DOUBLING FARMERS' INCOME BY 2022

Vol. VI

(PRODUCTION ENHANCEMENT THROUGH PRODUCTIVITY GAINS)

PULSES: STRATEGY FOR ENHANCEMENT OF PULSES PRODUCTION BY 2022

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PREFACE

Food security and doubling of farmerôs income by 2022 is top the Government's agenda as production stagnates and prices unstable. The greatest challenge to the agriculture in the years to come is to provide adequate food to burgeoning population in order to combat with hunger and malnutrition. We will have to feed more people with scarce water resources, recurring droughts, degrading lands and difficult access to energy. The agricultural technologies need a shift from production oriented to profit oriented sustainable farming system.

A shift in crop preferences by the farmers has been seen since the 1990s. Indo-Gangetic belt farmers who grew pulses earlier, have increasingly taken to wheat production where yields range from 3,000 to 4,000 kg per hectare compared to only about 800 kg in case of pulses. Over the past two decades the production of pulses has largely shifted from northern India to central and southern part. Today, 80% of total pulses production is realized in six states namely, Madhya Pradesh, Maharashtra, Rajasthan, Andhra Pradesh, Karnataka and Uttar Pradesh. Both area and productivity of chickpea significantly increased over decades.

The Recommended Dietary Allowances (RDA) for adult male and female is 60 g and 55 g per day. The per capita availability of pulses is @ 42 g per day. Pulses are chief source of vegetable protein in the human diet. The deficiency of protein in human diet often leads to Protein-Energy-Malnutrition (PEM) causing various forms of anemia. Besides, nutritive value of pulses in human diet, food legumes tend to fix atmospheric nitrogen to N- compounds to the tune of 72 to 350 kg per hectare per year and provide soil cover that helps to sustain soil health.

India is the largest producer, 25% of worldôs production, and consumer 27% of total pulses of the world. The domestic production is often less than the estimated demand i.e. 23-24 million tons. Studies on consumption pattern has revealed that in India only 8-10 million tons of pulses are used directly as a food item (Dal), the remaining 12 million tons being indirect actual consumption as processed/value added products such as snacks, fast food for domestic consumption and export. Thus the average gap of 05 MT is met through imports. In India, the share of pulses to gross cropped area and in total foodgrains basket is about 12 per cent and 6-7 per cent respectively.

Indiaôs outstanding contribution towards total global acreage and production of pulses at 35 per cent and 25 per cent respectively is credited to our strength. The three five year plans viz., X^{th}, XI^{th} & XII^{th} exhibited an increasing yield trends, the highest being 784 kg/ha during 2016-17 as against the worldôs average productivity of 909 kg/ha, is less than the demonstrated potential under the frontline demonstrations. The targeted production and productivity is possible by way of harnessing this yield gap by growing pulses in new niches, precision farming, quality inputs, soil test based INM and mechanized method of pulse cultivation complimented with generous *Governmental Policies* and appropriate funding support to implementing states/stake holders.

In India, pulses have always received due attentions both in terms of requirement by consumers and adequate programmatic support from the government at the production front. Besides the game changing efforts under the *'Prime Minister's Krishi Sinchai Yojna'* pulse

production has received adequate importance. The IT initiatives in extension/apps to access market, Soil Health Cards, INM, crop advisories and E-NAM, involvement of KVKs in seed hub, additional breeder seed production, strengthening Bio-fertilizer/Bio-control production units and FPOs etc., are other specific efforts. Creation of buffer stock etc., are the other policy interventions.

August.14th, 2017

(A.K. Tiwari)
Director

6. Vol. VI- Production Enhancement through Productivity Gains

6.3 Pulses: Strategy for Enhancement of Pulses Production by 2022

1.0 Background

- Honôble Minister for Agriculture and Farmersô Welfare applauded efforts of the Central and State Governments in attaining an estimated record production of about 273.38 million tons in foodgrains and 32.52 million tons in oilseeds. The Minister made a special reference particularly referred to the quantum jump in pulses production, estimated at a record breaking 22.40 million tons as per the IIIrd Advance Estimate and the roadmap to scale up pulses production to 26 MT by 2022.
- States with lowest productivity should try and attain the national average and those with higher than average strive to bridge the yield gap of the best performing states in the country. Simillarly, disparities in the productivity amongst the districts within the states also need to be addressed.
- Multipronged strategy would be needed to double farmersô income by 2022. It is contemplated that the Pradhan Mantri Fasal Bima Yojana coverage would be expanded to 40% and 50% , of the total cropped area,during 2017-18 and 2018-19 respectively; implementation of the Paramparagat Krishi Vikas Yojana in a mission mode to promote organic farming, particularly in the rainfed and hilly areas; to leverage technology in the implementation of the schemes;to promote the custom hiring centers and use of solar technology, wherever feasible ; the need for digitalization of agriculture for greater efficiency
- Integrated farming and diversifications not only raise income but reduce the risk arising out of calamity, disease or price volatility.
- To promote Farmers Producers Organisations in enabling transfer of technology, aggregation, value addition and marketing of produce.
- The reduction of post harvest losses in quality and quantity can have a favourable impact on farmersô incomes.
- Prof. Ramesh Chand, Member, NITI Aayog, in his presentation on doubling farmersôincome,has emphasised asssured procurement in case of excess production of perishable commodity; Government should declare/purchase commodity under Excessive Production Support Price like MSP. Processing unit be allowed to sell all the commodity and APMC should also be allowed to purchase such commodity.

- **IMC ON doubling of farmers' income by 2022**: An Inter-Ministerial Committee (IMC) under the chairmanship of Dr. Ashok Dalwai, Additional Secretary, Govt. of India, in consultation with the experts/stakeholders and National Council of Applied Economic Research (NCAER) and National Institute of Agriculture Economics and Policy Research (NIAP), expert institutions taken on board by the DAC & FW, has decided the draft report on multiple dimensions.

- A total of 09 Experts Groups/ Sub-groups have so far been constituted to draft the report in their domain to address end to end issues/ strategy of the sector.

Composition of Group: Production Enhancement of pulses through Productivity Gains

(Para 6, Vol. VI (6.3)

S.No	Name	Designation/ Organization	Status
1.	Dr. N.P. Singh,	Director, ICAR-Indian Institute of Pulses Research, Kanpur	Group Leader
2.	Dr.A.K. Tiwari,	Director, Directorate of Pulses Development, DAC & FW, GoI, Bhopal	Member
3.	Dr. S.K. Chaturvedi	ADG (O&P), Indian Council of Agricultural Research, New Delhi	Member
4.	Dr. S.S. Tomar,	ADC (NFSM), DAC & FW, GoI, New Delhi	Member

2.0 Pulses in Food Security

Pulses are principle source of dietary protein, and are an integral part of daily diet in several farms worldwide. Pulses play an important role both for food and nutritional security. Being important ingredient under staple food in the Indian dietary system, the commodity has been identified to help increase the farmersô income. In addition to their nutritional value, the grain legumes help to fix atmospheric N and add organic matter content to the soil. Pulses provide significant nutritional and health benefits and are known to reduce several non- communicable diseases such as colon- cancer and cardiovascular diseases.

To double the farmersô income by 2022, the issues relating to NRM need to be tracked at an emergency basis. Global warming and climate change are further likely to influence activity, diversity of insect-pests and diseases including the emerging threats of new pests. Besides, erratic rainfall behaviour, spatial variations, deteriorating soil health and sustainability of the production system, across the country, could be addressed through the introduction/ incorporation of the pulses in the cropping system.

The red gram, a deep tap root system crop, can flourish well under adverse climatic conditions and soils. Similarly short duration crops like Urdbean, Mungbean fit well in between two main seasons as also under the intercropping. The Urdbean & Mungbean are used for green manuring. In view, the cost of economics as well as the role in sustainable system.

The pulses development programme under NFSM is operational in 29 states of the country since 2007-08.

3.0 Parameters

Source of income growth within agriculture-pulses sector is increase in pulses production/productivity. To delineate the strategy for enhancement of production of pulses it is imperative to understand the characteristics of Agro-climatic Zones, Sub- Zones, farming system, cropping systems, existing resources/ infrastructure etc. and also the crop development programmes in this regards.

3.1 The land resource: Land Use Classification

(Area: Million ha)

Particulars	Area
Geographical Area	328.73
Land utilization	305.94
Forest	70.01
Not available for cultivation	43.74
Other uncultivated land excluding fallow land	25.98
Fallow lands	26.28
Net area sown	139.93

Source: DES, DAC&FW, GOI, Statistics at a glance 2015

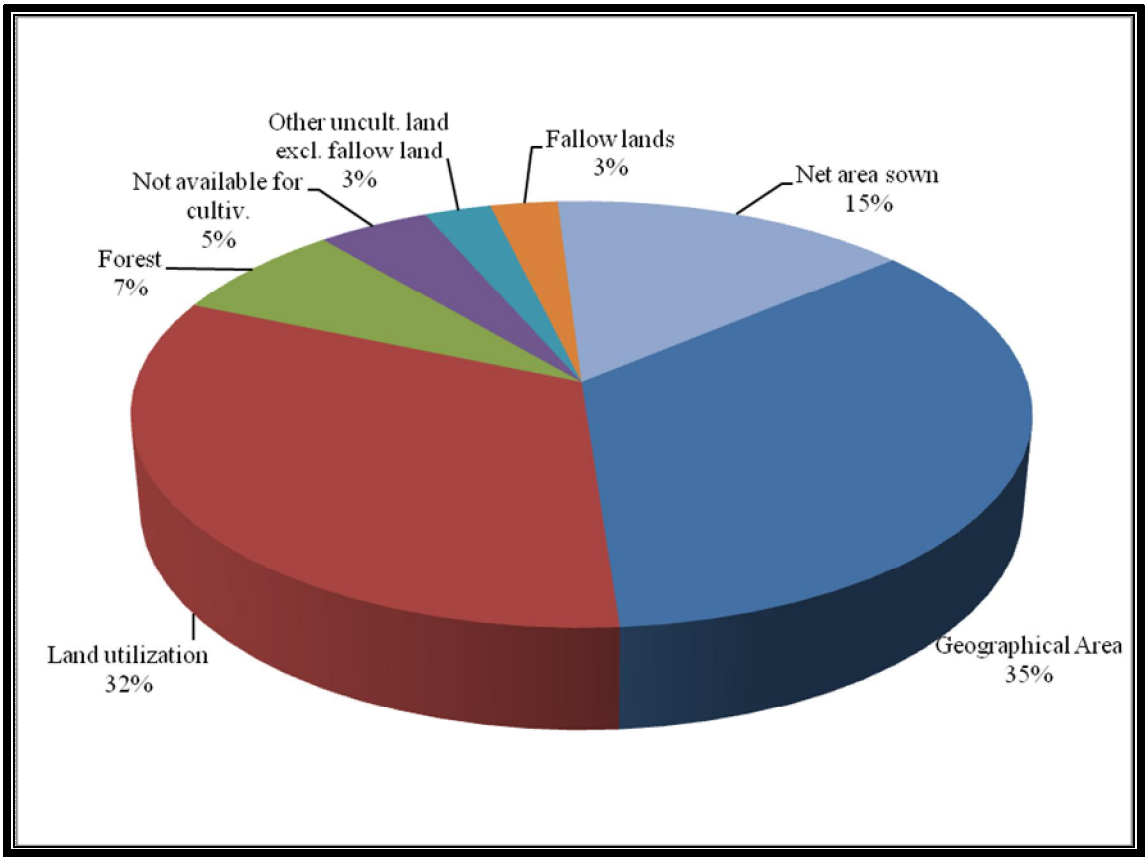

Fig. 1 Land use classification 2012-13

3.2 Facts

- Global population 9 billion by 2050
- Food production to increase 50 to 70%
- Can be achieved using the evolving tools, technologies and information management strategies precision agriculture
- The Green Revolution - wheat, rice and maize, left out the cultivation of pulses
- Indian population - pulses contribute a major part of the familyôs protein needs, much more than milk, eggs or meat
- WHO: Every Indian needs 80 gm of pulses/day
- Largest producer (22.95 M tonnes) and processor
- Import: 4.0 M tonnes annually
- We produce 1/4 of the worldôs pulses from 1/3 of the total acreage (26 m ha)
- We consume 30% of the worldôs pulses
- Very little surplus of red gram, black gram and green gram (preferred especially in Southern and Central India)
- Challenge to ensure supply of these pulses - primarily cultivated during monsoon and are prone to production losses due to moisture stress.

3.3 Pulses Share to Food grains

Food grains cover almost 62% of total gross cropped area comprising cereals 51% and pulses in about 11% in India. Further, among total pulses, the area under gram is 4%, arhar 2% and the other pulses in about 5% of gross cropped area.

The net irrigated area in the country is 47% while the remaining falls under rainfed ecology. The pulses under irrigation are cultivated in about 37% of the area while 63% of pulses are grown under *rainfed* conditions.

3.4 Top six pulses grown in India

Chickpeas (chana), Pigeonpea (arhar/toor dal), Urad beans (urad dal), Mung beans (moong), Lentils (masoor) and Peas. Grown in rabi season 60% and remaining in kharif season.
The share of pulses in total foodgrains area and production is about 20% & 7% respectively.

Table 1. Percent Share of Total pulses to total Food grains

(Area: lakh ha; Prod: lakh tonnes)

Year	Total Food grains		Total Pulses		Pulses (% Share)	
	Area	Production	Area	Production	Area	Production
2011-12	1247.55	2592.86	244.62	170.89	19.61	6.59
2012-13	1207.71	2571.35	232.57	183.42	19.26	7.13
2013-14	1250.47	2650.45	252.18	192.55	20.17	7.26
2014-15	1242.99	2520.23	235.53	171.52	18.95	6.81
2015-16	1232.17	2515.66	249.11	163.48	20.22	6.50

Source: Annual Report2016-17, DPD, Bhopal/DES, DAC&FW, GOI.

4.0 Pulses: National Scenario

The total area, production and productivity of major 10 states, contributing to approx. 90 % of area and production, namely MP, MS, Rajasthan, UP, Karnataka, AP, Gujarat, CG, Jharkhand and TN, is under Table 2.

Table 2. Total Pulses: National Scenario

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
MP	54.56	22.47	48.20	27.33	883	122
Maharashtra	34.91	14.38	22.68	12.86	650	90
Rajasthan	38.26	15.76	21.64	12.27	566	78
UP	22.65	9.33	18.07	10.25	798	110
Karnataka	24.41	10.05	13.05	7.40	534	74
AP	12.50	5.15	10.61	6.02	849	117
Gujarat	7.21	2.97	6.40	3.63	887	122
CG	8.66	3.57	5.77	3.27	666	92
Jharkhand	5.62	2.31	5.45	3.09	970	134
TN	7.51	3.09	5.00	2.84	666	92
Other	26.51	10.92	19.50	11.06	736	101
All India	**242.80**		**176.37**		**726**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 *(> 90% production is obtained from 10 states)*

Table 2. (a) Kharif Pulses

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Maharashtra	19.73	18.75	11.94	20.47	605	109
Rajasthan	24.03	22.84	9.56	16.39	398	72
Madhya Pradesh	13.82	13.13	7.96	13.66	576	104
Karnataka	12.80	12.16	6.10	10.47	477	86
Uttar Pradesh	8.60	8.17	5.68	9.74	660	119
Gujarat	4.67	4.44	3.73	6.40	799	144
Jharkhand	3.25	3.09	2.87	4.93	883	159
Odisha	4.53	4.30	2.36	4.04	521	94
Telangana	4.06	3.86	1.99	3.42	490	88
Tamil Nadu	2.22	2.11	1.49	2.56	671	121
Other	7.54	7.16	4.62	7.92	613	111
All India	**105.25**		**58.30**		**554**	

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 *(> 90% production is obtained from 10 states)*

Table 2. (b) Rabi Pulse

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Madhya Pradesh	51.02	22.38	43.39	25.78	850	115
Maharashtra	32.47	14.24	22.78	13.53	702	95
Rajasthan	35.09	15.39	21.66	12.87	617	84
Uttar Pradesh	21.46	9.41	17.84	10.60	831	113
Karnataka	22.84	10.02	13.20	7.84	578	78
Andhra Pradesh	12.10	5.31	10.11	6.01	836	113
Gujarat	6.82	2.99	5.96	3.54	874	118
Chhattisgarh	8.30	3.64	5.57	3.31	671	91
Bihar	5.29	2.32	4.96	2.94	938	127
Jharkhand	4.84	2.12	4.66	2.77	963	130
Other	27.75	12.17	18.22	10.82	657	89
All India	**227.98**		**168.35**		**738**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (approx. 90% production is obtained for 10 states)

4.1 Crop-wise: National Scenario

4.1.1 Kharif pulses

Table 3. Tur *(Area: lakh ha; Production: lakh tones; Yield: kg/ha)*

State	Area	% cont.	Prod.	% cont.	Yield	YI
Maharashtra	11.61	29.90	8.13	28.79	700	96
Madhya Pradesh	5.26	13.55	4.31	15.25	819	113
Karnataka	7.25	18.69	4.09	14.49	564	78
Uttar Pradesh	2.97	7.65	2.57	9.12	865	119
Gujarat	2.25	5.79	2.42	8.56	1076	148
Jharkhand	1.79	4.62	1.77	6.26	989	136
Odisha	1.40	3.60	1.23	4.35	879	121
Telangana	2.61	6.73	1.19	4.23	456	63
Andhra Pradesh	1.88	4.85	0.92	3.27	489	67
Tamil Nadu	0.54	1.38	0.51	1.80	944	130
Other	1.25	3.22	1.09	3.86	872	120
All India	**38.81**		**28.23**		**727**	

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 *(*> 90% production is obtained from 10 states

Table 4. Mungbean *(Area: lakh ha; Production: lakh tones; Yield: kg/ha)*

State	Area	% cont.	Prod.	% cont.	Yield	YI
Rajasthan	10.69	45.55	4.66	47.89	436	105
Maharashtra	3.99	17.00	1.66	17.04	416	100
Karnataka	2.75	11.71	0.61	6.27	222	53
Gujarat	1.21	5.17	0.61	6.23	504	121
Telangana	1.10	4.67	0.58	5.99	527	127
Madhya Pradesh	1.21	5.16	0.50	5.12	413	100
Odisha	1.02	4.37	0.27	2.76	265	64
Andhra Pradesh	0.23	0.98	0.18	1.86	783	189
Tamil Nadu	0.28	1.18	0.16	1.67	571	138
Jharkhand	0.20	0.87	0.14	1.45	700	169
Other	0.79	3.37	0.36	3.70	456	110
All India	**23.47**		**9.73**		**415**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 *(*> 90% production is obtained from 10 states)

Table 5. Urdbean *(Area: lakh ha; Production: lakh tones; Yield: kg/ha)*

State	Area	% cont.	Prod.	% cont.	Yield	YI
Madhya Pradesh	7.15	28.43	3.48	26.46	487	93
Uttar Pradesh	5.23	20.82	2.83	21.51	541	103
Maharashtra	3.23	12.85	1.64	12.45	508	97
Rajasthan	2.34	9.31	1.11	8.42	474	91
Jharkhand	0.94	3.74	0.78	5.96	830	159
Gujarat	0.82	3.25	0.52	3.98	634	121
Odisha	1.27	5.05	0.46	3.46	362	69
Tamil Nadu	0.53	2.13	0.42	3.18	792	152
West Bengal	0.64	2.56	0.40	3.03	625	120
Karnataka	0.85	3.40	0.32	2.46	376	72
Other	2.14	8.51	1.2	9.12	561	107
All India	**25.14**		**13.16**		**523**	**100**

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 *(*> 90% production is obtained from 10 states)

Table 6. Kulthi

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Karnataka	0.67	26.77	0.33	28.31	493	105
Odisha	0.48	19.26	0.16	13.29	333	71
Jharkhand	0.21	8.47	0.14	12.13	667	142
Chhattisgarh	0.47	18.63	0.14	12.05	298	63
Uttarakhand	0.13	5.38	0.11	9.26	846	180
Tamil Nadu	0.16	6.24	0.09	7.62	563	120
Maharashtra	0.19	7.57	0.09	7.20	474	101
Bihar	0.09	3.43	0.08	7.02	889	189
MP	0.18	7.23	0.06	5.40	333	71
AP	0.07	2.72	0.04	3.05	571	122
All India	**2.51**		**1.18**		**470**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 *(100% production is obtained from 10 states)*

Table 7. Moth

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Rajasthan	11.14	96.73	4.17	95.72	374	99
Gujarat	0.24	2.12	0.12	2.80	500	132
Maharashtra	0.22	1.91	0.07	1.70	318	84
Himachal Pradesh	0.01	0.12	0.02	0.44	2000	529
Jammu & Kashmir	0.05	0.42	0.02	0.42	400	106
Haryana	0.02	0.21	0.01	0.20	500	132
All India	**11.52**		**4.36**		**378**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (100% production is obtained from 06 states)

4.1.2 Rabi Pulses

Table 8. Gram

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Madhya Pradesh	30.41	35.07	33.26	41.00	1094	117
Rajasthan	13.62	15.71	11.39	14.04	836	89
Maharashtra	13.72	15.82	10.22	12.60	745	80
Karnataka	10.06	11.60	6.76	8.33	672	72
Andhra Pradesh	4.67	5.38	5.07	6.25	1086	116
Uttar Pradesh	5.17	5.96	4.84	5.96	936	100
Chattisgarh	2.74	3.16	2.50	3.08	912	97
Gujarat	1.87	2.16	2.20	2.72	1176	126
Jharkhand	1.49	1.72	1.68	2.07	1128	120
Telangana	0.88	1.01	1.22	1.51	1386	148
Other	2.07	2.39	1.98	2.44	957	102
All India	**86.70**		**81.12**		**936**	

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 (> 90% production is obtained from 10 states)

Table 9. Urd

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
AP	3.56	42.90	2.95	48.67	829	113
TN	2.81	33.88	2.02	33.20	719	98
Assam	0.52	6.27	0.31	5.11	596	81
UP	0.46	5.52	0.28	4.58	609	83

Odisha	0.39	4.65	0.18	2.93	462	63
WB	0.12	1.45	0.11	1.80	917	125
Telangana	0.15	1.76	0.10	1.58	667	91
MP	0.11	1.29	0.06	0.91	545	75
Karnataka	0.07	0.89	0.03	0.56	429	59
Gujarat	0.04	0.46	0.02	0.40	500	68
Other	0.06	0.72	0.01	0.16	167	23
All India	**8.29**		**6.07**		**732**	

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 (> 90% production is obtained from 10 states)

Table 10. Mung

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
TN	1.64	17.78	1.01	18.90	616	106
AP	1.33	14.46	0.94	17.60	707	122
Bihar	1.50	16.23	0.93	17.37	620	107
Odisha	1.63	17.68	0.58	10.96	356	61
MP	0.88	9.61	0.42	7.90	477	82
Haryana	0.59	6.37	0.32	6.00	542	94
Punjab	0.37	4.07	0.32	5.93	865	149
UP	0.43	4.69	0.31	5.85	721	125
Gujarat	0.42	4.60	0.24	4.44	571	99
WB	0.28	2.99	0.21	3.92	750	130
Other	0.14	1.52	0.05	0.94	357	62
All India	**9.21**		**5.33**		**579**	

Source: DES, DAC&FW, GOI, Avg:2011-12 to 2015-16 (> 90% production is obtained from 10 states)

Table 11. Lentil

Area: lakh ha; Production: lakh tones; Yield: kg/ha

State	Area	% cont.	Prod.	% cont.	Yield	YI
UP	5.08	34.36	3.80	36.65	748	107
MP	5.85	39.56	2.99	28.82	511	73
Bihar	1.83	12.40	1.92	18.49	1049	149
WB	0.62	4.22	0.56	5.44	903	129
Jharkhand	0.39	2.66	0.36	3.46	923	131
Rajasthan	0.36	2.44	0.35	3.34	972	138
Assam	0.27	1.82	0.17	1.64	630	90
Uttarakhand	0.12	0.80	0.09	0.91	750	107
Chhattisgarh	0.15	1.00	0.06	0.54	400	57
Haryana	0.05	0.30	0.04	0.39	800	114
Other	0.07	0.47	0.04	0.39	571	81
All India	**14.79**		**10.38**		**702**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (> 90% production is obtained from 10 states)

Table 12. Kulthi

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Karnataka	1.23	55.41	0.63	54.91	512	100
TN	0.56	25.35	0.33	28.78	589	115
AP	0.24	10.62	0.11	10.02	458	89
Maharashtra	0.13	5.86	0.04	3.91	308	60
WB	0.03	1.22	0.01	1.20	333	65
Telangana	0.03	1.18	0.01	1.03	333	65
All India	**2.22**		**1.14**		**514**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (100% production is obtained from 06 states)

Table 13. Lathyrus (*Khesari*)

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Chhattisgarh	3.49	70.50	2.34	63.59	670	90
Bihar	0.72	14.60	0.78	21.16	1083	145
Madhya Pradesh	0.47	9.56	0.32	8.78	681	91
West Bengal	0.29	5.81	0.32	8.69	1103	148
Maharashtra	0.21	4.20	0.06	1.61	286	38
All India	**4.95**		**3.69**		**745**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (100% production is obtained from 05 states)

Table 14. Peas

(Area: lakh ha; Production: lakh tones; Yield: kg/ha)

State	Area	% cont.	Prod.	% cont.	Yield	YI
Uttar Pradesh	3.41	40.79	3.89	49.19	1141	121
Madhya Pradesh	2.87	34.26	2.02	25.56	704	75
Odisha	1.35	16.17	0.80	10.17	593	63
Jharkhand	0.34	4.07	0.42	5.35	1235	131
Himachal Pradesh	0.11	1.36	0.29	3.63	2636	279
Assam	0.27	3.26	0.20	2.56	741	78
Bihar	0.19	2.31	0.19	2.43	1000	106
Manipur	0.17	2.01	0.16	1.97	941	100
Rajasthan	0.09	1.13	0.15	1.92	1667	177
West Bengal	0.13	1.50	0.14	1.76	1077	114
All India	**8.37**		**7.90**		**944**	

Source: DES, DAC&FW, GOI, Avg: 2011-12 to 2015-16 (90% production is obtained from 10 states)

5.0 Target

5.1 Increasing production from existing (XIIth Plan) 187.56 lakh tonnes to 260.00 lakh tones and productivity from743 kg/ha to 1030 kg/ha. Focus attention on six crops-Chickpea, Pigeonpea, Mungbean, Urdbean, lentil and Peas. Crop-wise targeted production and productivity is given table 15.

Table 15. Crop-wise targeted production & productivity.

(A-lakh ha, P-lakh tones, Y-kg/ha)

Crop	XIth Plan			XIIth Plan			% COP			Target- 2022	
	A	P	Y	A	P	Y	A	P	Y	Prod.	Yield
Arhar	37.90	26.66	703	42.00	32.69	778	10.84	22.64	11	48.00	1143
Urd	31.08	15.20	489	35.15	21.00	597	13.10	38.14	22	28.60	814
Moong	33.95	13.84	408	34.50	16.12	467	1.64	16.50	15	23.40	678
Kulthi	5.40	2.51	464	4.63	2.25	486	-14.23	-10.14	5	2.60	561
Gram	82.18	72.42	881	89.28	84.43	946	8.63	16.58	7	117.00	1311
Lentil	14.64	9.60	655	13.77	10.41	756	-5.94	8.42	15	15.00	1090
Lathyrus	5.16	3.42	662	4.69	3.76	803	-9.19	10.14	21	5.20	1109
Peas	7.16	6.22	869	9.01	8.49	942	25.95	36.48	8	13.00	1442
Total Pulses	**245.10**	**161.89**	**661**	**252.43**	**187.56**	**743**	**2.99**	**15.85**	**12**	**260.00**	**1030**

Source: Annual Report-2016-17, DPD, Bhopal/DES, DAC&FW, GOI.

5.3 Crop diversification through diverting additional area of 25 lakh hectares under focussed crops

- Chickpea 9.41 lakh ha.
- Pigeonpea 4.55 lakh ha.
- Mungbean 4.75 lakh ha.
- Urdbean 3.81 lakh ha.
- Lentil 1.81 lakh ha
- Peas 0.60 lakh ha

Table 16 : Additional potential arean proposed to be brought under different pulse crops

Crop	State/Regions	Additional Area (Lakh ha)	Cropping system /Situation
Chickpea	Punjab, Haryana, UP	0.75 (Desi) 0.20 (Kabuli)	• Popularization of rice-chickpea cropping system to diversity cereals based production system.
	Eastern UP, Jharkhand, Bihar, Chhatisgarh, AP, Karnataka, Orissa and WB	1.2	• Expansion of short duration varieties of chickpea in the non-traditional areas/rice fallows to ensure double cropping systems.
	Bhal areas of Gujarat and Tal areas of Bihar	0.26	• Expansion of chickpea areas.
	Maharashtra Karnataka & Maharashtra Karnataka, AP, Rajasthan, UP & Bihar	7.00	• Intercropping of chickpea with Sorghum & Safflower • Corriander • Mustard and Popularization of soybean-chickpea cropping system.
	Total	**9.41**	

Crop	State/Regions	Additional Area (Lakh ha)	Cropping system /Situation
Pigeonpea	Centrral & Western UP, MP and North Rajasthan	1.00	• Popularization of short duration pigeonpea-wheat sequential cropping system to diversify cereals based production system and sustainability.
	Bihar, Gujarat, AP, Maharashtra & Eastern UP	0.85	• Introduction of pre-rabi pigeonpea.
	UP and Chhatisgarh	0.20	• Replacing rainfed upland paddy with pigeonpea.
	MP, Bihar, Tamil Nadu, Karnataka and Orissa	1.00	• Cultivation of pigeonpea on paddy bunds.
	MP, Gujarat, Maharashtra, AP & Tamil Nadu, Bihar, UP, MP, MH, Karnataka	1.50	• Intercropping of pigeonpea with Soybean & Groundnut • Pearl Mllet/Cotton/Mungbean and Urdbean
	Total	**4.55**	
Mungbean	UP, Bihar, Orissa, Gujarat & MP	1.00	• Spring/Summer mungbean after harvesting of mustard, potato, sugarcane, peas and wheat etc.
	AP, Orissa, Tamil Nadu, Karnataka, UP & Bihar	2.75	• Introduction of mungbean in rice fallow.
	UP Bihar and MP	0.50	• Sugarcane+Mungbean intercropping.
	Bihar, UP, MP, MH, Karnataka, AP, Gujarat, Orissa, Rajasthan and TN	0.50	• Intercropping with long duaration pigeonpea/sorghum/cotton/maize/pearl millet
	Total	**4.75**	
Urdbean	UP, Bihar, Orissa, Gujarat, MP	0.25	• Extension of cultivations of urdbean in spring season after harvesting of mustard, potato, sugarcane etc.
	AP, Orissa, Tamil Nadu, Karnataka	2.56	• Extension of cultivation of urdbean in rice fallow.
	Bihar, UP, MP, MH, Karnatajka, AP, Gujarat, Orissa, Rajasthan, TN	1.00	• Intercropping with long duration pigeonpea/sorghum/pearl millet/cotton.
	Total	**3.81**	
Peas	UP, Bihar, MP, Orissa and TN	0.45	• Introduction of peas in rice fallowas.
	UP and Bihar	0.15	• Introduction of peas in diaralands.
	Total	**0.60**	
Lentil	Eastern UP and Bihar	0.50	• Intrioduction of lentil areas in rice falllows.
	Tal areas of Bihar, Eastern UP, Bundelkhand region of UP, MP, MH and Rajasthan	1.20	• Expansion of lentil.
	UP and Bihar	0.11	• Lentil in diaralands
	Total	**1.81**	
Grand Total		**24.93**	

Source: Annual Report-2016-17, DPD, Bhopal.

6.0 Broad Strategy for increasing Production

Although the scope for area expansion is limited, however, the Expert Group on Pulses has recommended following strategies:

6.1 Strategy: Horizontal Expansion

The scope for area expansion is, however, limited, Identification of additional area having potential, is the major strategy.

6.1.1 Utilization of potential area of rice-fallow lands

Rice fallows are widely distributed in rainfed ecosystem of eastern, central and peninsular India, besides north-eastern hill region. It is expected that nearly 3.0 Mha area of rice fallows can be brought under cultivation, which can provide about 1.5-2.0 Mt of additional food grain production.

The estimated extent of such fallow land is about 12 Mha, mostly in the eastern states of country. The potential horizontal expansion under post kharif rice fallow area to be cultivated during rabi, has been delineated by NCFC, now also a part of Targeted Rice fallow Area (TRFA-RKVY programme) *About 30-40% of the area currently left fallow after rice can be converted into productive farm lands. About 3.0 million ha additional land under pulses and 1.0 million ha under oilseeds can be brought with appropriate policy interventions. The distribution of rice fallows, potential districts and area is under Table-17 (a to c).*

Table 17 (a) Distribution of Rice Fallows

States	Major Districts
AP	Krishna, Guntur, East Godavari, West Godavari, Srikakulum, Nellore and Prakasam
Assam	Lakhimpur, Jorhat, Sibsagar, Dibrugarh, Golaghat, Karbi, Nagaon and Maringon
Bihar	Kisanganj, Sahibganj, Gaya, Aurangabad, Katihar and Bhagalpur
Chhattisgarh	Surguja, Jashpur, Raigarh, Durg, Bilaspur and Bastar
Jharkhand	Ranchi, Purbi Singhbhum, Paschim Singbhum, Hazaribagh, Gumala Sahibganj, Deogarh, Palamau, Dumka and Dhanbad
Maharashtra	Dhule, Amravati, Nagpur, Wardah, Bhandara, Chandrapur and Nanded
MP	Shahdol, Seoni, Balaghat, Damoh, Mandla, Rewa, Betul and Sidhi
Odisha	Koraput, Kalahandi, Sambalpur, Sundergarh, Bhadrak, Cuttack, Puri, Dhenkanal and Mayurbhanj.
West Bengal	Purulia, Bankura, Birbhum, Bardhaman, Medinapur, Murshidabad, South 24-Parganas, Maldah, West Dinajpur, Jalpaiguri and Coochbihar
UP	Gonda, Siddarthnagar, Lakhimpur, Kheri, Pilibhit, Etawah, Mirzapur, and Sonbhadra
Karnataka	Shimoga and Belgaum
Tamil Nadu	Salem, Namakkal, Tiruchirappalli, Cuddalore, Ramnathpuram, Madurai, and Villupuram

Table 17. (b) Rice Fallow Area

S.No.	States	Rice fallow area (Mha)
1.	Odisha	2.961
2.	CG	2.856
3.	WB	1.159
4.	Assam	1.042
5.	Jharkhand	0.475
6.	Bihar	0.049
7.	Other States	3.458
Total		**12.000**

Source: (National Crop Forecast Centre, DAC & FW, New Delhi)

Table 17. (c) Potential pulses area under rice fallows

State	Potential area (M ha)	Rice-fallow Districts
Chhattisgarh	0.88	Bilaspur, Dhamtari, Kanker, Jashpur, Raipur, Durg, Rajgarh, Kabirdham, Korba, Mahasamund and Rananadgaon
MP	0.53	Anuppur, Chhattarpur, Damoh, Dindori, Raisen, Jabalpur, Katni, Jhabua, Rewa, Satna, Shahdol, Seoni, Mandla, Narsingpur and Umaria
Odisha	0.37	Baleshwar, Dhenkanal, Sundergarh, Mayurbhanj, Kalahandi, Bolangir, Kheonjar, Puri and Cuttack
WB	0.52	Bankura, Purulia, Medinapur, West Dinajpur, Malda, Jalpaiguri, Bardhaman and Birbhum
Assam	0.16	Marigaon, Naogaon, Lakhimpur, Kokrajhar, Bongaigaon, Nalbari, Kamrup, Barpeta, Darrang, Cachar, Goalaghat, Jorhat, Dibrugarh, Tinsukia and Sonitpur
Total	**2.46**	

Source: The Expert Group on Pulses, DAC & FW, MoA & FW, GoI, (2009)

6.1.1.1 Existing scheme: Targeting Rice Fallows for Pulses Production (TRFA)

A new sub-scheme ôTargeting Rice Fallow Areaô in six BGREI states to promote pulses/oilseeds with annual allocation of Rs. 200 crores under RKVY with central share of Rs. 130 crores (2016-17 onwards) has been approved by Honôble AM. Increase allocation under NFSM and NMOOP will also bring rice fallow area under cultivation of oilseeds and pulses.

6.1.1.2 Recommendations for improving pulses productivity under rice fallow

Under mentioned recommendations and policy issues indicated in the NAAS Policy Paper (64) on *ñimproving productivity of rice fallowsò*, is relevant to harness the potential of rice fallows, and may be the part of ongoing programmes of pulses development under *NFSM-Additional Pulse Programme and RKVY-TRFA.*

i. Mechanization of field operations: Residual soil moisture in surface layer at the time of planting *rabi* crops is the major constraint in rice fallows. Relay cropping in standing rice is often practiced but with use of combine for rice harvesting, the option is now shifting for direct seeding using zero-till drill or turbo type Happy Seed drill which need to be designed for different situations. For harvesting and threshing, appropriate machines need to be designed and developed.

ii. Scaling-up crop management practices: Tillage and plant population management, application of nutrients and weed management in *rabi* crops pose serious challenges in rice fallows. Early-maturing crop varieties, relay cropping, higher seed rate, seed priming, seed inoculation with *Rhizobium* culture, seed pelleting, mulching, foliar spray of nutrients etc. are recommended practices which need to be further refined and standardized for different ecosystems. Work on development of short-duration, high-yielding varieties, appropriate seeding techniques, water harvesting and recycling, post-emergence herbicides, biotic and abiotic stresses etc. need to be strengthened.

iii. Crop-specific information on area expansion: Based on biophysical conditions, farm resources and market demand, likely coverage of area under each crop in different states/ region need to be estimated. This would facilitate area expansion in phased manner by arranging critical inputs.

iv. Periodic GIS mapping: In order to monitor impact of R&D efforts on area expansion in rice fallows under different crops, cropping systems and soil health, periodic monitoring through GIS is required.

v. Creation of community water reservoirs: Despite heavy rains during *kharif* season, soil moisture becomes the most critical limiting factor for raising second crop during winter as most of the runoff is wasted. It is, therefore, necessary to create farm pond and community water reservoirs in the area well supported by Government. This will serve as important source for life-saving and supplemental irrigation. Further, the loss of soil and plant nutrients from productive lands will be reduced.

vi. Quality seeds: Timely availability of quality seeds is often a major constraint for delayed planting and poor yields**.** Hence, community-based seed production programmes need to be launched with appropriate processing and storage facilities. The national and state seed Corporations should strengthen their activities in these areas.

vii. Ensuring timely availability of other critical inputs: Traditionally, the winter crops on residual soil moisture are grown using local varieties without application of plant nutrients, bio-fertilizers, fungicides and other agro-chemicals due to their non-availability. Since crop productivity is the driver for area expansion, which in turn is influenced by better crop management, emphasis needs to be placed on timely availability of all critical inputs.

viii. Marketing infrastructure: Marketing plays a key role in enthusing farmers for crop production. Well organized marketing and processing of farm produce need attention.

ix. Protection from stray cattle: Blue bull and other stray cattle cause heavy damage to pulses and thus discourage farmers to grow winter crops. Appropriate policies are needed to tackle this menace. To avoid crop damage by stray cattle, open grazing lands at panchayat level should be earmarked. These activities should be the part of state level planning.

6.1.1.3 Recommendations based on Performance/ Experience

Under NFSM-pulses, *additional area coverage programme of spring/summer season and RKVY-TRFA*, the development efforts on increasing productivity of pulses in rice fallow areas includes identification of suitable varieties, planting methods, foliar nutrition and plant protection, refining and packaging improved technologies etc are based on the past experience, to address different problems.

i) **Selection of crops and varieties:** should be decided on the basis of winter temperature, soil texture, soil moisture content etc. *(In lentil and gram, small seeded varieties due to better contact with soil, less rotting be selected)*

ii) **Seed priming and optimum seed rate:** Overnight soaking of seeds (seed priming), hastens seed germination and crop establishment under relay cropping. Adoption of 20-25% higher seed rate over the recommended rate is recommended ensures desired plant stand.

iii) **Foliar nutrition:** Since application of fertilizers under relay cropping is not feasible, seed pelleting and foliar application of nutrients should be practiced. Foliar application of 2% urea at flowering and pod formation significantly improves yields of chickpea under rainfed conditions by increasing leaf N content and making them photosynthetically more active. Seed pelleting with micronutrients like Zn and Mo is also recommended as a part of nutrient management strategy in rice fallows.

iv) **Planting strategy:** In rice fallows, planting is generally delayed. Under relay planting, seeds should be broadcast 2-5 days before harvest of rice. Zero-till seed-cum-fertilizer drill should be used wherever feasible when planting is done after harvest of rice. It is necessary to use short to medium maturing varieties of rice for timely planting of *rabi* crops.

v) **Plant protection:** Since post-emergence herbicides are not commercially available specially for crops like chickpea and lentil and inter-cultivation is difficult due to hard soil, hand pulling of weeds is the only option which should be done at an early stage. Post-emergence herbicide ***(Imazethapyr @ 50 g/ha***) has been found quite effective against seasonal grassy weeds in crops like groundnut, urdbean and mungbean. It should be applied at 3-4 leaf stage. Similarly, ***quizalofop*** can be used to check ratooning of rice stubbles which cause substantial moisture loss. Insect-pests and diseases should be promptly controlled. Seed dressing with fungicides like *carbendazim* should be done.

vi) Issues based major technological interventions and region specific varieties are summarized under *Table 18 (a) and (b).*

Table 18. (a) Major technological interventions

Issues	Interventions	Action
Lack of suitable cultivars	Development of high-yielding varieties with appropriate maturity duration	ICAR-IIPR
Poor crop stand and establishment	Tillage machines, sowing methods, seed priming, higher seed rate, timely planting, seed treatment with fungicides	SDA/SAUs
Diseases and pests	Development of IPM modules	SDA/SAUs/NCIPM
Weed menace	Post-emergence herbicides like *Quizalofop ethyl* and *Imazethapyr*	SDA/SAUs/DWR
Nutrient management	Foliar spray of urea/DAP to supplement N and P	SDA/SAUs
Micronutrient deficiencies	Mo, B, Zn as seed pallets	SDA/IISS
Terminal moisture/heat stress	Residue mulching	SDA/SAUs/CRIDA
Non-availability of quality seeds	Informal and formal seed production and supply systems	SDA/SSC/NSC
Lack of mechanization	Tillage machines, zero-till planter and harvester	SDA/SAUs/CIAE
Poor transfer of technology	Innovative farmerôs participatory approach	SDA/SAUs/KVKs

Table 18. (b) Performance based recommendation

Region Rec. Crops & Varieties	Eastern Plains	Central region	Coastal Region
Lentil	Rust- A major threat Small seeded lentil varieties having resistance to rust WBL-77, KLS-218, PL-8, NM-1, DPL-15	1. Chickpea var Pusa-372, PG-186, Udai 2. Small seeded chickpea var. JSC-55, JSC-56, JG-14, vijay, JG-315, JAKI-9516 3. Lathyrus- var- Ratan, Prateek, Mahateora	Powdery Mildew a major threat 1. Urdbean-var.- powdery mildew resistance var., LBG-17, LBG-602, LBG-623 Urdbean Normal planting var. (Mid Nov to Mid Dec) LBG-402, LBG-611, LBG-22, LBG-648, LBG-685, LBG-645, LBG-709, LBG-752 2. Late Planting Urdbean (IInd fortnight of Dec) var. LBG-22, LBG-645, LBG-709, LBG-752 3. Mungbean varieties (Normal Planting) LGG-460, LGG-410, LGG-450, LGG-407, IM- 96-3, Pusa 9072, NARM-1,2 and 18.

Source: Policy Paper 64: Improving Productivity of Rice Fallows

6.1.2 Diversification: Replacement of less remunerative crops with pulses

More than 5 Lha area of upland paddy, 4.5 Lha of millets and 3 Lha area under barley, mustard and wheat may be diverted under kharif/rabi pulses

6.1.3 Cultivation of spring/summer pulses

More than 20 Lha vacated by wheat, peas, potato, sugarcane and lentil may be brought under spring/ summer pulses with critical irrigation support in the states of Bihar (3 Lha), TN (2.31 Lha), Odisha (2.14 Lha) MP (1.51 Lha), UP (1.36 Lha), AP (0.74 Lha), WB (0.61 Lha), Gujarat (0.40 Lha), CG (0.20 Lha), Punjab (0.20 Lha). During kharif 2017 against the stateôs target of 19.45 Lha, an area of 12.52 Lha (Mung 8.63+ Urd 3.61) was covered.

(Note: Figures in parentheses is the coverage during Spring/Summer 2017 as per WWWR of DPD, Bhopal).

6.1.4 Promotion of intercropping and utera cultivation

Intercropping of pulses is the best approach for increasing production of pulses through horizontal expansion. The farmers in rainfed states of Karnataka, Gujarat, MP, CG, MS and AP are traditionally cultivating pulses. Besides increasing the total productivity of the system, legume plays an important role in economizing the use of resources, particularly N fertilizer. Wheareas, mungbean and urdbean are ideal intercrop with spring planted sugarcane under irrigated/rainfed conditions. Cotton and spring summer sunflower, lentil, fieldpea, chickpea and rajmash are also ideal intercrops with autumn planted sugarcane under irrigated conditions.

In AP, out of 9 Lha groundnut area, 4 Lha alone goes under intercropping (GN+ Tur- 7:1, 11:1); (Cotton+ Tur-1:11,1:12,1:7); (Maize/Jowar+ Tur- 2:1); (Mung/Urd+ Redgram- 7:1).

Table 19. Prominent intercropping systems

States	Intercropping Systems
Andhra Pradesh	Pigeonpea+Groundnut/castor, Chickpea+Sunflower, Rice + Mungbean / Urdbean, Tapioca+Mungbean/Urdbean
Bihar	Pigeonpea+Maize/Small millets/Turmeric, Chickpea+ Mustard/Linseed, Lentil+Mustard, Fieldpea+Mustard,Potato+Common bean, Rice+Pigeonpea
Gujrat	Pigeonpea+Groundnut, Cotton+ Pigeonpea, Pearl millet +Mothbean, Castor+Urdbean/Munhgbean/Cowpea/Horse gram
HP	Maize+Urdbean/Soybean/Cowpea/Common bean
Karnataka	Pigeonpea+Horse gram/Small millets/Cowpea/Groundnut, Finger millet+Horse Gram, Chickpea+Sunflower, Tapoca+Mungbean/Urdbean
Madhya Pradesh	Pigeonpea +Pearlmillet/Sorghum/Urdbean/Mungbean/Castor/Soybean, Pearl millet+Mungbean/Urdbean, Chickpea+ Mustard/ Wheat/ Barley/ Linseed, Field pea + Mustard,Lentil +Linseed/Mustard/Barley, Cotton+Pigeonpea
Maharashtra	Pigeonpea+Sorghum/Maize, Cotton+Pigeonpea/Mungbean/Urdbean, Grd.nut+Pigeonpea
Orissa	Pigeonpea+Ground nut, Tapioca+Mungbean/Urdbean
Punjab & Haryana	Chickpea+Wheat/Barley/Mustard/Linseed, Sugarcane+Summer Mungbean /Urdbean /Chickpea, Pigeonpea+Mungbean/Urdbean, Urdbean+Maize, Maize + Soybean
Rajasthan	Pearl millet+Urdbean/Mungbean/Cowpea/Mothbean, Sorghum+Mothbean, Cluste rbean+Mothbean, Chickpea+Barley/Mustard/Wheat
Tamil Nadu	Pigeonpea+Sorghum, Tapioca+Mungbean/Urdbean, Sugarcane+Urdbean
Uttar Pradesh	Pigeonpea+Pearl millet/Sorghum/Castor/Maize/Urdbean/Mungbean, Pearl millet +Urdbean/Mungbean, Sugarcane+ Urdbean/Mungbean/Field pea/Chickpea, Chickpea+Wheat/Barley/Linseed/Mustard.
West Bengal	Sunflower+Mungbean, Chickpea+Mustard/Lentil, Jute+Urdbean

Source: Adopted from Sekhon and Singh (2005)

6.1.5 Scope of area expansion for increasing pulses production through intercropping is indicated under *Table 20*.

Table 20. Scope of area expansion through intercropping system manipulation

Crop	Intercropping with	Specific Area
Mungbean/ Urdbean	Spring planted sugarcane (irrigated) Cotton and Millets (Rainfed upland) Spring/Summer Sunflower (Rainfed upland)	Western U.P., Central U.P. and North Bihar, Maharashtra, A.P. and T.N.Western U.P., Haryana and Punjab
Lentil, Field pea, Chickpea, Rajmash	Autumn planted sugarcane (irrigated)	Western U.P., Central U.P. and North Bihar
Rajmash	Potato	Western U.P., Central U.P. and North Bihar
Pigeonpea	Soybean, Sorghum, Cotton, Millets and Groundnut (Rainfed upland)	A.P. Malwa Plateu of M.P., Vidarbha of M.H., North Karnataka, North T.N. South East Rajasthan, Punjab, Haryana, U.P. and Bihar
Chickpea	Barley, Mustard and sunflower (Rainfed upland)	South East Rajasthan, Punjab, Haryana, U.P., Bihar, Vidarbha of Maharashtra

6.1.6 Cultivation of pigeonpea on rice bunds/transplanting

An area of 0.3 Lha can be brought under pigeonpea in CG, MP, Odisha, WB and Jharkhand.

6.2 Strategy: Vertical Expansion

Despite various efforts of the Government of India, the pulse production from an area of 23 million ha has stabilised at around 18-20 million tonnes against the consumption of 22-26 million tonnes, which necessitates imports of 4-6 million tonnes pulses each year. To meet the projected pulses requirement, productivity level needs to be enhanced to 1000-1100 kg/ ha from the present 743kg/ha or about 2.5-3.0 million ha additional area has to be brought under pulse crops. Also, a sincere effort has to be made for reducing the post-harvest losses. Estimates indicate that India needs an annual growth rate of 2.5% in pulse production from existing production (22.95 MT) of terminal year 2016-17.

The existing production technology is capable of increasing productivity atleast by 40 % as amply demonstrated by on farm trials. This coupled with technological interventions & operational synery among planners, administraters, researchers, extension workers and developmental agency in mission mode can translate the vision into reality.

Production Constraints

The poor productivity level of pulses like pigeonpea, chickpea, lentil, green gram, black gram and peas etc. is attributed primarily to poor spread of improved varieties and technologies, untimely and inadequate availability of quality seed of improved varieties and other inputs, water use due to

dependence on rainfall, low and high temperature stress, vulnerability to pests and diseases and cultivation on marginal and sub-marginal land.

Future Thrust

- Introduce pigeonpea in rice-wheat cropping systems.
- Improve seed systems by seed village & seed ï hub programme.
- Introduce mechanization.
- Provide remunerative support price and assured marketing.
- Systems for surveillance and monitoring of pests in pigeonpea and chickpea for timely preventive /control measures.
- Transplanting and dibbling techniques to achieve optimum plant population and better productivity of pigeonpea.
- Site specific nutrient management including application of 20-25 kg sulphur and 15-20 kg $ZnSO_4$/ ha.
- Foliar spray of 2% urea at pod formation stage under drought stress.
- Seed inoculation with Rhizobium and Phosphate Solubilizing Bacteria.
- Raised bed planting to economize water and also to off-set water-logging stress during excess rainfall period is reported to improve yield by 10-20%. Raised-bed planting may be promoted in rainfed areas.
- Large-scale promotion of drip and sprinkler irrigation for higher water-use efficiency and yield in rainfed areas.
- Stored rain water during monsoon can be effectively used for life-saving irrigation, employing precision irrigation techniques.

Research Issues

- Development of short-duration, high-yielding varieties suitable for adoption in rabi season.
- Development of drought tolerant varieties.
- Development of Tur varieties comprising early vigour to compete with weeds at the initial stage .

6.2.1 Vertical Expansion (Increasing Productivity)

The potential of vertical expansion explain the yield gap analysis of pulses such as *inter-state, intra-state and between FLD and state's average yield* under different pulses in the major growing states.

Here, the strategy would be to bridge the yield gaps with the interventions of the improved recommended technologies vis-à-vis is the pulse development programmes under NFSM in all the 29 states of the country, with major emphasis on the major states contributing to more than 90 % of the pulse production of the country. Through bridging the yield gaps additional return may get by farmers. The yield gaps inter-state, intra-state and improved practices are given as under:

Table 21. Yield gap: National and Inter-state

(Avg. Yield - kg/ha)

Crop/Season	National	Highest/Lowest Yield	States > National Avg.	States < National Avg.
Total Pulses	726	Jharkhand (970)/ Karnataka (534)	Jharkhand, MP, Gujarat, UP, AP	Karnataka, Maharashtra, Rajasthan, CG, TN
Total Kharif	554	Jharkhand (883)/ Rajasthan (398)	Mha., MP, UP,Guj. Jha, TN	Rajasthan, Karnataka, Odisha, Telangana
Total Rabi	738	Jharkhand (963)/ Karnataka (578)	MP, UP, AP, Guj., Bihar, Jha.	Mha., Raj., Kar., CG,
Tur	727	Gujarat(1076)/ Telangana(456)	MP, UP, Guj., Jha., Odisha, TN	Maharashtra, Karnataka, Telangana, AP
Mungbean (K)	415	AP(783)/ Karnataka(53)	Raj., Mha., Guj., Telangana, MP,AP, TN, Jha.	Karnataka,Odisha,
Urdbean (K)	523	Jharkhand (830)/ Odisha (362)	UP, Jha., Guj., TN, WB,	MP, Mha, Raj., Odisha, Karnataka
Kulthi(K)	470	Bihar (889)/ CG (298)	Karnataka, Jha., Uttarakhand, TN, Bihar, Mha., AP,	Odisha, CG,MP,
Moth(K)	378	HP(2000)/ Mha(318)	Guj., HP, J&K, Haryana	Raj.,Mha.,
Gram	936	Telangana(1386)/ Karnataka(672)	MP,AP,UP,Guj.,Jha., Telangana	Raj.,Mha., Karnataka,CG,
Urd (Rabi)	732	WB(917)/ Karnataka(429)	AP,WB,	TN, Assam, UP, Odisha, Telangana, MP, Karnataka, Gujarat
Mungbean (Rabi)	579	Punjab(865)/ Odisha(356)	TN, AP, Bihar, Punjab,UP, WB	Odisha,MP, Haryana, Gujarat
Lentil	702	Bihar (1049)/ CG (400)	UP,Bihar,WB,Jha., Raj., Uttarakhand, Haryana	MP, Assam,CG,
Kulthi (Rabi)	514	TN(589)/ Maharashtra(308)	Karnataka, TN	AP, Mha., WB, Telangana
Lathyrus (Khesari)	745	WB(1103)/ Maharashtra(286)	Bihar, WB	CG, MP, Maharashtra
Peas	944	Rajasthan(1667)/ Odisha(593)	UP,Jha.,HP, Bihar, Manipur, Rajasthan, WB,	MP, Odisha, Assam

Source: Annual Report 2016-17, DPD, Bhopal

Table 22. Yield gap Intra - State *(District-wise)*

(Avg. Yield - kg/ha)

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Bihar						
Tur	1768	Bhojpur (2803) /Bhagalpur (1106)	(08) Purnia, Bhojpur, Aurangabad, Saharsa, Patna, Purbi Champaran, Begusarai, Vaishali,	(05) Buxar, Lakhisarai, Khagaria, Sheohar, Munger	(12) Kaimur (Bhabua), Gaya, Muzaffarpur, Siwan, Samastipur, Jamui, Nawada, Saran, Banka, Bhagalpur, Pashchim Champaran, Gopalganj,	(13) Nalanda, Sheikhpur, Arwal, Darbhanga, Jehanabad, Araria, Rohtas, Sitamarhi, Madhubani, katihar, Supaul,Kishanganj Madhepura
Mungbean (K)	758	Jehanabad (951)/ Puri Champaran((477)	(05) Araria, Kishanganj, Katihar, Nawada, nalanda,	(06) Suapaul, Jehanabad, Arwal, Gopalganj, Lakhisarai, kaimur	(09) Gaya, Bhagalpur, Purnia, Darbhanga, Banka, Madhepur, Madhubani, Khagaria, Samastipur,	(16) Begusarai, Purbi Champaram, Aurangabad, Bhojpur, Munger, Sheohar, Jamui, Sitamarhi, Saran, Paschim Champaran, Rohtas, Sheikhpura, Vaishali, Siwan, Saharsa, Buxar
Urdbean (K)	890	Saharsa (1000)/ Khagaria ((872)	(04) Lakhisarai, Samastipur, Supaul, Gaya,	(21) Vaishali, Purvi Champaran, Paschim Champaran, Kishanganj, nawada, Siwan, Saran, Jehanabad, Bhojpur, Muzaffarpur, Gopalganj, Rohtas, Buxar, Sheohar, Banka, Arwal, Sitamarhi, Saharsa, Sheikhpura, Jamui, Munger	(03) Katihar, Khagaria, Bhagalpur,	(10) Begusarai, Madhubani, Madhepura, Araria, Purnia, Aurangabad, Darbhanga, Nalanda, kaimur, Patna.

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Gram	1163	Purnia ((1956)/ Jamui (831)	(07) Patna, Bhojpur, Lakhisarai, Gaya, Rohtas, Jehanabad, Sheohar,	(10)Sheikhpura, Kishanganj, Araria, Purnia, Kathihar, Vaishali, Paschim Champaran, Madhubani, Sitamarhi, Purvi Champaran,	(8)Aurangabada, Kaimur, Nalanda, Bhagalpur, Buxar, Banka, Nawada, Jamui,	(9)Munger, Arwal, Khagaria, Siwan, Muzaffarpur, Darbhanga, Samastipur, Begusarai, Saran,
Lentil	1058	Patna (1329)/ Saharsa(639)	(08) Patna, Nalanda, Pashchim Champaran, Lakhisarai, Jehanabad, kaimur, Buxar, Rohtas,	(09) Sheikhpura, Darbhanga, Araria, Jamui, Begusarai, Khagaria, Siwan, Saran, Gopalganj	(06) Aurangabad, Bhojpur, Purvi Chamaparan, Madhubani, Gaya, nawada,	(15) Arwal, Sitamarhi, Bhagalpur, Purnia,Muzzaffarpur, Katihar, Samastipur, Supaul, Banka, Sheohar, Kishanganj, Munger, Madhepura, Saharsa, Vaishali
Peas & Bean	1038	Jehanabad (1155)/ Puri Champaran (911)	(12) Kishanganj, Begusarai, madhepura, Bhojpur, Buxar, Siwan, Patna, Katihar, Samastipur, Nalanda, Rohtas, Jamui,	(07)Munger, Khagaria, Purnia, Saran, Sheikhpura, Lakhisarai, Jehanabad.	(06) Aurangabad, Bhagalpur, Kaimur, Madhubani, Arwal, Paschim Champaran,	(03)Supaul, Araria, Gaya, Gopalganj, Purbi champaran, Saharsa, Nawada,Muzaffarpur, Sheohar, Vaishali, Sitamarhi, Banka, Darbhanga
Gujarat						
Tur	1018	Panch Mahals (1457)/ Valsad (832)	(04) Vadodara, Panch mahal, Dohad, Surat,	(05) Bharuch, Narmada, Sabar Kantha, Tapi, Valsad		(17) Navsari, Dang, Kheda, Banaskantha, Ahmadabad, Anand, Junagadh, Rajkot, Amreli, Bhavnagar, Patan, Gandhinagar, Jamnagar, Mehsana, Surendra nagar, Kachchh, Porbandar

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Mungbean (K)	435	Gandhinagar (593)/ Patan (373)	(04) Banaskantha, Mahesana, Sabarkantha, Surendranagar,	(06) Gandhinagar, Jamnagar, Ahmadabad, Panch mahals, Porbandar, Navsari	(03) Kachchh, Patan, Rajkot,	(12) Amreli, Bhavnagar, Junagadh, Surat, Bharuch, Valsad, Vadodara, Tapi, Kheda, Dohad, Anand, Narmada
Urdbean (K)	639	Vadodara (805)/ Patan (509)	(07) Vadodara, Dang, Banas Kantha, Jamnagar, Panch Mahals, Tapi, Bharuch,	(05) Porbandur, Gandhinagar, Kheda, Surendranagar, Kachchh	(09) Patan, Dohad, mahesana, Sabarkantha, Junagadh, valsad, Rajkot, Navsari, Amreli,	(05) Bhavnagar, Surat, Ahmadabad, Narmada, Anand
Gram	1057	Junagadh (1755)/ Patan (624)	(07) Jamnagar, Surendranagar, Porbandar, Junagadh, Rajkot, Dang, Amreli,	(10) Tapi, Vadodara, Navsari, Narmada, Bhavnagar, Valsad, Kheda, Surat, Banaskantha, Mahesana	(04) Dohad, Ahmadabad, Panch Mahals, Patan,	(05) Sabarkantha, Anamnd, Bharuch, Kachchh, Gandhinagar.
Jharkhand						
Tur	1330	Ramgarh (1898)/ Garhwa (1124)	(05) Latehar, Godda, Lohardaga, Hazaribagh, Pakur,	(06) Koderma, Ramgarh, Bokaro, Giridih, Saraikela Kharsawan, Deogarh	(08) Palamu, Garhwa, Ranchi, Chatra, Dumka, Gula, Khunti, Simdega,	(05) Sahebganj, West Singhbhum, East Singhbhum, Jamtara, Dhanbad
Gram	733	Giridih (989)/ Gumla (492)	(08) Palamu, Godda, Chatra, Sahebganj, Hazaribagh, Pakur, Koderma,	(07) Ranchi, Giridih, West Singhbhum, Deoghar, Khunti, Saraikela Kharsawan, Ramgarh, East Singhbhum	(03) Garhwa, Latehar, Dumka,	(06) Gumla, Lohardaga, Simdega, Bokaro, Jamtara, Dhanbad.
Lentil	646	Palamu (762)/ Ranchi (295)	(03) Godda, palamu, Latehar,	(01) Gumla	(04) Sahebganj, Garhwa, Pakur Chatra,	(08)WestSinghbhum, Ranchi, Koderma,Hazaribagh, Dumka, Lohardaga, simdega, Deoghar

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Andhra Pradesh						
Tur	440	Guntur (1222)/ Anantpur (144)	(02) Prakasam, Guntur,	(06) Krishna, Vizianagaram, SPSR Nellore, Srikakulam, East Godavari, West Godavari	(04) Anantpur, Kurnool, Cudappah, Chittor,	(01) Vishakhapatnam
Mungbean (K)	598	Guntur (964)/ East Godavari (308)	(04) Guntur, Krishna, West Godavari, SPSR Nellore,	(03) Cudappah, Anantpur, Chittor	(06) Srikakulam, East Godavari, Vizianagaram, Prakasam, Vishakhapatnam, Kurnool	
Urdbean (K)	750	Guntur (930)/ East Godavari (271)	(03) Krishna, Guntur, Kurnool,	(02) Chittor, Anantpur	(06) Srikakulam, SPSR Nellore, East Godavari, Prakasam, Vizianagaram, West Godavari,	(02) Vishakhapatnam, Cudappah
Gram	1136	Guntur (2003)/ Anantpur (729)	(03) Kurnool, Prakasam, Guntur,	(07) SPSR Nellore, Krishna, Vizianagaram, East Godavari, Vishakhapatnam, West Godavari, Srikakulam	(02) Cudappah, Anantpur,	(01) Chittor
CG						
Tur	536	Bijapur (651)/ Gariyaband (335)	(07) Balrampur, Surguja, Jashpur, Surajpur, Bilaspur, Raigarh, Mungeli,	(06) Janjgir Champa, Kanker, Bastar, Sukma, Konbdagaon, Bijapur	(07) Kabirdham, Rajnandgaon, Korea, bemetara, Durg, Baloda Bazar, korba,	(07) Raipur, Mahasamund, Balod, Gariyaband, Dantewada, Dhamtari, Narayanpur

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Mungbean	199	Kondagaon (378)/ Durg (36)	(05) Raigarh, Sukma, kanker, bijapur, Rajnandgaon,	(09) Dhamtari, Dantewada, Raipur, Kondagaon, Bastar, Kabirdham, Jashpur, Mungeli, Narayanpur	(03) Gariyaband, Mahasamund, Durg,	(10) Janjgir-Champa, Balod, Balopda Bazar, Bilaspur, Korba, Surajpur, Balrampur,. Bemetara, Korea, Surguja
Urdbean	313	Sukma (434)/ Raigarh (238)	(08) Jashpur, Kondagaon, Surajpur, Kanker, Balrampur, Surguja, Rajnandgaon, Kabirdham,	(09) Baloda bazaar, Bastar, gariyaband, Narayanpur, Dhamtari, Dantewada, Bijapur, Sukma, Raipur	(05) Raigarh, Mahasamund, Korba, Korea, Balod,	(05) Bilaspur, Janjgir Champa, Bemetara, Durg, Mungeli
Gram	989	Balod Bazar (1219)/ Korea (808)	(06) Bemetara, Durg, Mungeli, Bilaspur, Balod, Dhamtari,	(12) Raipur, Baloda bazaar, Bijapur, Jashpur, Kanker, Gariyaband, Raigarh, Kondagaon, Bastar, Mahasamund, Narayanpur, Dasntewada	(02) Kabirdham, Rajnandgaon,	(07) Surguja, Balrampur, Surajpur, Korea, korba, Janjgir-Champa, Sukma.
Lentil	327	Mahasamund (467)/ Kondagaon (250)	(06) Bemetara, Durg, Raipur, Baloda bazaar, Mungeli, Dhamtari,	(02) Gariyaband, Mahasamund	(08) Kabirdham, Rajnandgaon, Surguja, Balod, Jashpur, Surhguja, Balrampur, Bilaspur,	(07) Korea, Raigarh, kanker, Korba, janjgir-Champa, Bastar, Kondagaon
Pea & Beans	363	Mahasamund (511)/ Dantewada (143)	(08) Baloda bazaar, Surajpur, Raipur, Dhamtari, raigarh, Bilaspur, Balrampur, Gariyaband,	(04) Mungeli, Korea, Janjgir-Champa, Mahasamund	(08) Kanker, Sarguja, Jashpur, Kabirdham, Balod, Bemetara, Durg, Rajnandgaon,	(05) Korba, Bastar, Kondagaon, Narayanpur, Dasntewada

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Assam						
Tur	836	Goalpara (1125)/ Shivsagar (637)	(06) Sonitpur, Goalpara, Chirang, Kamrup, Darrrng, Bongaigaon,	(04) Tinsukia, Dibrugarh, Kamrum Metro, Dhemaji	(08) Karbi Anglong, Nagaon, Kokrajhar, Dimahasao, Barpeta, Udalguri, Baksa, Golaghat,	(09) Cachar, Dhubri, Hailakandi, Marigaon, Nalbari, Lakhimpur, Karimganj, Sivasagar, Jorhat
Mungbean	594	Karbi Anglong (778)/ Marigaon (309)	(08) Sonitpur, Karbi Anglong, Kokrajhar, Lakhimpur, Darrrng, Dhemaji, Hailakandi, Udalguri,	(01) Dhubri	(10) Jorhat, Nagaon, Marigaon, Barpeta, kamrup, Bongaigaon, Goalpara,Baksa, Nalbari, Golaghat,	(08) Tinsukia, Chirang, Dima Hasao, Dibrugarh, Sivasagar, Kamrup Metro, Cachar, Karimganj.
Urdbean	579	Sonitpur (735)/ Jorhat (352)	(08) Dhubri, Sonitpur, Goalpara, Nagaon, Lakhimpur, Udalguri, Tinsukia, Karbi Anglong,	(08) Dhemaji, Cachar, Marigaon, Nalbari, Hailakandi, Dibrugarh, Sivasagar, Karimganj	(05) Jorhat, Barpeta, Bongaigaon, Kokrajhar, Darrang,	(06) Baksa, Kamrup, Golaghat, Chirang, Dimahasao, kamrup Metro
Gram	656	Dhubri (1147)/ Dima hasao (318)	(04) Sonitpur, Dhubri, Goalpara, Bongaigaon,	(05) Darrang, Udalguri, Tinsukia, Sivasagar, Dibrugarh	(09) Karbi Anglong, Chirang, nagaon, Barpeta, kamrup, Baksa, Kokrajhar, Marigaon, Cachar,	(09) Golaghat, Lakhimpur, Nalbari, Jorhat, Dima hasao, Dhemaji, karim ganj, kamrup metro, Hailakandi
Lentil	640	Darrang (1197)/ Nagaon (456)	(07) Chirang, Sonitpur, Darrang, Bongaigaon, Dhubri, Marigaon, Udalguri,	(03) Kokrajhar, Golaghat, Sivasagar	(06) Barpeta, Nalbari, Kamrup, Baksa, Goalpara, Nagaon,	(11) Lakhimpur, Karbi Anglong, Kamrup Metro, Dhemaji, Jorhat, Cachar, Dibrughar, Tinsukia, Karimganj, Dima Hasao, Hailakandi
Pea & Beans	744	Darrang (1184)/ Dibrugarh (443)	(07) Darrrng, Nalbari, Kamrup Barpeta, Baksa, Golaghat, Marigaon,	(04) Dhubri, Bongaigaon, Chirang, Kamrup metro	(09) Sonitpur, Jorhat, Nagaon, Lakhimpur, Dhemaji, Tinsukia, Dibrugarh, Kokrajhar, Karbi Anglong,	(07) Udalguri, Dima hasao, Goalpara, Sivasagar, cachar, Karimganj, Hailakandi

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
West Bengal						
Tur	1266	Murshidabad (1459)/ Birbhum (538)	(03) 24 Parganas South, Nadia, Murshidabad,	(01) Medinipur East	(05) Purulia, Medinipur West,Hoogly, Bardhaman, Maldah,	(04) Jalpaiguri, Darjeeling, Dinajpur Uttar, Birbhum,
Mungbean	734	Hoogly (1396)/ Maldah (332)	(05) Medinipur West, Dinajpur Uttar, Coochbehar, Nadia, Murshidabad	(01) Hoogly	(03) Purulia, Maldah, Jalpaiguri,	(04) Bardhman, Darjeeling, Howrah, Bankura
Urdbean	695	Maldah (938)/ Bankura (191)	(04) Murshidabad, Nadia, Maldah, 24 Parganas North,	(03) Dinajpur Uttar, Medinipur West, 24 Parganas South	(04) Purulia, Coochbehar, Jalpaiguri, Dinajpur Dakshin,	(07) Darjeeling, Medinipur East, Birbhum, Bardhman, Bankura, Hoogly, Howrah
Gram	1132	Bardhaman (1342)/ Dinajpur Uttar (910)	(02) Birbhum, Maldah,	(04) Purulia, Bardhman, Hoogly, Medinipur West,	(04) Nadia, Murshidabad, 24 Parganas North, 24 Parganas south,	(05) Dinajpur Uttar, Jalpaiguri, Bankura, Dinajpur Dakshin, Howrah
Pea & Beans	1118	Murshidabad (1556)/ Bankura (711)	(03) Murshidabad, 24 Parganas North, 24 Parganas south,	(05) Hoogly, Coochbehar, Dinajpur Uttar, Purulia, Dinajpur Dakshin	(04) Nadia, Maldah, Bardhaman, Birbhum,	(05) Jalpaiguri, Darjeeling, Bankura Howrah, Medinipur West

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Madhya Pradesh						
Tur	646	Chhindwara (1343)/ Tikamgarh (168)	(06) Narsinghpur,Chhindwara,Singrauli, Seoni, Jabalpur, Morena	(15) Khandwa, Hoshangabad, Mandla, Dewas, Balagahat, Bhind, Buhanpur, Jhabua, Bhopal, Sheopur, Guna, Ashoknagar, Ratlam, Indore, Harda	(13) Rewa, Raisen, Satna, Damoh, Betul, Sidhi, Khargone, Panna, Shadol, Sagar, Chhatarpur, Umaria, Sehore	(17) Katni, Anuppur, Dindori, Vidisha, Barwani, Dhar, Shajapur, Alirajpur, Rajgarh, Datia, Ujjain, Shivpuri, Agar Malwa, Gwalior, Mandsaur, Neemuch, Tikamgarh
Mungbean	379	Ratlam (825)/ Indore (70)	(3) Hoshangabad Barwani, Dhar,	(15) Harda, Jabalpur , Panna Datia Bhind, Rajgarh, Guna, Agar Malwa, Bhopal ,Morena, Ratlam, Gwalior, Dewas, Katni, Singrauli,	(11) Khargone, Sehore, Chhatarpur, Shivpuri, Tikamgarh, Narsinghpur, Rewa, Satna, Khandwa ,Sagar, Raisen	(22) Chhindwara, Sidhi, Vidisha, Sheopur, Alirajpur, Betul, Ashoknagar, Damoh, Mandsaur, Burhanpur, Seoni, Jhabua, shajapur, Shahdol, Indore ,Ujjain, Balaghat,Neemuch, Anuppur, Umaria, , Mandla, Dindori,
Urdbean	397	Guna (620)/ Tikamgarh (248)	(5) Vidisha, Alirajpur, Shivpuri, Datia, Mandsaur,	(24) Narsinghpur, Jhabua, Shahdol, Guna, Barwani, Singhrauli, Ratlam, Gwalior, Balaghat, Neemuch, Katni, Dhar, Umaria, Anuppur, Ujjain, Mandla, Sheopur, Buhanpur, Bhopal, Bhind, Sehore, Morena, Harda, Dewas	(8) Tikamgarh, Chhatarpur, Ashoknagar, Sagar, Damoh, Jabalpur, Panna, Satna	(14) Rewa, Chhindwara, Seoni, Betul, Agar Malwa, Rajgarh, Dindori, Sidhi, Raisen, Khargone, Shajapur, Khandwa, Hoshangabad, Indore,

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Gram	2729	Chhindwara (1940)/ Dindori(519)	(10) Vidisha, Dewas, Raisen, Ashoknagar, Rajgarh, Dhar, Narsinghpur, Guna, Shivpuri, Indore,	(15) Agar Malwa, Chhindwara, Bhopal, Hoshangabad, Harda, Datia, Bhind, Gwalior, Neemuch, Khandwa, Sheopur, Singrauli, Morena, Burhanpur, Barwani	(10) Ujjain, Sagar, Damoh, Shajapur, Sehore, Chhatarpur, Panna, Satna, Ratlam, Jabalpur	(16) Rewa, Seoni, Betul, Mandsaur, Katni, Tikamgarh, Sidhi, Jhabua, Dindori, Khargone, Mandla, Balaghat, Alirajpur, Shahdol, Umari, Anuppur
Lentil	501	Ashoknagar (852)/ khargone (325)	(6) Vidisha, Panna, Narsinghpur, Damoh, Ashoknagar, Raisen	(21) Rajgarh, Umaria, Agar Malwa, Sidhi, Chhindwara, Bhind, Singhrauli, Datia, Sehore, Mandsaur, Betul, Bhopal, Shahdol, Guna, Morena, Ratlam, Khandwa, Neemuch, Hoshangabad, Dewas, Sheopur,	(9) Sagar, Rewa, Satna, Dindori, Jabalpur, Mandla, Sheoni, Katni, Anuppur	(13) Shajapur, Chhatarpur, Shivpuri, Tikamgarh, Gwalior, Ujjain, Indore, Dhar, Balaghat, Harda, Burhanpur, Khargone, Jhabua
Pea	643	Datia (1385)/ Mandla(352)	(5) Datia,Narsi-nghpur, Raisen Chhindwara,	(21) Bhind, Dewas, Gwalior, Ashoknahar, Shivpuri, Rajgarh, Ratlam, Dhar, Sehore, Shahdol, Balaghat, Bhopal, Singhrauli, Morena, Indore, Badwani, Mandsaur, Gunna, Neemuch, Alirajpur, Sheopur	(10) Mandla, Jabalpur, Panna, Sagar, Chhatarpur, Damoh, Dindori, Sheoni, Tikamgarh, Katni	(15) Betul, Satna, Umaria, Anuppur, Rewa, Sidhi, Hoshangabad, Khandwa, Ujjain, Shajapur, Harda, Agar Malwa, Jhabua, Khargone, Burhanpur

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Karnataka						
Tur	663	Kolar (1296)/ Tumkur (307)	(2) Gulbarga, Bidar	(6) Chitradurga, Davangere, Kolar, Ramanagara, Hassan, Bangalore Rural	(3) Bijapur, Yadgir, Raichur	(16) Tumkur, Koppal, Chikballapur, Bellary, Bagalkot, Mysore, Belgaum, Dharwad, Haveri, Gadag, Mandya, Chamarajanagar, Bengaluru Urban, Chikmagalur, Shimoga, Uttar Kannad
Mungbean	256	Gulbarga (395)/ Bijapur (140)	(6) Bidar, Gulbarga, Dharwad, Uttar Kannad, Yadgir, Mysore	(6) Haveri, Chamarajanagar, Shimoga, Mandya, Ramanagara, Bangalore Rural	(7) Gadag, Bagalkot, Belgaum, Koppal, Hassan, Tumkur, Bijapur	(6)Chitradurga, Raichur, Chikmagalur, Davangere, Bellary, Bengaluru Urban
Urdbean	404	Uttar Kannad (500)/ Hassan (176)	(2) Bidar, Gulbarga	(7) Yadgir, Uttar Kannad, Mandya, Koppal, Ramanagara, Bellary, Shimoga	(4) Mysore, Chamarajanagar, Belgaum, Hassan	(12) Dharwad, Chikmagalur, Tumkur, Haveri, Bijapur, Bagalkot, Gadag, Davangere, Bengaluru Urban, Chitradurga, Raichur, Bangalore Rural

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Rajasthan						
Tur	694	Karauli (1258)/ Sikar (119)	(7) Udaipur, Alwar, Pratapgarh, Dholpur, Jhalawar, Karauli, Sirohi	(9) Jaipur, Sawai Madhopur, Bharatpur, Ganganagar, Chittorgarh, Baran, Kota, Hanumangarh, Bundi	(2) Dungarpur, Banswara	(11) Pali, Bhilwara, Sikar, Jaisalmer, Ajmer, Jodhpur, Dausa, Rajsamand, Tonk, Jalore, Bikaner
Mungbean	411	Ganganagar (639)/ Barmer (194)	(4) Nagaur, Jodhpur, Jaipur, Ganganagar	(13) Hanumagarh, Bikaner, Chitaurgarh, Baran, Pratapgarh, Jhalawar, Kota, Sawai Madhopur, Dholpur, Bundi, Bharatpur, Dausa, Alwar	(6) Pali, Jalore, Ajmer, Barmer, Tonk, Churu	(10) Jhunjhunu, Bhilwara, Sikar, Sirohi, Jailsalmer, Rajsamand, Udaipur, Karoli, Dungarpur, Banswara
Lentil	915	Bharatpur (1160)/ Dungarpur (667)	(2) Bundi, Bharatpur	(8) Dholpur, Alwar, Ajmer, Sikar, Jalore, Bikaner, Hanumangarh, Jhunjhunu	(5) Bhilwara, Pratapgarh, Jhalawar, Tonk, Chittorgarh	(9) Sawai Madhopur, Baran, Kota, Banswara, Ganganagar, Nagaur, Karauli, Jaipur, Dungarpur
Urdbean	478	Churu (1000)/ Ajmer (251)	(6) Bundi, Dungarpur, Tonk, Jhalawar, Kota, Sawai Madhopur	(11) Baran, Sirohi, Jaipur, Dholpur, Pali, Hanumangarh, Karauli, Dausa, Bikaner, Jaisalmer, Churu,	(6) Bhilwara, Banswara, Ajmer, Udaipur, Chittorgarh, Pratapgarh	(6) Rajsamand, Ganganagar, Barmer, Bharatpur, Jalore, Alwar
Gram	711	Bharatpur (1316)/ Churu (328)	(7) Ganganagar, Jhunjhunu, Jaipur, Sikar, Ajmer, Tonk, Jhalawar,	(21) Nagaur Pratapg,arh, Bhilwara, Pali, Sawai Madhopur, Karauli, Banswara, Dungarpur, Alwar, Chittorgarh, Udaipur, Bundi, Dausa, Kota, Baran, Bharatpur, Sirohi, Dholpur, Jodhpur, Rajsamand, Barmer	(4) Churu, Hanumangarh, Bikaner, Jaisalmer	(1) Jalore
Pea & Beans	2017	Jodhpur (12000)/ Jaisalmer (333)	(1) Jaipur	(2) Ganganagar, Baran, Jodhpur	(3) Nagaur, Bundi, Ajmer, Chittorgarh	(21) Jhalawar Jhunjhunu, Alwar, Bharatpur, Kota, Dholpur, Bhilwara, Tonk, Sawai Madhopur, Hanumangarh, Sirohi, Rajsamand, Dausa, Bikaner, Karauli, Banswara, Barmer, Jalore, Jaisalmer, Udaipur, .Pali,

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Maharastra						
Tur	695	Latur (994)/ Kolapur (286)	(7) Amravati, Yavatmal, Latur, Wardha Akola, Hingoli, Chandrapur	(4) Jalgaon, Bhandara, Gondia, Gadchiroli	(9) Osmanabad, Nanded, Parbhani, Buldhana, Nagpur, Beed, Washim, Jalna, Aurangabad	(13) Solapur, Nandurbar, Ahmednagar, Nashik, Dhule, Sangli, Pune, Thane, Satara, Kolhapur, Raigad, Ratnagiri, Palghar,
Mungbean	518	Nasik (861)/ Chandrapur (310)	(8) Buldhana, Jalgaon, Washim, Nanded, Dhule, Latur, Nandurbar, Nashik	(9) Ahmednagar, Beed, Pune, Aurangabad, Satara, Kolhapur, Solapur, Thane, Bhandara	(7) Amravati, Akola, Parbhani, Jalna, Hingoli, Osmanabad, Yavatmal	(9) Sangli, Nagpur, Chandrapur, Gadchiroli, Gondia, Raigad Wardha, Ratnagiri, Sindhudurg
Urdbean	648	Nasik (948)/ Amravati (444)	(8) Nanded, Buldhana, Jalgaon, Washim, Latur, Nashik, Nandurbar, Beed	(8) Dhule, Solapur, Thane, Pune, Aurangabad, Raigad, Ratnagiri, Bhandara	(7) Osmanabad, Hingoli, Akola, Parbhani, Jalna, Sangli, Ahmednagar	(10) Yavatmal, Amravati, Satara, Kolhapur, Nagpur, Sindhudurg, Wardha, Chandrapur, Gondia, Gadchiroli
Gram	836	Hingoli (1385)/ Jalna (550)	(10) Amravati, Akola, Latur, Hingoli, Nanded,, Pune, Jalgaon, Yavatmal, Dhule, Washim	(4) Nandurbar, Kolhapur, Thane, Raigad	(13) Ahmednagar, Osmanabad, Nagpur, Buldhana, Parbhani, Beed, Aurangabad, Nashik, Solapur, Chandrapur, Wardha, Satara, Sangli	(5) Jalna, Bhandara, Gondia, Gadchiroli, Palghar

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Uttar Pradesh						
Tur	904	Kanpur nagar (2030)/ Shravasti (450)	(6) Mirzapur, Jaunpur, Aligarh, Azamgarh, Kanpur Dehat, Pratapgarh	(24) Sultanpur, Jalaun, Ghazipur, Kanpur Nagar, Baliya, Sant Ravidas Sitapur, Auraiya, Chandauli, Ambedkar Nagar, Mau, Etah, Mathura, Etawah, Faizabad , Gautam Budh Nagar, Kasganj, Kannauj, Firozabad, Farrukhabad, Mainpuri, Agra, Pilibhit Varanasi,	(9) Banda, Fatehpur, Hamirpur, Allahabad , Chitrakoot, Sonbhadra, Bulandsheher, Kaushambi, Balrampur	(36) Gonda, Rai Barreily, Deoria, Mahoba, Hathras, Amethi, Bahraich, Gorakhpur, Basti,Sant Kabir Nagar, Unnao, Shravasti, Jhansi,Siddharth Nagar Barabanki, Hardoi, Ghaziyabad, Merrut, Kheri, Hapur, Khusinagar, Lucknow, Baghpat, Budaun, Shahajahanpur, Maharajganj, Sambhal, Amroha, Moradabad, Muzaffarnagar, Lalitpur, Barreilly, Rampur, Bijnor, Shamli, Saharnpur
Mungbean	410	Hathras (646)/ Kheri (340)	(4) Lalit Pur, Unnao, Jalaun, Rai Barreily, Fatehpur	(36) Aligarh, Etah, Kasganj, Kanpur Nagar, Pratapgarh, Budaun, Firozabad, Moradabad, Barabanki, Kannauj, Ghaziyabad, Etawah, Lucknow, Farrukhabad, Amethi, Shahajahanpur, Ghazipur, Hathras, Kaushambi, Sultanpur, Chandauli, Sonbhadra, Allahabad , Rampur, Sant Ravidas Nagar, Basti, Gonda, Bijnor, Ambedkar Nagar, Gorakhpur, Gautam Budh Nagar, Shamli, Azamgarh, Muzzaffarnagar, Faizabad , Mau	(5) Mahoba, Jhansi, Hamirpur, Banda, Chitrakoot	(22) Bulandsheher, Kheri, Varanasi, Kanpur Dehat, Sambhal, Hardoi, Mainpuri, Auraiya, Mirzapur, Agra, Amroha, Sitapur, Hapur, Merrut, Baghpat, Mathura, Jaunpur, Khusinagar, Baliya, Deoria, Balrampur, Barreilly

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Pea & Beans	1139	Pilibhit (1900)/ Chitraloot (625)	(2) Jalaun, Lalitpur	(38) Azamgarh, Jaunpur Basti, Sant Kabir Nagar, Ghazipur, Mirzapur, Siddharth Nagar, Gonda, Varanasi, Baliya, Kanpur Dehat, Kanpur Nagar, Balrampur, Barreilly, Chandauli, Mau, Bahraich, Rampur, Mainpuri, Budaun, Kannauj, Farrukhabad, Etah, Shahajahanpur, Bulandsheher, Pilibhit, Firozabad, Moradabad, Etawah, Aligarh, Auraiya, Agra, Bijnor, Hathras, Gautam Budh Nagar, Muzaffarnagar, Saharnpur, Shamli	(3) Jhansi, Mahoba, Hamirpur	(32) Sultanpur, Amethi, Allahabad, Pratapgarh, Ambedkar Nagar, Sonbhadra, Banda, Barabanki, Faizabad , Rai Barreily, Sitapur, Gorakhpur, Fatehpur, Deoria, Kaushambi, Hardoi, Maharajganj, Sant Ravidas Nagar, Lucknow, Unnao, Kasganj, Kheri, Khusinagar, Shrawasti, Chitrakoot, Merrut, Sambhal, Amroha, Hapur, Baghpat, Ghaziyabad, Mathura
Lentil	749	Hathras (1594)/ Chitrakoot (412)	(8) Bahraich, Jalaun, Balrampur, Shahajahanpur, Lalit Pur, Baliya, Kheri, Gonda	(37) Ghazipur, Hardoi, Mirzapur, Budaun, Barreilly, Pilibhit, Lucknow, Etah, Kasganj, Aligarh, Rampur, Farrukhabad, Sambhal, Kanpur Nagar, Bijnor, Moradabad, Agra, Unnao, Merrut, Jaunpur, Hathras, Kanpur Dehat, Mau, Varanasi, Kannauj, Ghaziyabad, Mainpuri, Azamgarh, Gautam Budh Nagar, Amroha, Rai Barreily, Baghpat, Shamli, Firozabad, Mathura, Auraiya, Etawah	(9) Hamirpur, Banda, Mahoba, Jhansi, Sitapur, Shravasti, Chitrakoot, Barabanki, Sonbhadra	(21) Allahabad , Chandauli, Maharajganj, Sultanpur, Khusinagar, Siddharth Nagar, Amethi, Basti,S aharnpur, Faizabad, Gorakhpur, Sant Kabir Nagar, Bulandsheher, Fatehpur, Deoria, Ambedkar Nagar, Muzaffar Nagar, Hapur, Kaushambi, Pratapgarh, Sant Ravidas Nagar

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Urdbean	601	Moradabad (927), Banda (355)	(5) Lalit Pur, Budaun, Sambhal, Sitapur	(32) Moradabad, Barreilly, Kanpur Dehat, Pratapgarh, Rampur, Amroha, Sonbhadra, Kheri, Bijnor, Bahraich, Etawah, Auraiya, Kaushambi, Farrukhabad, Muzaffar Nagar, Saharnpur, Mirzapur, Sant Ravidas Nagar, Baghpat, Shamli, Kannauj, Ghaziyabad, Basti, Agra, Azamgarh, Hathras, Pilibhit, Gorakhpur, Baliya, Aligarh, Deoria, Mau	(6) Jhansi, Mahoba, Unnao, Hardoi, Hamirpur, Rai Barreily	(33) Barabanki, Shahajahanpur, Jalaun, Fatehpur, Kanpur Nagar, Lucknow, Jaunpur, Amethi, Banda, Faizabad , Varanasi, Sultanpur, Bulandsheher, Chitrakoot, Balrampur, Merrut, Kasganj, Allahabad , Etah, Hapur, Gonda, Ghazipur, Shrawasti, Firozabad, Mainpuri, Siddharth Nagar, Mathura, Chandauli, Ambedkar Nagar, Maharajganj, Khusinagar, Gautam Budh Nagar, Sant Kabir Nagar
Gram	810	Agra (1764)/ Amroha (500)	(8) Fatehpur, Hamirpur, Hathras, Kanpur Dehat, Jalaun, Lalitpur, Kanpur Nagar, Mirzapur	(40) Sonbhadra, Kaushambi, Auraiya, Jaunpur, Pratapgarh, Azamgarh, Unnao, Ghaziyabad, Baliya, Amethi, Varanasi, Ghazipur, Etawah, Ambedkar Nagar, Chandauli, Mau, Agra, Lucknow, Kannauj, Mainpuri, Barabanki, Sant Ravidas Nagar, Farrukhabad, Firozabad, Etah, Hardoi, Bahraich, Shravasti, Merrut Bulandsheher, Muzaffarnagar,Bijnor, Aligarh, Mathura, Saharnpur, Siddharth Nagar, Rampur, Baghpat, Shamli, Gautam Budh Nagar	(6) Banda, Mahoba, Jhansi, Chitrakoot, Gorakhpur, Allahabad	(20) Rai Barreily, Sultanpur, Faizabad, Basti, Gonda, Sitapur, Balrampur, Sant Kabir Nagar, Deoria, Kheri, Shahajahanpur, Moradabad, Maharajganj, Kasganj, Budaun, Khusinagar, Barreilly, Sambhal, Pilibhit, Amroha

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Telangana						
Tur	520	Adilabad (743)/ Rangareddi (422)	(4)Adilabad, Nalgonda, Warangal, Karimnagar,	(1) Khammam	(3) Mahbubnagar, Rangareddi, Medak	Nizamabad
Mungbean	617	Rangareddi (787)/ Mahbubnagar (472)	(5) Warangal, Medak, Khammam, Karimnagar, Rangareddi,		(4)Nalgonda, Adilabad, Mahbubnagar, Nizamabad	
Urdbean	739	Rangareddi (997)/ Nalgonda (425)	(3)Adilabad, Rangareddi, Karimnagar		(5)Medak, Nizamabad, Khammam,Warangal, Mahbubnagar	(1)Nalgonda
Gram	1597	Nizamad (1887)/ Warangal (1127)	Mahbubnagar, Nizamabad	Nalgonda, Khammam	Adilabad, Medak, Rangareddi	Karimnagar, Warangal
Tamil Nadu						
Tur	730	Theni (1313)/ Thiruvannamalai (301)	(5) Krishnagiri, DharmapuriSalem, Madurai, Theni	(6) Tiruppur, Sivaganga, Tuticorin, Kanchipuram, Thiruvarur, Kanniyakumari	(2) Vellore, Karur	(16) Namakkal, Dindigul, Erode, Tiruvannamalai, Tiruchirappalli, Thiruvallur, Perambalur, Pudukkottai, Virudhunagar, Coimbatore, Ariyalur, Villupuram, Cuddalore, Tirunelveli, Thanjavur, Ramanathapuram

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average		
			HAHP	LAHP	HALP	LALP	
Mungbean	500		Cuddalore (887)/ Tuticorin (178)	(6) Thiruvarur, Nagapattinam, Ramanathapuram ,Thiruvallur, Cuddalore, Sivaganga,	(10) Dharmapuri, Tiruvannamalai, Villupuram, Tiruchirappalli, Namakkal, Kanniyakumari, Perambalur, Salem, Ariyalur, Thanjavur	(5) Tuticorin, Madurai, Virudhunagar, Tirunelveli, Tiruppur	(9) Dindigul, Krishnagiri, Karur, Vellore, Coimbatore, Theni, Erode, Kanchipuram Pudukkottai,
Urdbean	595		Villupuram (849)/ Tuticorin (169)	(5) Cuddalore, Thiruvarur, Villupuram, Thanjavur, Tiruchirappalli	(17) Dindigul, Dharmapuri, Salem, Krishnagiri, Pudukkottai, Ariyalur, Karur, Namakkal, Kanchipuram, Thiruvallur, Coimbatore, Madurai, Kanniyakumari, Erode, Sivaganga, Theni, Perambalur	(4) Nagapattinam, Tuticorin, Tirunelveli, Tiruvannamalai	(4) Virudhunagar, Ramanathapuram, Vellore, Tiruppur
Gram	650		Parambalur (1000)/ Karur (161)	(2) Tiruppur, Coimbatore	(4) Tirunelveli, Thiruvallur, Perambalur, Ramanathapuram	(3) Dharmapuri, Dindigul, Vellore	(14) Salem, Namakkal, Karur,Virudhunagar, Theni, Madurai, Tiruchirappalli, Villupuram, Tuticorin, Sivaganga, Krishnagiri, Thanjavur, Pudukkottai, Tiruvannamalai

Crop/Season	State Avg. Yield	Highest/ Lowest Yield	Districts Above the State average		Districts below the State average	
			HAHP	LAHP	HALP	LALP
Uttrakhand						
Tur	779	Haridwar (1000)/ Champawat (255)	(5) Tehri Garhwal, Uttar Kashi, Dehradun, Pauri Garhwal Rudra Prayag	(2) Udam Singh Nagar, Haridwar	(2) Chamoli, Champawat	(2) Pithoragarh, Almora, Nainital, Bageshwar
Mungbean	552	Nainital (1333)/ Udham Singh Nagar (535)	(1) Haridwar	(1) Nainital	(2) Udham Singh Nagar, Dehrudun	
Urdbean	787	Uttarkashi (1054)/ Bageshwar (564)	(4) Tehri Garhwal, Uttar Kashi, Pithoragarh, Chamoli	(7) Pauri Garhwal, Nainital, Almora, Dehradun, Champawat, Udam Singh Nagar, Rudra Prayag		(2) Bageshwar, Haridwar
Gram	821	Uttar Kashi (1000)/ Bageshwar (563)	(1) Nainital	(1) Uttar Kashi	(5) Pauri Garhwal, Almora, Dehradun, Champawat, Tehri Garhwal,	(5) Udam Singh Nagar, Pithoragarh, Bageshwar, Haridwar, Chamoli
Lentil	797	Champawat (927)/ Haridwar (591)	(4) Pithoragarh, Tehri Garhwal, Champawat, Uttar Kashi	(7) Bageshwar, Pauri Garhwal, Almora, Dehradun, Haridwar, Nainital, Udam Singh Nagar		(2) Chamauli, Rudraprayag
Peas & Beans	999	Udham Singh Nagar (1117)/ Almora (511)	(1) Udham Singh Nagar	(5) Uttar Kashi, Dehradun, Nainital, Tehri Garhwal, Pithoragarh		(7) Almora, Chamoli, Champawat, Pauri Garhwal, Haridwar, Bageshwar, Rudra Prayag

Source: Annual Report 2016-17, DPD, Bhopal

Recommendation

High area- High productivity	High area- Low productivity	Low area- High productivity	Low area- Low productivity
• Post harvest management • Value addition/Branding • Per unit cost in productivity • Yield gap, if any	• Verical expansion • Seed SSR/ VRR • Micro irrigation system /critical irrigation • Mechanization	• Horizontal expansion • Intercropping. • Transplanting (Dharwad method). • Branding	• Replacement of low yielding crop with high yielding. • Incorporation of pulses for sustainable cropping. • Strategy for crop diversification

6.2.2 Yield Gap Analysis: FLD (Crop-wise)

The gap over state average yield and the likely additional return by way of bridging the yield gap is about Rs.12554/ha over the farmers practices and Rs.22119/ha over the state average yield. The additional return has been worked out on the basis of quantity under yield gap multiplyied by the MSP in all crops, excluding field pea. The field pea, having no provision of MSP, has been calculated on the basis of ruiling market price (@ Rs3500/qtl). The details crop-wise yield gaps and additional return by bridging the yield gap is given as under and also under individual crops, state-wise, is indicated under ***Table 23and 23 (a to f):***

Table 23. Crop-wise Yield Gap and Additional Return ***(Yield: Kg/ha; Return: Rs./ha.)***

Crop	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17 *	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
Pigeonpea	1394	1078	863	316	29	530	61	787	17373	29177
Chickpea	1502	1244	907	257	21	594	66	860	10296	23776
Rice fallow Chickpea	1275	960	976	315	33	299	31	772	13871	13145
Mungbean(Kh)	781	608	435	173	28	345	79	455	9682	19339
Mungbean(R)	1398	1228	704	170	14	694	99	508	9520	38864
Mungbean(RF)	960	723	532	237	33	428	80	434	13272	23968
Mungbean Summer/Spring	931	559	674	372	66	257	38	717	20832	14414
Urdbean (Kh)	813	622	368	191	31	445	121	614	10287	24019
Urdbean (R)	1203	986	774	217	22	429	55	788	12152	24024
Urdbean (RF)	1185	1002	774	183	18	411	53	788	10220	22988
Lentil	1289	966	777	323	33	512	66	756	12920	20480
Field pea	1225	933	904	292	31	321	36	827	10220	11235
Average	**1163**	**909**	**724**	**254**	**30**	**439**	**65**	**692**	**12554**	**22119**

Source-Annual Report- 2016-17, GoI, DPD, Bhopal (Ave. 2013-14 to 2015-16)
State Average Yield - E&S (Ave. 2011-12 to 2015-16) *Third Advance Estimates 2016-17
IP: Improved Practise FP: Farmers Practise SAY: State Avergae Yield

Table 23. (a) State-wise Yield Gap and Additional Return: Pigeonpea

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17 *	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
AP	1953	1498	493	455	30	1460	296	376	25025	80300
Bihar	2082	1765	1669	317	18	413	25	1561	17435	22715
Gujarat	1442	1098	1092	344	31	350	32	1105	18902	19250
Haryana	1897	1530	1104	368	24	793	72	915	20222	43633
Jharkhand	1513	1192	987	322	27	526	53	1043	17692	28948
Karnataka	1017	812	557	205	25	460	83	713	11293	25318
MP	1336	1043	819	293	28	517	63	1133	16097	28417
Maharashtra	1189	930	692	259	28	497	72	906	14263	27335

Nagaland	1191	702	891	489	70	300	34	0	26895	16482
Punjab	1542	1282	944	260	20	598	63	825	14300	32890
Odisha	1236	888	880	348	39	356	40	848	19140	19553
Rajasthan	750	632	703	118	19	47	7	879	6490	2585
Telangana	1518	1112	457	407	37	1061	232	555	22367	58373
TN	965	808	940	157	19	25	3	745	8653	1393
Tripura	895	616	716	279	45	179	25	0	15345	9827
UP	1773	1339	867	434	32	906	104	994	23852	49812
Average	**1394**	**1078**	**863**	**316**	**29**	**530**	**61**	**787**	**17373**	**29177**

Table 23. (b) State-wise Yield Gap and additional return: Chickpea

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17*	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
AP	1651	1553	1085	98	6	566	52	1107	3920	22640
Assam	1082	749	692	333	44	390	56	1000	13320	15600
Bihar	2063	1798	1159	265	15	904	78	986	10600	36160
Haryana	2135	1803	848	332	18	1287	152	810	13280	51480
UP	1518	1522	916	-4	0	602	66	1125	-160	24080
Maharashtra	1441	1125	752	316	28	689	92	869	12640	27560
Gujarat	1620	1379	1179	241	17	441	37	1235	9640	17640
Uttarakhand	2000	1552	868	448	29	1132	130	1000	17920	45280
Tamil Nadu	887	741	648	146	20	239	37	648	5840	9560
Rajasthan	1690	1446	842	244	17	848	101	930	9760	33920
Chhattisgarh	981	911	912	70	8	69	8	1027	2800	2760
Manipur	1142	814	895	328	40	247	28	0.0	13120	9880
MP	1432	1052	1100	380	36	332	30	1101	15200	13280
Karnataka	1459	1231	619	228	19	840	136	380	9120	33600
Punjab	1598	1453	1191	145	10	407	34	1300	5800	16280
J & K	794	619	558	175	28	236	42	0	7000	9440
WB	2033	1402	1157	631	45	876	76	1100	25240	35040
Average	**1502**	**1244**	**907**	**257**	**21**	**594**	**66**	**860**	**10296**	**23776**
Rice fallow chickpea										
Assam	1257	901	692	356	40	565	82	1000	14240	22600
Bihar	1346	1037	1159	309	30	187	16	986	12669	7667
Manipur	1298	950	895	348	37	403	45	0	14616	16926
West Bengal	1198	950	1157	248	26	41	4	1100	10664	1763
Average	**1275**	**960**	**976**	**315**	**33**	**299**	**31**	**772**	**13871**	**13145**

Table 23. (c) State-wise Yield Gap and additional return: Mungbean

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17*	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
Kharif										
Tripura	1016	782	513	234	30	503	98	0	13104	28168
Gujarat	766	606	501	160	26	265	53	457	8960	14840
Karnataka	655	563	214	92	16	441	206	276	5152	24696
Maharasthra	546	430	418	116	27	128	31	522	6496	7168
Rajasthan	773	600	436	173	29	337	77	475	9688	18872
Tamil Nadu	1000	796	588	204	26	412	70	714	11424	23072
Manipur	642	479	0.00	163	34	642	0	-	9128	35952
WB	1229	915	838	314	34	391	47	727	17584	21896
Average	**781**	**608**	**435**	**173**	**28**	**345**	**79**	**455**	**9682**	**19339**
Rabi										
AP	1398	1228	704	170	14	694	99	508	9520	38864
Rice fallow										
AP	1094	947	704	147	16	390	55	508	8232	21840
Odisha	825	498	359	327	66	466	130	359	18312	26096
Average	**960**	**723**	**532**	**237**	**33**	**428**	**80**	**434**	**13272**	**23968**
Summer/Spring Mungbean										
Bihar	939	735	603	204	28	336	56	548	11424	18816
Uttar Pradesh	1176	953	709	223	23	467	66	631	12488	26152
Haryana	524	487	576	37	8	-52	-9	735	2072	-2912
Punjab	1143	0.00	857	1143	0	286	33	986	64008	16016
Assam	875	622	624	253	41	251	40	686	14168	14056
Average	**931**	**559**	**674**	**372**	**66**	**257**	**38**	**717**	**20832**	**14414**

Table 23. (d) State-wise Yield Gap and additional return: Urdbean

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17*	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
Kharif										
Assam	868	701	**0**	167	24	868	0	-	9018	46872
J&K	576	403	358	173	43	218	61	-	9342	11772
Tamil Nadu	907	724	781	183	25	126	16	713	9882	6804
Karnataka	795	672	386	123	18	409	106	494	6642	22086
M.P.	570	393	475	177	45	95	20	660	9558	5130
Maharashtra	668	535	506	133	25	162	32	562	7182	8748
UP	1060	700	536	360	51	524	98	539	19440	28296
West Bengal	1196	927	622	269	29	574	92	692	14526	30996

Manipur	613	466	0.00	147	32	613	-	-	7938	33102
Rajasthan	875	702	474	173	25	401	85	641	9342	21654
Average	**813**	**622**	**368**	**191**	**31**	**445**	**121**	**614**	**10287**	**24019**
Rabi										
AP	1437	1188	831	249	21	606	73	922	13446	32724
Tamil Nadu	969	784	716	185	24	253	35	654	10175	13915
Average	**1203**	**986**	**774**	**217**	**22**	**429**	**55**	**788**	12152	24024
Rabi & rice fallow										
Tamil Nadu	927	764	716	163	21	211	29	848	8802	11394
AP	1442	1240	831	202	16	611	74	728	11110	33605
Average	**1185**	**1002**	**774**	**183**	**18**	**411**	**53**	**788**	**10220**	**22988**

Table 23. (e) State-wise Yield Gap and additional return: Lentil

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SPY		Yield 2016-17*	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
Assam	1013	770	668	243	32	345	52	693	9720	13800
HP	642	396	567	246	62	75	13	263	9840	3000
Jharkhand	670	520	911	150	29	-241	-26	768	6000	-9640
Bihar	1805	1295	1068	510	39	737	69	932	20400	29480
Chhattisgarh	644	465	378	179	38	266	70	331	7160	10640
M.P.	918	721	594	197	27	324	55	719	7880	12960
Rajasthan	1788	1443	942	345	24	846	90	859	13800	33840
UP	1369	1112	755	257	23	614	81	710	10280	24560
Tripura	933	712	690	221	31	243	35	-	8840	9720
West Bengal	1899	1254	922	645	51	977	106	985	25800	39080
Average	**1289**	**966**	**777**	**323**	**33**	**512**	**66**	**756**	**12920**	**20480**

Table 23. (f) State-wise Yield Gap and additional return: Field pea

(Yield: Kg/ha; Return: Rs./ha.)

State	Yield (kg/ha)			Gap over FP		Gap over SAY		Yield 2016-17*	Additional return by bridging yield gap (Rs/ha)	
	IP	FP	SAY	Actual	%	Actual	%		FP	SAY
Assam	1205	960	782	245	26	423	54	782	8575	14805
Bihar	1805	1256	993	549	44	812	82	1053	19215	28420
Chhattisgarh	764	586	419	178	30	345	82	381	6230	12075
J&K	1164	942	831	222	24	333	40	-	7770	11655
Jharkhand	1284	964	1188	320	33	96	8	766	11200	3360
Manipur	784	582	936	202	35	-152	-16	940	7070	-5320
Tripura	1420	1390	850	30	2	570	67	-	1050	19950
UP	1628	1278	1110	350	27	518	47	997	12250	18130
Average	**1225**	**933**	**904**	**292**	**31**	**321**	**36**	**827**	**10220**	**11235**

Source-Annual Report- 2016-17, GoI, DPD, Bhopal (Ave. 2013-14 to 2015-16)
State Average Yield - E&S (Ave. 2011-12 to 2015-16) *Third Advance Estimates2016-17
IP: Improved Practise FP: Farmers Practise SAY: State Avergae Yield

6.3 Emphasis on improvement in total factor productivity

Total factor productivity is an important source of output growth which directly contributes to cost saving and the increase in income. Input use efficiency need to be improved. Some recent development initiatives taken by the Govt. aims at raising output and reduction in the cost of production. These development initiatives include PMKSY, SHCs, PKVY, PMFBY etc.

6.3.1 Precision Agriculture

Precision agriculture, farming by soil, site-specific management (SSM).Involves site-specific management, depending on the ability to collect and control information to accurately and appropriately address parts of field for actual and specific needs rather than whole field for average needs.

- It is an integrated agricultural management system, involving right amount of input at the right location and right time to enhance production, decrease input cost, improve quality of the product, and/or protect the environment.
- The technological tools often include the *global positioning system, geographical information system, yield monitor, variable rate technology, and remote sensing*
- The major philosophy of precision farming is: Find ways to reduce cost of cultivation/energy input;Use inputs appropriate to the productive capacity of the soil; Optimise outputs for safe and stable supply of food; Ability to handle variations in productivity within a field and to maximize financial returns; Reduce wastages; Minimize negative impacts on the environment

6.3.2 Importance of Precision Farm Machinery

- Increased production/productivity - 10-15%
- Higher cropping intensity - 5-20%
- Savings in seeds - 15-20%
- Saving in fertilizer/chemicals - 15-20%,
- Reduction in time/labour - 20-30%

6.3.3 Effect of protective irrigation on yield of various crops

Crop and Irrigation	No. of protective irrigation	Yield (q/ha)		Increase Over rainfed (%)	WUE (Kg/ha	
		Rainfed	Irrigated		Rainfed	Irrigated
Pigeonpea	01	8.00	12.00	50.00	1.25	1.73
Greengram	01	5.00	11.25	125.00	0.78	1.63
Chickpea	01	5.00	9.50	90.00	0.78	1.48

Source: Annual report -2016-17, DPD, Bhopal

6.4 Policy for improving terms of trade for farmers

Doubling of farmersô income should not be viewed as same as doubling of farm output. The policy needed to ensure the market stability and remunerative prices of farm output, especially perishable and pulse crops.

6.4.1 Comparative statement of MSP & cost of production

The analysis of average gap between Minimum Support Price and cost of production of pulse crops during 2012-13 to 2014-15 reveals that the MSPs are above the cost of production in Arhar, Urdbean and Gram, however, less in Mungbean and lentil. It is pertinent to mention here that the cost of production vary from state to state, depending on cost of cultivation and productivity level of particular states. The detailed analysis under individual crops, state-wise, is indicated under ***Table 24 and 24 (a to e):***

Table 24. Comparative statement of MSP & cost of production

Rs./quintal

Crops	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
Arhar	3428	3850	422	3529	4300	771	5237	4350	-887	3847	4167	320
Mungbean	4832	4400	258	5257	4500	-6	6864	4600	-1283	4844	4500	-344
Urdbean	3614	4300	686	4310	4300	-10	4485	4350	426	3949	4317	367
Gram	2971	3000	326	3058	3100	348	3183	3175	-8	2870	3092	222
Lentil	2555	2900	345	3289	2900	-389	3839	3075	-764	3228	2958	-269

Table 24. (a) Comparative statement of MSP & cost of production-Arhar

Rs./quintal

States	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
AP	4484	3850	-634	4701	4300	-401	6431	4350	-2081	5205	4167	-1039
Bihar	1759	3850	2091	1470	4300	2830		4350		1076	4167	3090
Guj	3747	3850	103	3889	4300	411	4585	4350	-235	4074	4167	93
MP	2814	3850	1036	2830	4300	1470	4569	4350	-219	3404	4167	763
Kar	3102	3850	749	3058	4300	1242	4097	4350	253	3419	4167	748
MH	3102	3850	748	2982	4300	1318	5715	4350	-1365	3933	4167	234
Orissa	4314	3850	-464	4553	4300	-253	7076	4350	-2726	5314	4167	-1148
UP	4105	3850	-255	4751	4300	-451	4184	4350	166	4347	4167	-180
Avg. Above	**3428**	**3850**	**422**	**3529**	**4300**	**771**	**5237**	**4350**	**-887**	**3847**	**4167**	**320**

Table 24. (b) Comparative statement of MSP & cost of production -Mung bean

Rs./quintal

States	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
AP	4608	4400	-208	4328	4500	172	4656	4600	-56	4530	4500	-30
Gujarat		4400	4400		4500	4500	11264	4600	-6664	3755	4500	745
Kar	4437	4400	-37	3699	4500	801	6094	4600	-1494	4744	4500	-244
MH	4762	4400	-362	7817	4500	-3317	8099	4600	-3499	6892	4500	-2392
Orissa	4856	4400	-456	5183	4500	-683	5690	4600	-1090	5243	4500	-743
Raj	5639	4400	-1239	5989	4500	-1489	5378	4600	-778	5669	4500	-1169
TN	4690	4400	-290	4526	4500	-26		4600	4600	3072	4500	1428
Avg. Above	**4832**	**4400**	**258**	**5257**	**4500**	**-6**	**6864**	**4600**	**-1283**	**4844**	**4500**	**-344**

Table 24. (c) Comparative statement of MSP & cost of production- Urd bean

Rs./quintal

State	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
AP	3056	4300	1244	3165	4300	1135	3394	4350	956	3205	4317	1112
CG	1884	4300	2416	2594	4300	1706	3395	4350	955	2624	4317	1692
MP	2353	4300	1947	4363	4300	-63	3504	4350	846	3407	4317	910
MH	4413	4300	-113	4875	4300	-575	6107	4350	-1757	5131	4317	-815
Orissa	4548	4300	-248	4894	4300	-594	5791	4350	-1441	5078	4317	-761
Raj	3262	4300	1038	5393	4300	-1093		4350	4350	2885	4317	1432
TN	5224	4300	-924	4404	4300	-104	4447	4350	-97	4692	4317	-375
UP	4173	4300	127	4791	4300	-491	4756	4350	-406	4573	4317	-257
Avg. Above	**3614**	**4300**	**686**	**4310**	**4300**	**-10**	**4485**	**4350**	**426**	**3949**	**4317**	**367**

Table 24. (d) Comparative statement of MSP & cost of production -Gram

Rs./quintal

State	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
AP	2985	3000	15	3094	3100	6	3106	3175	69	3062	3092	30
Bihar	3448	3000	-448	2452	3100	648	2390	3175	785	2763	3092	328
CG	2541	3000	459	3002	3100	98	3114	3175	61	2886	3092	206
HR	2830	3000	170	3346	3100	-246	3313	3175	-138	3163	3092	-71
JH		3000	3000		3100	3100	1631	3175	1544	544	3092	2548
KAR	3815	3000	-815	2507	3100	593	2989	3175	186	3104	3092	-12
MP	2715	3000	285	2946	3100	154	2916	3175	259	2859	3092	233
MH	2965	3000	35	2777	3100	323	3419	3175	-244	3054	3092	38
Raj	2393	3000	607	2192	3100	908	3443	3175	-268	2676	3092	416
UP	3048	3000	-48	5206	3100	-2106	5507	3175	-2332	4587	3092	-1496
Avg. Above	**2971**	**3000**	**326**	**3058**	**3100**	**348**	**3183**	**3175**	**-8**	**2870**	**3092**	**222**

Table 24. (e) Comparative statement of MSP & cost of production -Lentil

Rs./quintal

State	2012-13			2013-14			2014-15			Average		
	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -	CP	MSP	+ -
Bihar	2662	2900	238	2278	2900	622	2400	3075	675	2447	2958	512
MP	2361	2900	540	3375	2900	-475	3575	3075	-500	3104	2958	-145
UP	2518	2900	382	3624	2900	-724	6851	3075	-3776	4331	2958	-1373
WB	2680	2900	220	3877	2900	-977	2529	3075	546	3029	2958	-70
Avg. Above	**2555**	**2900**	**345**	**3289**	**2900**	**-389**	**3839**	**3075**	**-764**	**3228**	**2958**	**-269**

Source: CACP, Min. of Agri &FW, GOI; CP-Cost of Production; MSP-Minimum Support Price

6.4.2 Economics of processing of pulses

To know the economics of processed/ value added pulses, discussed with the Dal Millers to *know percentage of Dal recovery and waste by- products as "broken grain and cattle feed" and also their market value.* The per quintal cost of whole grain has been considered as per MSP, subject to market rates at par or ruling below MSP. For Non- MSP pulses, the market rates have been considered.

The Net Return to a Dal Miller under six pulses after deductions of processing expanses and profit accrued over whole pulse grain due to value addition is at **Annex-B**.

It is revealed that the value addition through processing in various pulses range between 7 to 35 per cent from whole grain to dal. In pigeon pea 14 %, Lentil 10 %, Mung bean 6 %, Urd bean 35 %, Chickpea 11 % and Pea 14 %. Further more from dal to gram besan it is 18 % (total value addition 29 %) while for pea besan (Yellow Dal besan) it is 7 % (total value addition 21 %).

6.4.3 Household consumption of Pulses in India (as per NSSO 68th Round July 2011-June 2012)

The report of the consumption of pulses has been published in June, 2014 by MoSPI. This report is based on the information collected during 2011-12 from 101651 households in 7469 villages and 5268 urban blocks spread over entire country.

- For the pulses and pulse products group as a whole, per capita consumption rose by 77-78 g between 2004-05 and 2011-2012- from 705 g per month to 783 g in the rural sector and from 824 g to 901 g in the urban sector. Of this rise, however, as much as 69 g in the rural sector and 57 g in the urban sector was contributed by the four items split gram, whole gram, pea and *besan*.
- The four pulses arhar, mung, masur and urd- which is 2011-12 together made up about 64% of consumption of pulses products in rural India and 68 % in urban India- registered a total increase in monthly per capita consumption of only 14 g in the rural sector and 18 g in the urban sector over this 7-year period.
- Arhar (Tur) accounted for as much as 27% of pulse consumption in rural areas and 33% in urban areas. Mung and masur together contributed 26% in rural and 23 % in urban areas,

the share of mung being greater in urban India. Split gram contributed about 10% in each sector. Products of pulses and gram had a total share of 9 % in rural and 11 % in urban areas. While whole gram had a share of 5% in both sectors, the share of peas was markedly higher in rural (7%) than in urban India.

Table 25. Details of consumption of selected pulses and pulse products, All India

Pulse/pulse products	Per capita consumption in 30 days				% of consuming hhs (in 30 days)	
	R	U	R	U	R	U
Arhar, Tur	212	301	12.94	19.47	59.60	74.10
Gram: split	79	85	3.57	4.10	39.90	46.60
Gram: Whole	40	45	1.66	2.22	20.70	25.90
Mung	91	117	5.78	8.15	45.60	60.00
Masur	112	93	5.86	5.20	41010	38.00
Urd	84	98	4.73	6.10	38.90	44.70
Peas	52	23	1.58	0.87	14.90	11.90
Besan	50	75	2.39	3.73	34.70	45.10
All pulses & products	783	901	41.58	53.66	98.10	92.50

Source: NSSO 68th Round July 2011-June 2012. *R- Rural, U- Urban

6.5 Increasing SRR of Improved/Recommended Varieties

Seed is very impotant input for increasing the productivity of pulses**.** Increased production/productivity by 20-30% has been reported with improved /quality seeds.

Non- availability of quality seeds in adequate quantity is one of the major constraints in pulse production. The existing SRR under pulses are only 15-20%, may be enhanced to 42%.

Crop-wise requirement of certified seed, foundation seed and breeder seed up till 2022, as worked out are given below and also crop-wise and state-wise requirement of certified seed, foundation seed and breeder seed is indicated under ***Table 26 & 26 (a) to (j):***

Table 26. Requirement of seed under different categories (2018-19 to 2021-22)

(Quantity in Qtl.)

Crop	Normal Area	Certified seed				Foundation seed				Breeder seed			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
Arhar	39.25	282.6	298.3	314.0	329.7	7.1	7.5	7.9	8.2	5.7	6.0	6.3	6.6
Urdbean	24.80	178.6	188.5	198.4	208.3	6.0	6.3	6.6	6.9	8.9	9.4	9.9	10.4
Mungbean	23.60	169.9	179.4	188.8	198.3	5.7	6.0	6.3	6.6	8.5	9.0	9.4	9.9
Other Kharif	18.14	130.6	137.9	145.1	152.4	4.4	4.6	4.8	5.1	6.5	6.9	7.3	7.6
Total Kharif	**105.79**	**761.7**	**804.1**	**846.3**	**888.7**	**23.2**	**24.4**	**25.6**	**26.8**	**29.6**	**31.3**	**32.9**	**34.5**
Gram	86.80	875.8	924.5	973.1	1021.8	58.4	61.6	64.9	68.1	87.6	92.5	97.3	102.2
Lentil	14.14	127.3	134.3	141.4	148.5	4.2	4.5	4.7	5.0	6.4	6.7	7.1	7.4
Fieldpea	9.93	357.5	377.3	397.2	417.1	23.8	25.2	26.5	27.8	35.8	37.7	39.7	41.7
Urdbean	7.85	56.5	59.7	62.8	65.9	1.9	2.0	2.1	2.2	2.8	3.0	3.1	3.3
Mungbean	9.26	66.7	70.4	74.1	77.8	2.2	2.4	2.5	2.6	3.3	3.5	3.7	3.9
Other Rabi	11.11	160.0	168.9	177.8	186.7	8.0	8.4	8.9	9.3	8.0	8.4	8.9	9.3
Total Rabi	**139.09**	**1643.8**	**1735.1**	**1826.4**	**1917.8**	**98.5**	**104.1**	**109.6**	**115**	**143.9**	**151.8**	**159.8**	**167.8**
Total Pulses	**244.88**	**2405.5**	**2539.2**	**2672.7**	**2806.5**	**121.7**	**128.5**	**135.2**	**141.8**	**173.5**	**183.1**	**192.7**	**202.3**

Source: Annual Report-2016-17, DPD, Bhopal

Table 26 (a) Requirement of seed under different categories (2018-19 to 2021-22)-Gram

(Quantity in Qtl.)

State	Normal Area	Certified seed				Foundation seed				Breeder seed			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
MP	30.41	875.8	924.5	973.1	1021.8	58.4	61.6	64.9	68.1	87.6	92.5	97.3	102.2
RAJ	13.62	392.3	414.1	435.8	457.6	26.2	27.6	29.1	30.5	39.2	41.4	43.6	45.8
Mha	13.72	395.1	417.1	439.0	461.0	26.3	27.8	29.3	30.7	39.5	41.7	43.9	46.1
Kar.	10.15	292.3	308.6	324.8	341.0	19.5	20.6	21.7	22.7	29.2	30.9	32.5	34.1
AP	4.67	134.5	142.0	149.4	156.9	9.0	9.5	10.0	10.5	13.5	14.2	14.9	15.7
UP	5.17	148.9	157.2	165.4	173.7	9.9	10.5	11.0	11.6	14.9	15.7	16.5	17.4
CG	2.74	78.9	83.3	87.7	92.1	5.3	5.6	5.9	6.1	7.9	8.3	8.8	9.2
Gujarat	1.87	53.9	56.9	59.8	62.8	3.6	3.8	4.0	4.2	5.4	5.7	6.0	6.3
Jhar.	1.49	42.9	45.3	47.7	50.1	2.9	3.0	3.2	3.3	4.3	4.5	4.8	5.0
Telan.	0.88	25.3	26.8	28.2	29.6	1.7	1.8	1.9	2.0	2.5	2.7	2.8	3.0
Bihar	0.60	17.3	18.2	19.2	20.2	1.2	1.2	1.3	1.3	1.7	1.8	1.9	2.0
Hariana	0.63	18.1	19.2	20.2	21.2	1.2	1.3	1.3	1.4	1.8	1.9	2.0	2.1
Odisha	0.43	12.4	13.1	13.8	14.5	0.8	0.9	0.9	1.0	1.2	1.3	1.4	1.4
WB	0.26	7.5	7.9	8.3	8.7	0.5	0.5	0.6	0.6	0.8	0.8	0.8	0.9
Other	0.16	4.6	4.9	5.1	5.4	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5
TOTAL	**86.80**	**875.8**	**924.5**	**973.1**	**1021.8**	**58.4**	**61.6**	**64.9**	**68.1**	**87.6**	**92.5**	**97.3**	**102.2**

Table 26. (b) Requirement of seed under different categories (2018-19 to 2021-22)- Lentil

(Quantity in Qtl.)

State	Normal Area	Certified seed				Foundation seed				Breeder seed			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
MP	5.76	51.8	54.7	57.6	60.5	1.7	1.8	1.9	2.0	2.6	2.7	2.9	3.0
UP	4.58	41.2	43.5	45.8	48.1	1.4	1.5	1.5	1.6	2.1	2.2	2.3	2.4
Bihar	1.66	14.9	15.8	16.6	17.4	0.5	0.5	0.6	0.6	0.8	0.8	0.8	0.9
WB	0.70	6.3	6.7	7.0	7.4	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Raj	0.42	3.8	4.0	4.2	4.4	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Jhar.	0.38	3.4	3.6	3.8	4.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Assam	0.28	2.5	2.7	2.8	2.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
CG	0.15	1.4	1.4	1.5	1.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Others	0.21	1.9	2.0	2.1	2.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TOTAL	**14.14**	**127.3**	**134.3**	**141.4**	**148.5**	**4.2**	**4.5**	**4.7**	**5.0**	**6.4**	**6.7**	**7.1**	**7.4**

Table 26. (c) Requirement of seed under different catogeries (2018-19 to 2021-22)-Fieldpea

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
UP	3.38	121.7	128.4	135.2	142.0	8.1	8.6	9.0	9.5	12.2	12.8	13.5	14.2
MP	3.31	119.2	125.8	132.4	139.0	7.9	8.4	8.8	9.3	11.9	12.6	13.2	13.9
Odisha	1.35	48.6	51.3	54.0	56.7	3.2	3.4	3.6	3.8	4.9	5.1	5.4	5.7

Jhar.	0.35	12.6	13.3	14.0	14.7	0.8	0.9	0.9	1.0	1.3	1.3	1.4	1.5
Mha.	0.27	9.7	10.3	10.8	11.3	0.7	0.7	0.7	0.8	1.0	1.0	1.1	1.1
Assam	0.26	9.4	9.9	10.4	10.9	0.6	0.7	0.7	0.7	0.9	1.0	1.0	1.1
Bihar	0.19	6.8	7.2	7.6	8.0	0.5	0.5	0.5	0.5	0.7	0.7	0.8	0.8
Manipur	0.18	6.5	6.8	7.2	7.6	0.4	0.5	0.5	0.5	0.7	0.7	0.7	0.8
CG	0.15	5.4	5.7	6.0	6.3	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.6
Others	0.48	17.3	18.2	19.2	20.2	1.2	1.2	1.3	1.3	1.7	1.8	1.9	2.0
TOTAL	**9.93**	**357.5**	**377.3**	**397.2**	**417.1**	**23.8**	**25.2**	**26.5**	**27.8**	**35.8**	**37.7**	**39.7**	**41.7**

Table 26. (d) Requirement of seed under different catogeries (2018-19 to 2021-22)-Rabi urd

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
AP	3.56	25.6	27.1	28.5	29.9	0.9	0.9	1.0	1.0	1.3	1.4	1.4	1.5
TN	2.73	19.7	20.8	21.8	22.9	0.7	0.7	0.7	0.8	1.0	1.0	1.1	1.2
Assam	0.50	3.6	3.8	4.0	4.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
UP	0.46	3.3	3.5	3.7	3.9	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
WB	0.12	0.9	0.9	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Telana.	0.15	1.1	1.1	1.2	1.3	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
MP	0.11	0.8	0.8	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Kar.	0.08	0.6	0.6	0.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Odisha	0.05	0.4	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gujarat	0.03	0.2	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others	0.08	0.6	0.6	0.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**7.85**	**56.5**	**59.7**	**62.8**	**65.9**	**1.9**	**2.0**	**2.1**	**2.2**	**2.8**	**3.0**	**3.1**	**3.3**

Table 26. (e) Requirement of seed under different catogeries (2018-19 to 2021-22)-Rabi mung

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20(38%)	2020-21(40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
TN	1.61	11.6	12.2	12.9	13.5	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.7
AP	1.33	9.6	10.1	10.6	11.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.6
Bihar	1.51	10.9	11.5	12.1	12.7	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.6
Odisha	1.64	11.8	12.5	13.1	13.8	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.7
MP	0.88	6.3	6.7	7.0	7.4	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
UP	0.46	3.3	3.5	3.7	3.9	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Punjab	0.36	2.6	2.7	2.9	3.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Haryana	0.53	3.8	4.0	4.2	4.5	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Gujarat	0.41	3.0	3.1	3.3	3.4	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Others	0.53	3.8	4.0	4.2	4.5	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Total	9.26	**66.7**	**70.4**	**74.1**	**77.8**	**2.2**	**2.4**	**2.5**	**2.6**	**3.3**	**3.5**	**3.7**	**3.9**

Table 26. (f) Requirement of seed under different catogeries (2018-19 to 2021-22)
Others rabi including Lathyrus and Kulthi

(Quantity in Qtl.)

State	Normal Area	Certified seed				Foundation seed				Breeder seed			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
CG	3.53	50.9	53.7	56.5	59.4	2.5	2.7	2.8	3.0	2.5	2.7	2.8	3.0
Kar	1.48	21.4	22.6	23.7	24.9	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3
Odisha	1.29	18.5	19.6	20.6	21.6	0.9	1.0	1.0	1.1	0.9	1.0	1.0	1.1

Mha	0.95	13.7	14.4	15.2	16.0	0.7	0.7	0.8	0.8	0.7	0.7	0.8	0.8
Bihar	0.74	10.7	11.3	11.8	12.4	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.6
TN	0.72	10.3	10.9	11.5	12.1	0.5	0.5	0.6	0.6	0.5	0.5	0.6	0.6
MP	0.49	7.1	7.5	7.9	8.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
AP	0.38	5.5	5.8	6.1	6.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
WB	0.32	4.6	4.9	5.1	5.4	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3
Gujarat	0.24	3.5	3.7	3.9	4.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Naga.	0.18	2.6	2.8	2.9	3.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2
Assam	0.15	2.2	2.3	2.4	2.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Telan.	0.13	1.9	2.0	2.1	2.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Others	0.50	7.1	7.5	7.9	8.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
TOTAL	**11.11**	**160.0**	**168.9**	**177.8**	186.7	8.0	8.4	8.9	9.3	8.0	8.4	8.9	9.3

Table 26. (g) Requirement of seed under different catogeries (2018-19 to 2021-22)-Arhar

(Quantity in Qtl.)

State	Normal Area	Certified seed				Foundation seed				Breeder seed			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
Mha	12.00	86.4	91.2	96.0	100.8	2.2	2.3	2.4	2.5	1.7	1.8	1.9	2.0
Kar	7.27	52.3	55.3	58.2	61.1	1.3	1.4	1.5	1.5	1.1	1.1	1.2	1.2
MP	5.26	37.9	40.0	42.1	44.2	1.0	1.0	1.1	1.1	0.8	0.8	0.8	0.9
Gujarat	2.25	16.2	17.1	18.0	18.9	0.4	0.4	0.5	0.5	0.3	0.3	0.4	0.4
UP	2.97	21.4	22.6	23.8	25.0	0.5	0.6	0.6	0.6	0.4	0.5	0.5	0.5
Telan.	2.61	18.8	19.8	20.9	21.9	0.5	0.5	0.5	0.6	0.4	0.4	0.4	0.4
Jhar	1.80	13.0	13.7	14.4	15.1	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3
AP	1.88	13.5	14.3	15.0	15.8	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Odisha	1.40	10.1	10.6	11.2	11.8	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
CG	0.55	4.0	4.2	4.4	4.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TN	0.53	3.8	4.0	4.2	4.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Bihar	0.22	1.6	1.7	1.8	1.9	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Other	0.51	3.7	3.9	4.1	4.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TOTAL	**39.25**	**282.6**	**298.3**	**314.0**	**329.7**	**7.1**	**7.5**	**7.9**	**8.2**	**5.7**	**6.0**	**6.3**	**6.6**

Table 26. (h) Requirement of seed under different catogeries (2018-19 to 2021-22)- kh.Urd

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
UP	5.23	37.7	39.8	41.8	43.9	1.3	1.3	1.4	1.5	1.9	2.0	2.1	2.2
MP	7.15	51.5	54.3	57.2	60.1	1.7	1.8	1.9	2.0	2.6	2.7	2.9	3.0
Maha.	3.24	23.3	24.6	25.9	27.2	0.8	0.8	0.9	0.9	1.2	1.2	1.3	1.4
Raj	2.34	16.9	17.8	18.7	19.7	0.6	0.6	0.6	0.7	0.8	0.9	0.9	1.0
Jhar.	0.94	6.8	7.1	7.5	7.9	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4
Gujarat	0.81	5.8	6.2	6.5	6.8	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
TN	0.57	4.1	4.3	4.6	4.8	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Kar.	0.85	6.1	6.5	6.8	7.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4
WB	0.64	4.6	4.9	5.1	5.4	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Odisha	0.88	6.3	6.7	7.0	7.4	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Others	2.15	15.5	16.3	17.2	18.1	0.5	0.5	0.6	0.6	0.8	0.8	0.9	0.9
TOTAL	**24.80**	**178.6**	**188.5**	**198.4**	**208.3**	**6.0**	**6.3**	**6.6**	**6.9**	**8.9**	**9.4**	**9.9**	**10.4**

Table 26. (i) Requirement of seed under different catogeries (2018-19 to 2021-22) kh.Mung

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20(38%)	2020-21(40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
Raj	10.68	76.9	81.2	85.4	89.7	2.6	2.7	2.9	3.0	3.8	4.1	4.3	4.5
Mha	3.95	28.4	30.0	31.6	33.2	1.0	1.0	1.1	1.1	1.4	1.5	1.6	1.7
Kar.	2.73	19.7	20.8	21.8	22.9	0.7	0.7	0.7	0.8	1.0	1.0	1.1	1.2
Telan	1.10	7.9	8.4	8.8	9.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
Gujarat	1.21	8.7	9.2	9.7	10.2	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5
MP	1.21	8.7	9.2	9.7	10.2	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5
Odisha	1.03	7.4	7.8	8.2	8.7	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
UP	0.40	2.9	3.0	3.2	3.4	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Others	1.29	9.3	9.8	10.3	10.8	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5
TOTAL	**23.60**	**169.9**	**179.4**	**188.8**	**198.3**	**5.7**	**6.0**	**6.3**	**6.6**	**8.5**	**9.0**	**9.4**	**9.9**

Source: Annual report-2016-17, DPD, Bhopal

Table 26 (j) Requirement of seed under different catogeries (2018-19 to 2021-22)
Others kharif pulses including kulthi

(Quantity in Qtl.)

State	*Normal Area*	*Certified seed*				*Foundation seed*				*Breeder seed*			
		2018-19 (36%)	2019-20 (38%)	2020-21 (40%)	2021-22 (42%)	2018-19	2019-20	2020-21	2021-22	2018-19	2019-20	2020-21	2021-22
Raj	10.87	78.3	82.6	87.0	91.3	2.6	2.8	2.9	3.0	3.9	4.1	4.4	4.6
Kar.	1.84	13.3	14.0	14.7	15.5	0.4	0.5	0.5	0.5	0.7	0.7	0.7	0.8
Odisha	1.14	8.2	8.7	9.1	9.6	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5
TN	0.91	6.6	6.9	7.3	7.6	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Maha	0.91	6.6	6.9	7.3	7.6	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Jhar.	0.40	2.9	3.0	3.2	3.4	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
UK	0.27	1.9	2.1	2.2	2.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Gujarat	0.43	3.1	3.3	3.4	3.6	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Nagala.	0.14	1.0	1.1	1.1	1.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
CG	0.51	3.7	3.9	4.1	4.3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Others	0.73	5.3	5.6	5.8	6.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
TOTAL	**18.14**	**130.6**	**137.9**	**145.1**	**152.4**	**4.4**	**4.6**	**4.8**	**5.1**	**6.5**	**6.9**	**7.3**	**7.6**

6.6 Bridging the yield gaps- by planting improved/recommended Varieties

Table 27. Varieties for normal and rice fallow areas.

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
UP	Chickpea	**Desi:** BG- 256, Udai (KPG 59), Pusa 372, KWR-108, Gujarat, G-4, HK 2, GNG 1581, Rajas, Pusa 547, RSG 963, RSG-931, RSG 888, CSG-8962, DCP-92-3, GNG- 469, KWR-108, Pusa 362, Pusa 372, Pusa subhra, JG-16, Gujarat Gram 1, BGD 72, Pusa 391, Vijay, ICCV 10. Vallabh Kabuli Chana 1 (WCGK 2000-16), GNG 1958, GNG 1969, CSJ 515, GLK 28127 **Kabuli:** Pusa 1003, BG 1053, JGK 1, KAK 2, Subhra	Oct-Nov March-April	80-100

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
UP	Pigeonpea	Manak, Pusa 84, Pusa 33, Jagriti (ICPL-151), UPAS-120, Pusa 855 Bahar, Pusa 9, MAL 13, NDA 98-1 (NDA2), NDA 99-6 (NDA3), T 7, Narendra Arhar 1, Amar (KA 32-1), MA 6, Anand Grain Tur-2 (AGT-2), BDN-711 (BDN 2004-3), BR ï 183, C-28	June-July March-April	12-15
	Mungbean			
	Kharif	Pant Moong 2, Pant Moong 3, Narendra Moong 1, pant Moong 4, Pant Moong 5, KM 2195 (Swati), MH 421, BM 2003-2, SML 832	July-Aug Sep-Oct	15-20
	Spring /Summer	PDM 139, Pusa Vishal, Meha, pant Moong 5, TMB 37, HUM-16	Feb-March May	30-35
	Urdbean			
	Kharif	IPU 94-1 (Uttara), WBU 108, Narendra Urd 1, Pant U 35, Pant U 19, Pant U 30, Pant U 40, B.R.68, Pratap Urd 1 (KPU 07- 08), UH-1 (UH 04-06)	July-Aug Sep-Oct	15-20
	Spring	KU 92-1(Azad Urd 1), KU 300, PDU 1, T 9, Pant U 19, Narendra Urd 1	Feb-March May	30-35
	Lentil	Pant L 406, PL 639, Malika (K 75), Lens 4076, NDL-1, NDL-2, PL-62 (Sheri), Narendra Masoor 1, DPL 15 (Priya), PL-4, L 4147, IPL 81 (Noori), IPL-406, HUL 57, KLS 218, WBL 77, Pant L 4, Azad Masur-1, IPL- 316, VL Masoor -129, VL Masoor -133, VL Masoor -514	Oct- Nov March- April	50-60
	Fieldpea	Adarsh, Vikas, Prakash, Rachna, KPMR 400, KPMR 522, KFP 103, DMR 7, HFP 8909, VL Matar 3,Sapna, HUDP 15,Pant pea 42, VL 42, Hariyal, HFP-529, IPFD 10-12, HFP 715	Oct- Nov March- April	80-100
Bihar	Chickpea	**Desi:** BG 256, Udai (KPG-59), Pusa 372, KWR 108, Gujarat, G 4, HK 2, GNG 1958, GNG 1969, GJG 0809, CSJ 515, GLK 28127, Bidisha (BG 1084) (WBG 29 **Kabuli:** Pusa 1003	Oct-Nov March-April	80-100
	Pigeonpea	Bahar, Pusa 9, MAL 13, NDA 98-1 (NDA 2), NDA 99-6 (NDA 3), Birsa Arhar 1, Sharad (DA 11) MA 6, BR ï 183.	July March-April	12-15
	Mungbean			
	Kharif	Pant Moong 2, Pant Moong 4, Narendra Moong 1, Sunaina, PDM 139, MH2-15, HUM-1, IPM 2-3, MH 421	July-Aug Sep-Oct	15-20
Bihar	Spring/ Summer	PDM 139, Pusa vishal, Meha, Pant Moong 5, TMB 37, HUM- 16	Feb-March /May	30-35
	Urdbean			
	Kharif	IPU 94-1 (Uttara), Birsa Urd 1, Pant U 19, Pant U 30, Pant U 31, B.R.68	July-Aug Sep-Oct	15-20
	Spring	KU 92-1 (Azad urd 1), WBu- 109, Pant U-31,	Feb-March /May	30-35
	Lentil	Pant L-406, PL 639, Malika (K 75), Arun (PL-77-12), NDL 2, WBL-58, HUL-57, KLS 218, WBL 77 , Azad Masur-1	Oct- Nov March- April	50-60
	Fieldpea	Rachna, HFP 4 (Aparna), HUDP 15, DDR 23, HFP 715,	Oct- Nov March- April	80-100

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Jharkhand	Chickpea	**Desi:** BG 256, Udai (KPG-59), Pusa 372, KWR 108, Gujarat, G 4, HK 2, GNG 1958, GNG 1969, GJG 0809, CSJ 515, GLK 28127, Bidisha (BG 1084) (WBG 29,Vallabh Kabuli Chana 1 (WCGK 2000-16) **Kabuli:** Pusa 1003	Oct- Nov March- April	80-100
	Mungbean			
	Kharif	Pant Moong 2, Pant Moong 4, Narendra Moong 1, Sunaina, PDM 139, MH2-15, HUM-1, IPM 2-3, MH 421	July-Aug Sep-Oct	15-20
	Spring /Summer	PDM 139, Pusa vishal, Meha, Pant Moong 5, TMB 37, HUM- 16	Feb-March /May	30-35
	Urdbean			
	Kharif	IPU 94-1 (Uttara), Birsa Urd 1, Pant U 19, Pant U 30, Pant U 31, B.R.68	July-Aug Sep-Oct	15-20
	Spring	KU 92-1 (Azad urd 1), Wbu- 109, Pant U-31	Feb-March /May	30-35
	Lentil	Pant L-406, PL 639, Malika (K 75), Arun (PL-77-12), NDL 2, WBL-58, HUL-57, KLS 218, WBL 77, Azad Masur-1	Oct- Nov March- April	50-60
	Fieldpea	Rachna, HFP 4 (Aparna), HUDP 15, DDR 23	Oct- Nov March- April	80-100
Assam	Chickpea	**Desi:** BG 256, Udai (KPG-59), Pusa 372, KWR 108, Gujarat, G 4, HK 2, HK 4 (HK 05-169) **Kabuli:** Pusa 1003	Oct- Nov March- April	80-100
	Mungbean			
	Kharif	SG 1 (Pratap), Pant Moong 2, Pant Moong 4, Narendra Moong 1, IPM 2-3	Aug ï Sep Nov-Dec	15-20
	Spring /Summer	PDM 139, Pusa vishal, Meha, Pant Moong 5, TMB 37, HUM- 16	Feb-March /May	30-35
	Urdbean	Pant U 19, Pant U 30, Pant U 31, WBU 108, IPU 94-1 (Uttara)	Aug ï Sep Nov-Dec Aug ï Sep (rabi) Nov-Dec	15-20 25-30
	Lentil	Asha (B 77), HUL-57, KLS 218, WBL 77,	Oct- Nov March- April	50-60
	Fieldpea	Rachna, Malviya Matar	Oct- Nov March- April	80-100

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
West Bengal	Chickpea	**Desi:** BG 256, Udai (KPG-59), Pusa 372, KWR 108, Gujarat, G 4, HK 2, Bidisha (BG 1084) (WBG 29) **Kabuli:** Pusa 1003	Oct- Nov March- April	80-100
	Pigeonpea	Bahar, Pusa 9, MAL 13, NDA 98-1 (NDA 2), NDA 99-6 (NDA 3), WB 20-105	July March-April	12-15
	Mungbean			
	Kharif	Narendra Moong 1, Pant Moong 4, Pant Moong 5, MH 2-15, Srekumar	July ï Aug Sep-Oct	15-20
	Spring /Summer	PDM 139, Pusa vishal, Meha, Pant Moong 5, TMB 37, HUM- 16	Feb-March /May	30-35
	Urdbean			
	Kharif	IPU 94-1 (Uttara), T 9, Pant U -19	July-Aug Sep-Oct	15-20
	Spring	KU 92-1 (Azad urd 1), WBU- 109,	Feb-March /May	30-35
	Lentil	Ranjan (B 256), Asha (B 77), Malika WBL 77,WBL-58, Pant L-406,KLS 218,HUL 57	Oct- Nov March- April	50-60
	Fieldpea	Rachna, HUDP 15, DDR 23, DDR 23	Oct- Nov March- April	80-100
New Delhi	Chickpea	Desi: GNG 1581, Rajas, Pusa 547, RSG-963, RSG-931, RSG-888,CSG-8962,DCP 92-3, GNG 469, KWR 108,Pusa 362, Pusa 372, Udai, BG 256, GNG 1958, GNG 1969, GJG 0809, CSJ 515, GLK 28127, Bidisha (BG 1084) (WBG 29,Vallabh Kabuli Chana 1 (WCGK 2000-16), Pusa-547 (BGM-547) Kabuli: BG-1053	Oct-Nov March-April	80-100
	Pigeonpea	Pusa 992	June Nov-Dec	12-15
	Mungbean			
	Kharif	ML 337, Pant Moong 3,ML 267, Pant Moong 1, MUM 2, Ganga 8, MH 02-15 , MH 421	July-Aug Sep-Oct	15-20
	Spring/Summer	Pusa Vishal, Ganga 8, SML 668, Pant Mung-5	Feb-March May	30-35
	Lentil	PL 639, Lens 4076, Sapna, Pant L 4, DPL-15 (Priya), L 4147, PL-4, DP 62 (Sheri), LH 84-8	Oct- Nov March- April	50-60
	Fieldpea	Rachna, KFP 103, DMR 7, KPMR 522, HFP 8909, DMR 11, DDR 27, Hariyal, HFP-529, HFP 715	Oct- Nov March- April	80-100
Punjab	Chickpea	Desi: GNG 1581, Rajas, Pusa 547, RSG-963, RSG-931, RSG-888,CSG-8962,DCP 92-3, GNG 469, KWR 108,Pusa 362, Pusa 372, Udai, BG 256, GJG 0809, GNG 1958, GNG 1969, CSJ 515, GLK 28127, Vallabh Kabuli Chana 1 (WCGK 2000-16), PBG -5 Kabuli: BG-1053	Oct-Nov March-April	80-100
	Pigeonpea	Pusa 992, Manak, Pusa 84, Pusa 33, Jagriti (ICPL 151), UPAS 120, Pusa 855, AL 201, AL-15, Pusa 992	June Nov-Dec	12-15
	Mungbean			
	Kharif	ML 337, Pant Moong 3,ML 267, Pant Moong 1, MUM 2, Ganga 8, MH 02-15, IPM 2-3, ML 5, ML 32, ML 613, MH 421, SML 832	July- Aug Sep-Oct	15-20

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Punjab	Spring/Summer	Pusa Vishal, SML 668, Pant Mung-5, Pant Mung-2	Feb-March May	30-35
	Urdbean			
	Kharif	IPU 94-1 (Uttara), WBU 108, Krishna, UG 218	July- Aug Sep-Oct	15-20
	Spring/Summer	KU 300, PDU 1	Feb-March May	30-35
	Lentil	Pant L 406, PL 639, Lens 4076, Sapna, Pant L 4, DPL-15 (Priya), L 4147, PL-4, DP 62 (Sheri), LH 84-8, LL- 931	Oct- Nov March- April	50-60
	Fieldpea	Rachna, KFP 103, DMR 7, KPMR 522, HFP 8909, DMR 11, DDR 27	Oct- Nov March- April	80-100
Haryana	Chickpea	Desi: GNG 1581, Rajas, Pusa 547, RSG-963, RSG-931, RSG-888,CSG-8962,DCP 92-3, GNG 469, KWR 108,Pusa 362, Pusa 372, Udai, BG 256, GJG 0809, GNG 1958, GNG 1969, CSJ 515, GLK 28127, Vallabh Kabuli Chana 1 (WCGK 2000-16) Kabuli: BG-1053	Oct-Nov March-April	80-100
	Pigeonpea	Pusa 992, Manak, Pusa 84, Pusa 33, Jagriti (ICPL 151), UPAS 120, Pusa 855, AL 201, AL-15, Pusa 992	June Nov-Dec	12-15
	Mungbean			
	Kharif	MUM 2, Pusa Vishal, Ganga 8, MH 02-15, IPM 2-3, Muskan, MH 421, SML 832	July- Aug Sep-Oct	15-20
	Spring/Summer	Pusa Vishal, SML 668, Pant Mung-5	Feb-March May	30-35
	Urdbean			
	Kharif	Mash 338, Pant U-19, KU 300, (Shekhar 2) UG 218	July- Aug Sep-Oct	15-20
	Spring	Pant U 31, PDU 1	Feb-March May	30-35
	Lentil	PL 639, Lens 4076, Sapna, Pant L 4, DPL-15 (Priya), L 4147, PL-4, DP 62 (Sheri), LL- 931	Oct- Nov March- April	50-60
	Fieldpea	Rachna, KFP 103, DMR 7, KPMR 522, HFP 8909, Hariyal	Oct- Nov March- April	80-100
Rajasthan	Chickpea	Desi: GNG 1581, Rajas, Pusa 547, RSG-963, RSG-931, RSG-888,CSG-8962,DCP 92-3, GNG 469, KWR 108,Pusa 362, Pusa 372, Udai, BG 256, GJG 0809, GNG 1958, GNG 1969, CSJ 515, GLK 28127, Vallabh Kabuli Chana 1 (WCGK 2000-16) Kabuli: BG-1053	Oct-Nov March-April	80-100
	Pigeonpea	Manak, Pusa 84, Pusa 33, Jagriti (ICPL 151), UPAS 120, Pusa 855	June Nov-Dec	12-15
	Mungbean			
	Kharif	RMG 62,PMG 268, MUM 2, RM 492, Ganga 8, MH 02-15, IPM 2-3, MH 421, SML 832	July- Aug Sep-Oct	15-20
	Spring/Summer	RMG 268, PDM 139, Meha SML 668	Feb-March May	30-35
	Urdbean			

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Rajasthan	Kharif	IPU 94-1 (Uttara), WBU-108, Krishna, Pant U-31, KU 300, RBU-38, Pratap Urd 1 (KPU 07- 08)	July- Aug Sep-Oct	15-20
	Spring	KU 300, PDU 1	Feb-March May	30-35
	Lentil	K 75, L 4076, DPL 62, IPL 406	Oct- Nov March- April	50-60
	Fieldpea	Rachna, KFP 103, DMR 7, KPMR 522, HFP 8909, Hariyal, DDR-27	Oct- Nov March- April	80-100
Madhya Pradesh	Chickpea	Desi: Pusa Subhra, JG-16, Gujarat Gram-1, BGD 72, Pusa 391, Vijay, Pusa 372, ICCV 10, BG 256, Raj Vijay Kabuli gram 101 (JSC 42), Raj Vijay gram 201 (JSC 40), Raj Vijay Kabuli gram 202 (RVG 202), Raj Vijay Kabuli gram 203 (RVG-203), JG 12 Kabuli: JGK 1, KAK 2, Subhra	Oct- Nov March- April	80-100
	Pigeonpea	C 11, Vishakha-1 (TT 6),ICPL 87 (Pragati), Asha (ICPL 87119), Jawahar (JKM 7), Malviya Vikalp (MA 3), TT 401, TJT-501, GAUT 001E, JA 4, GTH 1(Hybrid), BDN-711 (BDN 2004-3), NP (WR) ï 15, Gwalior ï 3	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Pant Moong 3, Pusa 105, ML 337, BM 4, JM 721, Jawahar 45, HUM-1, Meha, TJM 3	June-July Aug-Sep	15-20
	Summer/Spring	HUM 1, Pusa 5931, PDM 139, Meha	Feb-march May	30-35
	Urdbean			
	Kharif	RBU 38 (Barkha), TPU 4, Jawahar Urd 2, Jawahar Urd 3, Khargone 3, Pant U 30	June-July Aug-Sep	15-20
	Spring	Pdu 1, Pant U 30, Pant U 31	Feb-march May	30-35
	Lentil	Malika (K 75), Lens 4076, IPL 81 (Noori), JL 3, IPL 406, IPL-316, Raj Vijay Lentil -31	Oct- Nov March- April	50-60
	Fieldpea	Adarsh, Vikas, Prakash, Rachna, Ambika, KPMR 400, IPFD 10-12	Oct- Nov March- April	80-100
Chhattisgarh	Chickpea	Desi: Pusa Subhra, JG-16, Gujarat Gram-1, BGD 72, Pusa 391, Vijay, Pusa 372, ICCV 10, BG 256, JG 12 Kabuli: JGK 1, KAK 2, Subhra	Oct- Nov March- April	80-100
	Pigeonpea	C 11, Vishakha-1 (TT 6),ICPL 87 (Pragati), Asha (ICPL 87119), Jawahar (JKM 7), Malviya Vikalp (MA 3), TT 401, TJT-501, GAUT 001E, JA 4, GTH 1(Hybrid), BDN-711 (BDN 2004-3)	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Pant Moong 3, Pusa 105, ML 337, BM 4, JM 721, Jawahar 45, HUM-1, Meha, TJM 3	June-July Aug-Sep	15-20

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Chhattisgarh	Summer /Spring	HUM 1, Pusa 5931, PDM 139, Meha	Feb-march May	30-35
	Urdbean			
	Kharif	RBU 38 (Barkha), TPU 4, Jawahar Urd 2, Jawahar Urd 3, Khargone 3, Pant U 30	June-July Aug-Sep	15-20
	Spring	PDU 1, Pant U 30, Pant U 31	Feb-march, May	30-35
	Lentil	Malika (K 75), Lens 4076, IPL 81 (Noori), JL 3, IPL 406	Oct- Nov March- April	50-60
	Fieldpea	Adarsh, Vikas, Prakash, Rachna, Ambika, KPMR 400	Oct- Nov March- April	80-100
Gujarat	Chickpea	Desi: Pusa Subhra, JG-16, Gujarat Gram-1, BGD 72, Pusa 391, Vijay, Pusa 372, ICCV 10, BG 256, GJG 0809 Kabuli: JGK 1, KAK 2, Subhra	Oct- Nov March- April	80-100
	Pigeonpea	C 11, Vishakha-1 (TT 6),ICPL 87 (Pragati), Asha (ICPL 87119), Jawahar (JKM 7), Malviya Vikalp (MA 3), TT 401, TJT-501, GAUT 001E, JA 4, GTH 1(Hybrid), Anand Grain Tur-2 (AGT-2)	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Pant Moong 2, Pusa 105, ML 337, BM 4, PIMS 4 (Sabarmati), Gujarat Moong 2, Gujarat Moong 4	June-July Aug-Sep	15-20
	Summer/Spring	Gujarat Moong 2, PDM 139,	Feb-march May	30-35
	Urdbean			
	Kharif	RBU 38 (Barkha), TPU 4, T 9, TAU 2, AKU 4, WBU 108, GU 1	June-July Aug-Sep	15-20
	Spring	PDU 1, Pant U 31	Feb-march May	30-35
	Lentil	Malika (K 75), Lens 4076, JL 3, IPL 81	Oct- Nov March- April	50-60
	Fieldpea	-	Oct- Nov March- April	80-100
Maharashtra	Chickpea	Desi: Pusa Subhra, JG-16, Gujarat Gram-1, BGD 72, Pusa 391, Vijay, Pusa 372, ICCV 10, BG 256, PKV harita (AKG 9303-12), Phule G-95311 Kabuli: JGK 1, KAK 2, Subhra	Oct- Nov March- April	80-100
	Pigeonpea	C 11, Vishakha-1 (TT 6),ICPL 87 (Pragati), Asha (ICPL 87119), Jawahar (JKM 7), Malviya Vikalp (MA 3), TT 401, TJT-501, GAUT 001E, BDN 2, TAT-10, BSMR 175, BSMR 736, AKT 8811, BDN-711(BDN 2004-3)	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Kopergaon, ML 131, Phule M 2, TARM 1, TARM 18, TARM 2, BM 200-1, BM 4, BM 2003-2	June-July Aug-Sep	15-20
	Summer/Spring	HUM 1, Pusa 9531, AKM 880	Feb-march May	30-35
	Urdbean			

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Maharashtra	Kharif	RBU 38 (Barkha), TPU 4, TAU 1, TAU 2, PDU 1, Pant U 30, AKU 4 (Melghat), Vishwas (NUL-7)	June-July Aug-Sep	15-20
	Lentil	Malika (K 75), Lens 4076, JL 3, IPL 81, IPL- 316	Oct- Nov March- April	50-60
	Fieldpea	Adarsh, Vikas, Prakash, Rachna, Ambika, KPMR-400, IPFD 10-12,	Oct- Nov March- April	80-100
Andhra Pradesh	Chickpea	Phule G 9531, JG 11, ICCV 10	Oct- Nov March- April	80-100
	Pigeonpea	Jagriti (ICPL 151), Maruthi (ICPL 8863), Visskha-1 (TT-6), ICPL 87 (Pragati), Asha (ICPL 87119), CORG 9701, SA 1, Abhaya (ICPL 332), Sarita (ICPL 85010) Durga (ICPL 84031) Laxmi (ICPL 85063), LRG ï 36	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Warangal-2, LGG 407, LGG 450, Madhira 295	June-July Aug-Sep	15-20
	Rabi	Pusa 9072, LGG 460, TM 96-2, WGG-2	Oct-nov Jan-Feb	25-30
	Urdbean			
	Kharif	KU 301, WBG 26, WBU 108, Pant U 30, IPU 2-43	June-July Aug-Sep	15-20
	Rabi	TU 94-2, LBG 611, LBG 20, LBG 402, LBG 17, LBG 623, LBG-709, WBG-26	Oct-nov Jan-Feb	25-30
Karnataka	Chickpea	Phule G 9531, JG 11, ICCV 10	Oct- Nov March- April	80-100
	Pigeonpea	Jagriti (ICPL 151), Maruthi (ICPL 8863), Visskha-1 (TT-6), ICPL 87 (Pragati), Asha (ICPL 87119), CORG 9701, SA 1, TTB 7, TS 3	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	ML 131, PDM 84-178, HUM 1, China Moong, KKM 3	June-July Aug-Sep	15-20
	Urdbean			
	Kharif	KU 301, WBG 26, WBU 108, LBG 402, LBG, Manikya, T 9, Pant U 30, TU 94-2	June-July Aug-Sep	15-20
Tamil Nadu	Chickpea	Phule G 9531, JG 11, ICCV 10	Oct- Nov March- April	80-100
	Pigeonpea	Jagriti (ICPL 151), Maruthi (ICPL 8863), Visakha-1 (TT-6), ICPL 87 (Pragati), Asha (ICPL 87119), CORG 9701, Co 5, Co 6, Vamban 1	June-July Jan-Feb	12-15
	Mungbean			
	Kharif	Paiyur 1, Vamban 1, ADT 3, CO 5, TM 96-2, COGG 912	June-July Sept	15-20
	Rabi	Pusa 9072, Sujata (Hyb 12-4), ADT-3	Oct-Nov Jan-Feb	25-30
	Urdbean			

State	Crop	Variety	Sowing time/ Harvesting Time	Seed rate (kg/ha)
Tamil Nadu	Kharif	ADT 3, ADT 5, Vamban 2, Pant U 30, WBU 108, Vamban 3, Vamban 4, (VBG04-008) VBN (Bg) 7, VBN 6, MDU 1	June-July Sept	15-20
	Rice fallow	WBG 26, Vamban 3, TU 94-2, Vamban 5, IPU 2-43, KBU 512	Oct-Nov Jan-Feb	25-30
Odisha	Chickpea	Phule G 9531, JG 11, ICCV 10	Oct- Nov March- April	80-100
	Mungbean			
	Kharif	ML 131, Kopergaon, PDm 54, TARM 1, PDM 139	June-July Sept	15-20
	Rabi/Spring	Pusa 9072, Sujata (Hyb 2-4) TARM-1, OBGG_52, LGG-460, PDM-139	Oct-Nov Jan-Feb	25-30
	Urdbean			
	Kharif	KU 301, WBG 26, WBU 108, T-9, Sarla	June-July Sept	15-20
	Rabi	TU 94-2, LBG 402, LBG 17, OBG 17, B-3-8-8	Oct-Nov (Rabi) Jan-Feb	25-30
	Lentil	B 77 (Asha)	Oct- Nov March- April	50-60
Himachal Pradesh	Mungbean	Pant Moong 2, Pant Moong 6, KM 2241, Shalimar Moong 1	June-July Sept	15-20
	Urdbean	Pant U 19, UG-218, PDU 1, Pant U 31, NDU 99-2	June-July Sept	15-20
	Lentil	Pant L 406, Pant L 639	Oct- Nov March- April	50-60
	Field Pea	Prakash, Rachna, VL Matar-3	Oct- Nov March- April	80-100
Jammu & Kashmir	Mungbean	Pant Moong 2, Pant Moong 6, KM 2241, Shalimar Moong 1	June-July Sept	15-20
	Urdbean	Pant U 19, UG-218, PDU 1, Pant U 31, NDU 99-2	June-July Sept	15-20
	Lentil	Pant L 406, Pant L 639, VL 4	Oct- Nov March- April	50-60
	Field Pea	Prakash, Rachna, HUDP 15	Oct- Nov March- April	80-100
NEH Region	Lentil	Pant L 406, Pant L 639, B 77 (Asha), DPL-62, HUL-57, KLS 218	Oct- Nov March- April	50-60

6.6.1 Technological Interventions

Activity	State	Recommendations
Spring/Summer pulses mungbean and urdbean	Bihar, Odisha, Tamil Nadu, MP, UP, AP, Gujarat West Bengal, CG, Punjab, Haryana, Jharkhand	• ***Weed Management***- Apply Pendimethalin (30 EC) @ n1.0 kg a.i/ ha as pre-emergence and Imazathapyr @ 70-80 g/ha as post emergence at 20-25 DAS after assuring the germination of weed. • ***Irrigations-*** First Irrigation may be delayed convincingly to 20 days depending upon the moisture status as results of pre-plant irrigations (Palewa). Subsequent irrigation schedule should be need based. • ***Seed Treatment***- with 5 ml Emida chloropid (17.8 SL) / kg seed followed by usual PGPR seed inoculation. • ***Thrips control***- spray Emida chloroprid (17.8 SL) @ 3 ml in 10 litres of water (@ 600 to 800 liters of solutions per ha).
All Pulses	UP, MP, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka	• Adoption of Life saving Irrigations It is far more rewarding in pulses if limited irrigation is given and water is used efficiently and effectively. One or two lifesaving irrigations have been found to be highly remunerative in chickpea, lentil, pea lathyrus, rabi rajmash and early sown pigeonpea. • Delineation of areas for one or two supplemental irrigation especially linked with sprinkler system can bring stability in the production as well as enhancement of productivity. • One pre sowing irrigation and other at flowering stage can give assured production and better returns. • Drip fertigation at branching and pod development stage with half of recommended dose of N and potash (other as basal) brought about maximum seed yield (37 q/ha) and water use efficiency in a long duration pigeonpea.
Seed priming	Chhattisgarh, Bundelkhand region of MP & UP, Bihar, West Bengal, Odisha and Assam	• Recommended for rabi pulses like chickpea, lentil and lathyrus, grown on residual soil moisture. Soil moisture in seed zone generally remains a limiting factor due to early withdrawl of monsoon. seed priming (soaking seeds for 6-8 hours in water) improves plant stand and early vigour which results in improving production.

Activity	State	Recommendations
Ridge planting of pigeonpea	Eastern UP, Bihar, Jharkhand, West Bengal and MP	• Kharif pulses especially pigeon pea suffer heavy losses due to water stagnation, resulting in poor plant population and seed yield. • Ridge planting of pigeonpea has been advocated for its successful cultivation especially in North- East Plain Zone (Eastern UP, Bihar, Jharkhand and West Bengal) not only to ensure desired plant stand of the crop but also to minimize the incidence of *Phytophthora stem blight*. The technology involves making ridge and furrows by tractor/bullock drawn ridge planter at 60 cm spacing and sowing seeds in the centre of the ridge.
2 % foliar spray of urea	Rainfed areas	• Foliar spray of 2 % urea/ DAP at flowering/pod filling stage has been turned out to be rewarding in term of higher yield. A large number of frontline demonstrations carried out in chickpea, lentil, mungbean and urdbean in different regions have shown spectacular increase of 13-20 % in productivity of these pulses. This could prove to be one of the simplest and low cost technologies for improving production of pulses in the rainfed areas.
Use of critical micronutrients I. Sulphur II. Zinc	Rajasthan, WB, Jharkhand, Gujarat UP, Andhra Pradesh, Karnataka, Maharashtra, MP, Bihar MP, TN, Maharashtra, Bihar, UP, Gujarat, Rajasthan	• ***Use of Sulphur*** @ 40 kg/ha has demonstrated enhanced yield upto 25-30 % in different pulse crops. Lentil 19.5%, Mungbean 17%,, Urd-13%, gram-19%, tur-21%, guar-35%. • The average absorption of zinc in chickpea is 50 +/- 16 g per tonnes. While in pigeonpea it is 30 g +/-17 g per tonnes. • Sources of Sulphur at **Annex-A** • Crop-wise recommendation of zinc as basal dressing is recommended as - for pigeonpea is 3 kg zinc {(15 kg $ZnSO_4$: Chickpea 2.5 kg Zn (12.5 kg $ZnSO_4$): other pulses 3.5 kg Zn (12.5 kg $ZnSO_4$)}. Zinc sulphate monohydrate ($ZnSO_4$. H_2O-33% zinc) or Zinc Sulphate Hepta hydrate ($ZnSO_4$. $7H_2O$-21% Zn) or Chelated Zinc (Zn-EDTA, 12 %) etc may be used as source of zinc. • use of Zn responding crop varieties (pigeonpea- C- 11, ICPL 87-119. GT-101, T-15-15

6.6.2 Integrated Nutrient Management

Crop	States	Recommendations
Chickpea	MP, Maharashtra, Rajasthan, UP, Andhra Pradesh, Karnataka, CG	• Application of 15-20 kg N/ha, 20-60 kg P_2O_5 and 20 kg K_2O and 20 kg S/ha as basal placement is recommended for normal conditions. • Need based application fo 15-20 kg $ZnSO_4$/ha and 1-1.5 kg Ammonium Molybdate/ha depending upon the deficiency of a particular micronutrient in soil. • Foliar spray of 2% urea/DAP twice during flowering and 15 days after first spray.
Pigeonpea	Maharashtra, Karnataka, MP, Gujarat, UP, Telangana, Jharkhand, Andhra Pradesh, Odisha & CG	• Application of 15-20 kg N/ha, 40-60 P_2O_5 and 20 kg S/ha basal placement is recommended for normal conditions. • Need based application of 15-20 kg $ZnSO_4$ and 1-1.5 kg ammonium Molybdate/ ha is recommended depending upon the deficiency of a particular micronutrient in soil. • Foliar spray of 2 % urea/ DAP twice during flowering and 15 days after first spray.
Mungbean & Urdbean	MP, UP, MS & Rajasthan, Jharkhand Gujarat, AP, TN, Karnataka & West Bengal, Odisha, Telangana & CG	• Application of 10-15 kg N/ha, 40 kg P_2O_5 and 20 kg S/ha as basal placement for normal conditions. • Need based application of 15-20 kg $ZnSO_4$/ ha and 1-1.5 kg Ammonium Molybdate/ha is recommended depending upon the deficiency of a particular micronutrient in soil. • Foliar spray of 2 % urea/DAP twice during flowering and 15 days after first spray.
Lentil & Fieldpea	MP, UP and Bihar	• Application of 15-20 kg N/ha, 40-60 kg P_2O_5 and 20 kg K_2O and 20 kg S/ha as basal placement for normal conditions. • Need based application of 15-20 kg $ZnSO_4$/ha and 1-1.5 kg Ammonium Molybdate/ha is recommended depending upon the deficiency of a particular micronutrient in soil. • Foliar spray of 2 % urea/ DAP twice during flowering and 15 days after.

6.6.3 Critical Irrigation

About 63% area under pulse is rainfed and consequently pulses face severe moisture stress with low productivity. Quantum jump in productivity can be achived by applying come-up life saving irrigation. Especially in rabi pulses grown on residual moisture. Micro- irrigation can be used for most efficient use of scares irrigation water.

On light textured soils 1-2 irrigations at branching and or pod development prove highly productive in most of rabi season pulse. *Irrigation should be avoided during active flowering period otherwise flower shedding and reversion to vegetative growth may occur.Crop-wise recommendation is given as under:*

Crop	States	Recommendations
Chickpea	• MP, CG, Rajasthan, Bundelkhand region of UP.	• Two irrigation I^{st} at branching and II^{nd} at pod formation.
	• Punjab, Haryana, Delhi, Western UP,	• Response to irrigation is generally low due to

	Plains of Uttarakhand, eastern UP, Bihar, Jharkhand, West Bengal, Assam	adequate winter rains and high relative humidity.
Fieldpea	• Eastern UP, Bihar, Jharkhand, West Bengal and Assam	• One irrigation at flowering stage is found beneficial.
	• MP, Maharashtra, CG, Bundelkhand region of UP, Gujarat, Punjab, Haryana, Rajasthan, Delhi, western UP plains of uttarakhand	• Two irrigation one each at branching and flowering stages are found most critical.
Lentil	• MP, UP and Bihar	• One to two irrigations are required for enhanced productivity.
Spring/summer Mungbean & Urdbean	• MP, UP, Bihar and Tamilnadu	• Four to five irrigations, first at 20 DAS followed by subsequent irrigations after 10 days of interval.

6.6.4 Weed Management

Crops	Recommendations
Chickpea, Lentil and Fieldpea	• Crops must be kept free from weeds to avoid loss in yield • Cultural practices like hoeing and hand weeding coupled with application of herbicides are ideal for weed management. • Pre-emergence application of pendimethalin 1.0-1.5 kg a.i./ha is very effective for controlling initial flush of weeds.
Pigeonpea, Mungbean, Urdbean	• Pre-emergence application of pendimethalin 1.0-1.5 kg a.i./ha is very effective for controlling initial flush of weeds. • Application of post-emergence herbicide Imazethapyr @ 70-80 g/ha, 20-25 DAS is effective in controlling the weeds.

6.6.5 Integrated Pest Management

On an average 20-40% crop is annually lossed due to damage caused by Pod borers in pigeonpea and chickpea. Pod fly also causes 10-15% loss especially in North India. Wilt and Root rots cause heavy loss to pigeonpea and chickpea crops. Effective IPM module is given as under for management of targeted pest and diseases.

Crop	Activity	Recommendations
Chickpea	Before Sowing	• Deep summer ploughing • Application of neem seed kernel powder @ 50 kg/ha in nematode infested soils.
	At the time of sowing	• Timely sowing • Seed treatment with carbendazim+ thiram (1+2 g/kg) or Trichoderma (4 g) + carboxin (1g)/kg • In nematode infested soils, seed treatment with carbosulfan @ 1 %.
	Standing crop	• Use of pheromone trap @ 4-5 per ha • Installation of bird perches (35-40/ha) • Start insecticidal spray if the pod borer reaches economic threshold level i.e. 1-2 larvae per linear meter. • First spray of NSKE (5 %). • Second spray of NPV 250 LE.

Crop	Activity	Recommendations
Pigeonpea	Before sowing	• Deep summer ploughing • Application of neem seed kernel powder @ 50 kg/ha in soil infested with nematode.
	At the time of sowing	• Sowing on ridges • Intercropping with sorghum (2:1 or 4:2) • Seed treatment with carbendazim @ 1 g/kg or Trichoderma (4 g) and vitavax (2 g)
	Standing crop	• Monitoring of the crop for the occurrence of diseases and pests • Use of pheromone trap @ 4-5/ha • When the moth reaches 4-5 per trap for 3-4 consecutive nights start pest management
	Early maturing crop	• First spray of monocrotophos (0.04 %) • Second spray of NSKE (5%) • If required, third and fourth spray of either NSKE or NPV @ 250 LE.
Mungbean & Urdbean	Before sowing	• Deep summer ploughing
	At the time of sowing	• Seed treatment with carbendazim+ thiram (1+2 g/kg)
	Standing crops	• In summer sown crops, timely irrigation minimizes thrips infestation • Foliar spray of monocrotophos 0.08% or dimethoate 0.03% against pod borers and sucking pests. • Foliar spray of carbendazim (0.05%) or thiophanate methyl (0.025%) at 30 DAS.
Lentil	Before sowing	• Deep summer ploughing
	At the time of sowing	• Timely sowing to avoid rust • Seed treatment with carbendazim+ thiram (1+2 g/kg) or Trichoderma (4 g) + carboxin (1g)/kg • Intercropping (2:1) or mixed cropping with linseed (1:1)
	Standing crop	• Foliar spray of dimethoate 0.03% in case of aphid infestation • Foliar spray of wettable Sulphur (0.2-0.3%) or mancozeb (0.2%) against rust. • Removal of diseased plant debris.
Fieldpea	Before sowing	• Deep summer ploughing
	At the time of sowing	• Timely sowing to avoid powdery mildew and rust • Seed treatment with carbendazim+ thiram (1+2 g/kg) or Trichoderma (4 g) + carboxin (1g)/kg
	Standing crop	• Regular monitoring of the crop • Foliar spray of wettable Sulphur (0.2-0.3%) against rust and powdery mildew • Carbendazim (1 g/l of water) or dinocap, karathane 48 EC (0.05 ml/l of water) are also used against powdery mildew • Removal of diseased plant debris.
Rajmash	At the time of sowing	• Seed treatment with carbendazim+ thiram (1+2 g/kg) or Trichoderma (4 g) + carboxin (1g)/kg
	Standing crop	• Foliar spray of metasystox or monocrotophos (0.04%) for aphid that are vectors of bean common mosaic virus. • Foliar spray of carbendazim (1g/l of water) against stem blight • Removal and destruction of stem blight affected plants • Avoiding stagnation of water in the field for limiting the buildup of stem blight and root rot diseases.

Source: Approach Paper on Pulses, IIPR- Kanpur

6.6.6 Cropping System approach.

Cropping System Approach: Addressing Biotic and Abiotic constraints.

Abiotic Stresses

Abiotic stresses are primarily unavoidable and are most detrimental to the growth and productivity of pulses, especially under un-irrigated areas. The ability to tolerate effectively by challenging these stresses is a complicated phenomenon stemming out from various plant interactions occurring in the specific environments. Abiotic stresses are occurring naturally and can only be resolved with mitigation strategies under varied climatic conditions.

Abiotic and biotic stress management: Various non-monetary inputs/techniques, viz. selection of crops, selection of drought-resistant/tolerant/early-maturing/short-duration varieties, healthy and disease-free seeds, seed treatment need to be adopted for mitigating abiotic and biotic stress for maximizing productivity and profitability of pigeonpea in dry land areas. Better crop-management practices like nutrient, water and weed management, insect-pest and disease management are essential to withstand these stresses. Climate-resilient crop varieties along with other suitable adaption and mitigation strategies will help overcome the adverse impact of climate change by lowering the yield losses under stress condition.

Drought Stress

Impact of moisture stress depends on its intensity/ severity and duration; prevents the crops from reaching the maximum yield. Nitrogen fixation, uptake and assimilation by leguminous plants are reduced due to reduction in leg haemoglobin in nodules and number of nodule under moisture stress conditions. Depending on the level of stress, legumes may suffer from grain yield losses to a larger extent than shoot biomass reduction.

Water logging stress

Water logging affects a number of biological and chemical processes in plants and soils that can impact crop growth in both the short and long term. Germinating seeds/ emerging seedling are very sensitive to water logging, as their level of metabolism is high. Pigeonpea is sensitive to water logging than other crops.

High temperature

Optimum temperature for kharif pulse 15-30°C is required for better growth and development. Soil moisture stress coupled with high temperature affects the growth and development of crop plants to larger extent in dryland areas.

Low temperature stress

Temperature lower than optimal growth temperature requirement causes low temperature requirement of chilling stress. Stress due to temperature less than 15°C is known as chilling stress and this occurs in plants which grow at 25-35°C. In majority of crops, chilling stress occurs at temperature less than 10°C but above 0°C. Chilling stress is most common in tropical and sub-tropical species, such as pigeonpea.

Cool/ winter season pigeon pea highly sensitive to low temperature stress during flowering and early pod-formation stages.

Nutrients stress

Nutrient deficiency and excess occurs when on essential nutrient is either not available to plant in required quantity or available in excess of plant needs. Unlike deficiency Symptoms, toxicity symptoms are common. In some cases the presence of one element in excess concentrations may include the deficiency of another element.

6.6.6.1 Varieties with special traits

Table 28. Flood and Drought Tolerant Varieties/ hybrids

Crops	Varieties/ Hybrids
Deep water/ submergence / water logging tolerance	
Rice	Swarna Sub-1, Sambha Mahsuri Sub-1, Varshadhan, Gayatri, Sarla, Pooja, Prateekhsha, Durga, JalaMani, CR Dhan 505, CR Dhan 502, Jalnidhi, Neerja, Jaladhi 1, Jaladhi 2, Hemavathi
Maize	HM-5, Seed Tech-2324, HM-10, PMH-2
Drought tolerance	
Rice	Sahabhagi Dhan, Vandana, Anjali, Satyabhama, DRR Dhan 42 (IR64 Drt 1), DRR Dhan 43, Birsa Vikas Dhan 203, Birsa Vikas Dhan 111, Rajendra Bhagwati, Jaldi Dhan 6
Wheat	PBW 527, HI 1531, HI 8627, HD 2888, HPW 349, PBW 644, WH 1080, HD 3043, PBW 396, K 9465, K 8962, MP 3288, HD 4672, NIAW 1415, HD 2987
Maize	Pusa Hybrid Makka 1, HM 4, Pusa Hybrid Makka 5, DHM 121, Buland,
Chickpea	Vijay, Vikas, RSG 14, RSG 888, ICCV 10, Pusa 362, Vijay
Soybean	NRC 7, JS 95-60
Cotton	HD 324, CICR-1 Raj DH-7, Jawahar Tapti, Pratap Kapi, Suraj, Surabhi, Veena, AK 235

Table 29. State Specific Strategy

S. No.	Constraints	States	Season	Crop
A.	**Climatic Variability**			
(i)	Occurrence of mid-season cold waves and terminal heat during winter season	**UP,MP**	Kharif	Pigeonpea, Urd,Mung
(ii)	Inundation of water in black cotton soils during heavy rains. Sub-optimal nutrient uptake.	MP,MS,AP, Guj., TN		
(iii)	Micro-nutrient deficiency (Zn, Fe, B, Mo) unbalanced and seldom soil test based use of micro-nutrient.	All States	All Season	All Crops
(iv)	Sulphur deficiency, inadequate availability of Gypsum or Pyrites.	MP,MS,AP, Karnataka, Guj, UP	All Season	All Crops
(v)	Pod Borer, Pod-fly and Maruca			Tur, Gram
(vi)	Fusarium wilt			Tur, Gram, Lentil
(vii)	YMV & Powdery mildew			Urd, Mung
(viii)	Blue Bull Menace	UP,Bihar, MP, Raj.,CG		
(ix)	Region Specific Technology	All States		All Crops

7. Brief Strategy for sustainability of pulses production

- Assured procurement of pulses should be ensured by State Governments at MSP.
- Mapping of major pulse growing areas and integration with PMKSY water resources for life saving irrigation should be ensured.
- Use of quality bio-fertilizer and bio-agents (MoU with ICAR/SAU) should be ensured.
- Soil test based nutrient applications including quality micro nutrients should be adopted.
- Adopting of line sowing, BBF, raised-bed & ridge-furrow planting techniques should be ensured
- Cultivation should be made under new niches-sole, catch crop, relay crop & inter cropping.
- Utilization of rice fallows and promotion of spring/summer pulse cultivation should be ensured.
- Adoption of short duration of paddy varieties should be encouraged to accommodate the pulses.
- Availability of Gypsum/promotion as nutrient supplement, effective pest-surveillance and community approach management methods/techniques should be ensured as practiced in Maharashtra.
- Moisture conservation technique, contingent drainage in the event of high rainfall through promotion of ridge planter, raised bed planter and sprinklers should be adopted.
- There is a need to promote Zero-tillage to reduce cost of cultivation/timely sowing.
- Custom Hiring for farm mechanization should be promoted.
- Convergence of fallow lands into pulse cultivation should be explored.
- Transplanting and dibbling method of Tur planting under SCSP/TSP with SMF should be adopted.
- PHM/Value Addition Promotion (spiral graders, clearer, mini dal-mill) as adopted in Assam should be encouraged.
- Screening and identification of potential local cultivars of Rajmash and Ricebean for NEH region should be promoted.
- Area under Cluster demonstration of NFSM may be reduced from 100 ha to 25 ha per cluster in case if area under crop is less.
- Fencing/solar fencing project for wild animal/stray cattle menace as adopted in Gujarat and Madhya Pradesh should be replicated.
- MSP for Moth bean may be considered
- Hoeing/weeding in major pulse districts of Rajasthan may be dove-tailed with MGNREGA.
- Large scale FLD for seed should be conducted in Seed Hubs and variety should be taken into chain.
- Short duration summer Mung seeds of 45 days should be procured by States in advance.
- Short duration seeds of pigeon pea available in Punjab and Haryana should be indented on priority.
- States should take pro-active steps to procure pulses under PSS.

Annexure-A

Different sources of Sulphur and their Nutrient constituents

Fertilizer/ Source	% of Nutrient Composition					Dosage of sources to fulfill the need of 1 kg Sulphur (kg/kg Sulphur)
	Sulphur	Nitrogen	Phosphorus	Potassium	Zinc	
Ammonium Sulphate	24	21	--	--	--	4.167
Ammonium phosphate sulphate	15	16	20	--	--	6.667
Gypsum	15-18	--	--	--	--	6.667
Phosphogypsum	13-18	--	--	--	--	6.667
Elemental Sulphur	85-95	--	--	--	--	1.050
Single super Phosphate	12	--	16	--	--	8.333
Potassium Sulphate	18	--	--	60	--	5.555
Zinc Sulphate	11	--	--	--	22	9.090
Iron Pyrite	11-12	--	--	--	--	4.545

Annex-B

Estimated Cost and Returns of Pulses

Commodity	Whole grain			Value addition/ Processing									Gross return (Rs./Q)	Processing cost (Rs/Q)	Net return (Rs/Q)	Value added (Rs/Q)
				Main Product			By-product									
				Dal			Broken			Cattle feed						
	kg	Rate Rs/ (Q)	Value (Rs)	Recovery (kg)	Rate Rs/Q	Value (Rs)	Qty (kg)	Rate Rs/Q	Value (Rs)	Qty (kg)	Rate Rs/Q	Value (Rs)				
	1	2	3	4	5	6=(4x5)	7	8	9=(7x8)	10	11	12=(10x11)	13=(6+9+12)	14	15=(13-14)	16=(15-3)
Pigeonpea	100	5050	5050	70	8000	5600	3	3500	105	27	1200	324	6029	250	5779	729
Pea	100	3000	3000	82	4000	3280	2	2000	40	16	1300	208	3528	100	3428	428
Lentil	100	3950	3950	76	5300	4028	4	3500	140	20	1600	320	4488	150	4338	388
Mung bean	100	5225	5225	74	7000	5180	3	5000	150	23	1500	345	5675	150	5525	300
Chickpea	100	4700	4700	76	6500	4940	2	4500	90	22	1600	352	5382	150	5232	532
Chickpea (Besan)	100	6500	6500	97	8000	7760							7760	75	7685	1185
Urd bean	100	5000	5000	75	8500	6375	3	6500	195	22	1500	330	6900	150	6750	1750
Pea (Besan)	100	4000	4000	97	4500	4365							4365	75	4290	290

Note

A. Per qtl rate considered: i) Gram & Pea prevailing market prices as gram rate are ruling above.

B. MSP & Pea –No MSP. ii) Other pulses as per MSP rate.

C. The processing cost, recovery & rate of by-product, percentage of by-product based on millers/processor feedback taken by the DPD, Bhopal