone) to 42 (Panna) per cent in Madhya Pradesh.

➢ The area under rice and coarse cereals was found to be decreased by 3.9 and 30.9 per cent with annual average growth rate of 0.39 and 3.03 per cent, respectively, while area of wheat, total pulses, total food grain and other pulses, was found to be increased by 21.1 per cent with the annual average growth rate of 2.11, 17.6, 4.5 & 2.3 per cent during the period 2001-10. The production of rice, wheat, total pulses and total food grain was found to be increased by 11.30, 31.22, 25.34 & 21.31 per cent with the annual average growth rate of 1.13, 3.12, 2.53 & 2.13 per cent per year, respectively, during the period 2001-10 while the production of total coarse cereals was found to be decreased by -15.93 per cent with the annual average growth rate of -1.59 per cent per year, respectively in Madhya Pradesh. Amongst different pulses viz. chickpea, blackgram, lentil, arhar and green gram the area was found to be increased by 23.1, 15.4, 9.4, 5.9 and 4.2 per cent per year during the period with the annual average growth of -2.31, -1.54, -0.94, -0.59 & -0.42 per cent per year respectively, during the period 2001 -10. The production of all the pulses viz. chickpea, black gram, lentil, green gram, other pulses and arhar was found to be increased with the annual average growth rate of 2.86, 2.86, 1.83, 1.65, 0.91 and 0.05, per cent per year respectively during 2001-2010 in Madhya Pradesh. The yield of different pulses in Madhya Pradesh was also found to be increased with the annual average growth of 1.23 (chickpea), 1.08 (lentil), 1.76 (black gram), 1.32 (green gram) & 0.69 (other pulses) per cent excepted -0.55 (arhar) per cent per year during period 2001-10.

➢ During period 2010-17 the area of all the food grains i.e. rice, wheat, coarse cereals, total pulses and food grains was found to increased with 23.4, 15.2, 4.6, 13.2 & 14.2 per cent with annual average growth rate of 4.67, 3.05, 0.91, 2.64 & 2.83 per cent per year, respectively in Madhya Pradesh. The production of all the food grains was also found to be increased in this period (2010-17) in State. The production of rice, coarse cereal, wheat, pulses, and total food grain was found to be increased by 55.45, 27.20, 30.50, 27.95 & 32.32 per cent with annual average growth rate of 11.09, 5.44, 6.10, 5.59 and 6.46

per cent per year, respectively in this particular period in Madhya Pradesh. The yield of food grains was found to be increased with annual average growth of 9.01 (rice), 3.22 (wheat), 5.47 (coarse cereal), 3.69 (pulses) and 4.55 (food grain) per cent.

➢ Amongst different pulses cultivated by the farmers of Madhya Pradesh, the area of chickpea, black gram, , arhar, green gram and other pulses was found to be increased with annual average growth rate of 1.39, 10.22, 23.91, 0.22 & 7.50 per cent per year, while the area of lentil was found to be decreased by the annual average growth rate of -2.20 per cent, respectively. The production of all the pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also found to be increased by 11.20, 51.98, 55.24, 57.89, 50.21 & 63.36 per cent, respectively with the annual average growth rate of 2.24, 10.40, 11.05, 11.58, 10.04 & 12.67 per cent, respectively during the period from 2010-17 in Madhya Pradesh. The yield of different pulses viz. chickpea, lentil, black gram, green gram, arhar and other pulses was also increased with annual average growth of 1.01, 11.45, 6.47, 1.51, 9.93 and 9.92 per cent per year, respectively during this period.

➢ The area of total pulses was found to be increased by 87.07 per cent from 22782 to 25976 thousand ha in the country during 2016-17 as compared 2006-07. Amongst different states the area of pulses was found to be increased maximum in Madhya Pradesh (19-23%) followed by Rajasthan (15-16%), Karnataka (9-10%) and other states (7-11%) to total area of the country in the year 2016-17 as compared to 2006-07. The production of pulses was found to be increased by 39.05 per cent 13570 to 18870 thousand tonnes in the country in the period 2006-17 as compared to 2006-07. The production of pulses was found to be increased from 24 to 29, 9 to 13, 7 to 8, 3 to 4, 7 to 12 per cent in Madhya Pradesh, Rajasthan, Karnataka, Chhattisgarh and Uttar Pradesh. The yield of total pulses was found to be increased in all the pulses growing States of the country during 2016-17 as compared to 2006-07 from 764 to 910 (Madhya Pradesh), 561 to 651 (Maharashtra), 364 to 570 (Rajasthan), 410 to 527 (Karnataka), 795 to 710 (Uttar Pradesh), 672 to 796 (Andhra Pradesh), 471 to 765kg/ha (Chhattisgarh), 651 to 914 (Gujarat), 418 to 529 (Orissa), 726 to 879 (Bihar) and 607 to 809 (Other States) The yield of total pulses was found to be increased 596 to 727 kg/ha in India in the year 2016-17 as compared 2006-07.

➢ The area of total pulses was found to be increased by 26.17 per cent from 4368 (2006-07) to 5511(2016-17) thousand ha in Madhya Pradesh. The percentage share of area of black gram and green gram to total area of pulses was found to be increased from 11 to 16, 2 to 3 and 7 to 10 per cent respectively, while percentage share of chickpea and lentil was found to be decreased from 60 to 53 & 12 to 10 per cent respectively.

➢ The production of total pulses was also found to be increased by 659.77 per cent from 4437 (2006-07) to 5151 (2016-17) in Madhya Pradesh. The contribution of all the pulses viz. lentil, black gram, arhar and other pulses to total production of pulses was found to be increased from 8 to 10, 5 to 9, 7 to 11 and 5 to 7 per cent respectively, except chickpea, which was decreased by 74 to 62 per cent in Madhya Pradesh. The production of green gram was found to be stagnate to 1 per cent to total area of pulses in both the period.

➢ The productivity of all the pulses was found to be increased in 2016-17 as compared to 2006-07. The productivity of all the pulses grown by the farmers viz. chickpea, lentil, black gram, green gram, arhar, other pulses and total pulses was found to be increased from 842 to 1077, 422 to 930, 319 to 525, 297 to 364, 613 to 1043, 510 to 906 and 763 to 935 kg/ha respectively, in 2016-17 as compared to 2006-07 respectively in Madhya Pradesh.

➢ The area, production and yield of total pulses were found to be increased 26.2, 54.5 & 22.4 per cent in 2016-17 over the year 2006-07 in Madhya Pradesh. The area of total pulses was found to be increased in all the districts of Madhya Pradesh except Jhabua (-60.5%), Shajapur (-21.9%), Bhind (-20.7%), Narsinghpur (-19.8%), Sagar (-19.3%), Sidhi (-12.4%), Jabalpur (-10.9%), Raisen (-9.5%) and Chhatarpur (-3.5%) in the year 2016-17 as compared to the year 2006-07.

➢ The study confined to the Datia and Sagar districts of Madhya Pradesh and related to 116 marginal, 126 small, 41 medium and 17 large HHs reveals that the average size of these all HHs (300) comprised of 6 members, out of which 3 were found to be engaged in farming. The majority of HHs was found to be between 30 to 60 years (77.67%) and an average HH was have 34 years of experience in farming. The majority of HHs was found to be belong to OBC (40.00%) followed by SC (28.67%), general (23.67%) and (ST (7.67%) categories and primarily depends on agriculture and allied activities for their livelihood. As for as secondary occupation of the HHs is concerned, the majority of the HHs was found to be engaged as agricultural labourers (46.85%) followed by non-agricultural labours (16.08%), salaried persons (13.29%), self business (13.29%), self services (5.59%) and agricultural and allied activities (2.80%). The annual income of an average HH from agriculture and allied activities (77.83%) was found to more as compared to non-agriculture activities (22.17%). The annual income of an average HH was found to be Rs. 144857/year, in which share of agriculture and allied activity (Rs. 112740/year) was found to be more as compared to non agriculture sources (Rs. 32117/year)

➢ An average household used to leased-in land of 2.41 acres. Leased-out land was not found in practice by the HHs in the area under study. An average HH was found to

leased in land with a rent of Rs.7431/season, which was found to be varied from Rs. 6250 (marginal) to Rs.6594 (small) per season in the area under study. The cropping intensity of 198 per cent per year, which indicates that an average household used to cultivate crops in both the seasons in their net operated area as 90% area was found to be under irrigation.

- Out of total net operational holding 91.11, 92.39, 93.09 and 87.94 per cent of area was found to be irrigated under marginal, small, medium and large farmers in the area under study. Canal (37.09%) followed by bore-well (31.49%) and dug well (14.92%) were found to be major sources of irrigation. An average HH was found to invest Rs. 1738.13 per acre per year as water charges for irrigation through canal, which found to be varies from Rs. 1676.83 (medium) to 1822.35 (large) farmers.Out of total irrigated area, the 45.67 and 45.85 per cent of Gross Cropped Area (GCA) was found to be cultivated in kharif and rabi season respectively and out of total rain fed area only 4.23 and 4.24 percent of GCA was found to be cultivated in kharif and rabi season respectively.

- Black gram (15.15%), soybean (13.3%) and paddy (9.42%) were found to be major kharif crops, while wheat (25.84%) and chickpea (14.07%) were found to be major rabi crops in irrigated condition. Soybean (2.04%) and black gram (1.24%) in kharif and in chickpea (1.99%) in rabi season were found to be major crops grown under rain fed condition. An average HH found to obtain Rs. 176027/year as a gross farm income from cultivation of crops. He was found to receive Rs. 35112/year net income over cost of production (Rs. 4004/year) and labour cost (Rs. 3850/acre in a year. Amongst different categories of farms, large farmers (Rs.44748 /year) were found to received more value of output as compared to marginal (Rs. 42898/year), small (Rs. 41600/year) and medium (Rs.43589/year) farmers. It was also observed that an average HH was found to receive 7.71 q/acre of production of grains in a year which ranged between 7.30 q/year (marginal) to 8.16 q/year (large) and as the size of holding increases the value of output as well as production of crops increases in the area under study.

- Seed minikits were found to be distributed to all the respondents. The maximum number of seed minikit were found to be distributed to small farmers (43.5%) followed by marginal (42.5%), medium (9%) and large (5%) respondents in the area under study. The majority of them cultivated pulses through line sowing followed by broadcasting method of sowing. The broadcasting method of sowing was found be adopted by more number of marginal (31.03%) as compared to large (11.76%) farmers and line sowing of method was more adopted by more number of large (88.24%) as compared to marginal (68.97%) farmers. The agricultural officers (89.66%)

followed by farmer facilitator (6.47%) and fallow farmers (3.87%) used to play key role in making respondents aware with regard to distribution of seed minikits. Aadhar Card and copy of land records were found to be major documents to avail facility of seed minikits in the area under study.

➢ The cost of production of chickpea, lentil and black gram were found to be reduced from 18.67 (lentil) to 35.35 (chickpea) per cent after availing facilities of seed minikit programme. The net return was also found to be increased 39.22 (chickpea), 35.60 (lentil) and 81.72 (black gram) per cent after availing seed minikit facilities by the average beneficiaries farmers as compared to non-beneficiaries farmers. The net obtained price was also found to be increased 2.45 (chickpea), 5.55 (lentil) and 31.80 (black gram) per cent in average beneficiaries farmers as compared to non-beneficiaries farm.

➢ In Madhya Pradesh all the seed minikits of pulses were found to be distributed by the officers of agriculture department (Department of Farmer's Welfare and Agriculture Development) among different size of respondents. No other agency has been found to be involved in distribution of seed minikits of pulses in the State. The majority of respondents opined that the seed supplied in seed minikits were of short duration varieties (100%) having a remarkable yield difference (74%), better quality (73%) and it fetches more price (64%) as compare to their local varieties. The Madhya Pradesh only seed was found to be supplied in seed minikit of pulses programme. The majority of respondents reported that non availability of seed minikit on time (73%) was found to be major problem in available seed minikit. They were wants short duration varieties of pulses (44.39%) and arrangement of field demonstration in the villages (24.16%) for effectiveness of seed minikit programme. The majority of respondents suggested that the seed minikits should be supplied at minimum rate (25.78%) for betterment of the programme. They wanted about the information regarding knowledge about latest available varieties of pulses and their sources of availability (21.68%). The respondents also suggested that there should be proper monitoring and supervision of cultivation of crops under seed minikits programme after sowing (20.08%) and more publicity should be required among the farmers of the villages (17.74%) and produce under seed minikit programme should be distributed among other farmers of the villages (14.72%).

➢ Among the different types of pulses 68.5, 10.0 and 21.5 per cent of seed minikits of pulses were found to be related to chickpea, lentil and black gram respectively, in which total transportation cost were found to be Rs. 1.27 (chickpea), 2.46 (lentil) & 5.00 (black

gram) per kg incurred in transportation of seed from Agriculture office to their farm in the area under study. An average respondent was found to cover approximate 12 km. distance to avail the facilities. He purchased 55, 25 and 16 Kg. of chickpea, lentil and black gram seed respectively at price of Rs. 62, 51 & 95 from other sources for cultivation of pulses in their field. He was found to be used more their owned seed as compared to purchased seed from private dealers. He was found to be covered 8 to 10 km distance to purchase seed from private dealer in which Rs. 0.58 to 1.39 seed was involved as transportation cost.

➢ Out of total cost of cultivation incurred in production of chickpea, the maximum cost was found to be incurred in the field preparation (25.14%) followed by fertilizer and its application (17.77), harvesting and threshing (13.97%), farm yard manure (13.52%), seed and sowing (11.35%), bagging & transportation (6.60%), weeding (5.98%), irrigation (4.57%) and plant protection measure (1.11%), while in total cost of cultivation of lentil and black gram the maximum cost was found to be incurred in the field preparation followed by harvesting & threshing, seed/sowing, farm yard manure and others operations. As regards to labour used an average respondent was found to be maximum in harvesting & threshing followed by bagging & transport, irrigation, farm yard manure application, plant protection chemical, interculture, seed & sowing, and land preparation. Overall labourers engaged in different operations of chickpea, lentil and black gram were found to be increased by 12.82, 16.13 and 10.00 per cent, respectively under farms of seed minikits beneficiaries as compared to non-beneficiaries in the area under study.

➢ None of respondent was found to imposed financial liability to avail seed minikits facility in the area under study. The 16, 8 and 4 Kg. seed of chickpea, lentil and black gram, respectively were found to be provided to cultivated 0.5 acres of area in seed minikits programme during 2018-19 in the area under study. The 31.02, 49.71 and 51.89 per cent of chickpea, lentil and black gram seed out of 2.45, 1.71 and 2.12 q/HH seed produced was used by the chickpea, lentil and black gram growers respectively in the next year for the cultivation of crops.

➢ JG-14 (92.70%) was found to be major variety of chickpea distributed among chickpea growers in the area under study. The other varieties of chickpea which were distributed among the respondents were found to be JG-64(5.11%), JG-16(1.46%) and JG-73 (0.73%). IPL-316 (70.00%) was found to be major variety of lentil distributed among lentil growers, while other varieties distributed among respondents were found

to be JL -4(20.00%), JL-3(5.00%) and JL-316 (5.00%). In case of black gram PU-31 (44.19%) was found to be major variety distributed among respondents, while Shekhar (18.60%), P-1 (18.60%), Azad (13.95%) and PU-1(4.65%) were found to be other others varieties distributed among the respondents.

➢ The most prominent channel followed by the beneficiaries for disposal of chickpea produce under seed minikit of pulses programme was found to be village farmers (52.55%). They were also be found to disposed off their 34.31 and 13.14 per cent of chickpea produce obtained under seed minikit of pulses programme to hat market and APMC respectively. In case of lentil it was found that the maximum quantity of lentil disposed off through village farmers (50%) followed by village traders (30%), hat market (10%) and APMC (10%), while in case of black gram the highest quantity found to be disposed off through APMC (37.21%) followed by village farmers (3.23%), hat market (30.23%) and village traders (2.33%) There was no remarkable difference was found in different size of respondents. Although, large size of respondents were found to be sell 100 per cent production of blackgram in APMC, these findings were found to similar for all size of respondents.

5.2 Policy Implication

➢ Seed is considered to be the major input, while cultivation of crops therefore before distribution of seed minikits, result demonstrations are required to be laid down on the farmers field to transfer the technology in totality and major inputs other than seed should be clubbed and distributed among farming communities with seed minikits to generate real impact of the technology.

➢ The farmers should be exposed to crop cafeteria grown by the KVKs were different popular/improved varieties were found to be grown, so that farmers should be able to recognise different varieties of a particular crop with its peculiar characteristics and adopt varietal diversification for enhancing the efficiency of the resources being used on one hand and increasing the productivity on the other, which leads to doubling the income of the farmers.

➢ As of now, there is no mechanism for collection of seed produced through seed minikits by govt agencies and its distributions among non-beneficiaries farming community at affordable prices, with the result of it farmers are bound/forced to sell it in the local/APMC markets as grain instead of seed in the absence of proper supply/ value chain for the marketing of the seed causing reduced income. This not only leads to wastage of precious input on the one hand and without its distribution it slower down the pace of penetration (horizontal/vertical) of the

improved technology among farming community on time and thereby increasing the time-leg for adoption of technology on the other incurring loss to the farming community in both ways. Sometimes the technology become old and looses its identity before its proper maturity due to introduction of new technology and in the absence of proper mechanism.

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ANNEXURE-I

COORDINATOR'S COMMENTS AND ACTION TAKEN ON THE REPORT SUBMITTED BY

Agro Economic Research Centre, Jabalpur, Madhya Pradesh

1. **Title of the draft report examined:** Relevance and Distribution Efficiency of Seed Minikits of Pulses in Madhya Pradesh
2. **Date of receipt of the draft report:** 16th June 2020
3. **Date of dispatch of the comments:** 4th September , 2020
4. **Comments on the objectives of the study:** The objectives of the study as proposed have been addressed albeit calculation mistakes need to be corrected.

Action: Corrected as Suggested

5. **Comments on the methodology:** The common methodology proposed for collection of primary data and tabulation of results has been followed.

Action: Corrected as Suggested

6. **Comments on analysis, organization, presentation etc.:** While calculating aggregate, please do not take simple averages. The values worked out at the aggregate in all tables are wrong. So kindly recalculate all these table for the aggregate and the sum total should be by dividing aggregate of the entire sample not by averaging marginal, small, medium and large farmers.

Action: Corrected as Suggested

The Cost of production should be reported in terms of Rs per acre, so that it has compatibility with the overall table. The aggregate values are wrong as indicated by the yellow ink. Please make all corrections. Table 4.8: Seed supplied sum of marginal, small, medium and large is calculated as 100% whereas it is asked whether the seed supplied was in sufficient quantity or not for which each farmer category will have independent number and total would be average of all the four categories. In Tables 4.13 and 4.14, transportation cost is reported as Rs 20 to 30 per kg which is almost 50% of the price per kg for a distance of 10-12 kilometers. How is this possible? For carrying one kg seed how farmer has to pay that high. Transport cost cannot exceed one to two percent of the price. In tables 4.14, 4.15, 4.16 and 4.17 along with percentages also give the aggregate cost. Table 4.20, area sown using seed-mini-kits does not match with area shown in Table 4.6.

Action: Corrected as Suggested

7. **Overall view on acceptability of report**

The draft report needs revisions. The revisions should be in accordance with the comments/suggestions. The soft copy of the revised report and revised excel data should be sent to us at the earliest as it helps in consolidating the state reports.

Agro Economic Research Centre for Madhya Pradesh & Chhatishgarh

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