PULSES REVOLUTION FROM FOOD TO NUTRITIONAL SECURITY

सत्यमेव जयते

Crops Division
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation & Farmers Welfare
Krishi Bhavan, New Delhi - 110 001

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D.O.No. /AM

राधा मोहन सिंह
RADHA MOHAN SINGH

सत्यमेव जयते

कृषि एवं किसान कल्याण मंत्री
भारत सरकार
MINISTER OF AGRICULTURE & FARMERS WELFARE
GOVERNMENT OF INDIA

संदेश

भारतीय अर्थव्यवस्था में कृषि का महत्वपूर्ण योगदान है। कृषि क्षेत्र का राष्ट्रीय सकल घरेलू उत्पादन में 16 प्रतिशत व रोजगार निर्माण में 49 प्रतिशत से अधिक का योगदान है। पोषण–युक्त समुचित खाद्यान्न उपलब्ध कराते हुए वर्ष 2030 तक जीरो हंगर के लक्ष्य को प्राप्त करना है।

वर्ष 2022 तक कृषकों की आमदनी दो गुना करने के संकल्प के दृष्टिगत वर्तमान सरकार ने नीतियों, कार्यक्रमों एवं पूंजी निवेश पर ध्यान केंद्रित करते हुए जमीनी स्तर पर प्रभावी कार्यक्रम क्रियान्वयन को सुनिश्चित किया है। वर्ष 2017–18 में 2848 लाख टन सर्वोच्च खाद्यान्न उत्पादन के साथ दलहन में भी अब तक का सर्वोच्च उत्पादन 252 लाख टन प्राप्त कर देश ने दलहन क्षेत्र में आत्म निर्भरता प्राप्त की है।

भारत सरकार, कृषि, सहकारिता एवं कृषि कल्याण विभाग के फसल निदेशालयों, राज्य कृषि विभागों एवं अन्य सहभागी संस्थाओं के समन्वय एवं कार्यक्रमों के प्रभावी क्रियान्वयन व अनुश्रवण एवं कृषकों के अथाह परिश्रम की इस उपलब्धि में अहम भूमिका रही है।

मुझे प्रसन्नता है कि भारत सरकार, कृषि, सहकारिता एवं कृषि कल्याण विभाग द्वारा ***"दलहन क्रांति – भोजन सुरक्षा से पोषण सुरक्षा तक"*** विषय पर एक सक्सेज स्टोरी का प्रकाशन किया जा रहा है। सफलता की इस यात्रा में सहायक योजनाओं व नवाचारों की भागीदारी का ब्यौरा देते हुये में वर्ष 2030 तक की भविष्णु रूपरेखा भी समाहित की गई है। विभाग का यह प्रयास अति प्रशंसनीय है।

आशा है कि यह प्रकाशन दलहन क्षेत्र में कार्यरत नीति निर्धारकों, विकास कार्यक्रम क्रियान्वयन संस्थाओं, विद्यार्थियों, शोधार्थियों, उद्यमियों, कृषक उत्पादक समूहों व स्वसहायता समूहों आदि के लिये अत्यन्त उपयोगी सिद्ध होगा।

राधा मोहन सिंह

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S.K. PATTANAYAK
SECRETARY

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कृषि, सहकारिता एवं किसान कल्याण विभाग
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation
& Farmers Welfare

FOREWORD

Our world today faces a tough challenge, for ensuring food security while providing a balanced diet for everyone. Overcoming hunger and malnutrition in the 21st century means increasing food quantity and quality, while making sure we produce food sustainably and efficiently. Pulses have been an essential part of the human diet for centuries. Yet their nutritional value is not generally recognized and their consumption is frequently under appreciated. Pulses in India have long been considered as the poor man's only source of protein, thus play a crucial role in healthy diets, sustainable food production and above all, in food security.

An improvement in pulses production technology can reduce the cost of production and ensure higher productivity resulting in affordable prices to consumers. This will create scope for further increase in demand for pulse crops by replacing some portion of the disproportionably high level of cereals in the consumption basket for a balanced diet. Considering the importance of pulses, Department of Agriculture, Cooperation and Farmers Welfare in the Ministry of Agriculture & Farmers Welfare has made sincere efforts through National Food Security Mission, which resulted in appreciable increase in the area, production and productivity of pulses in India. Recent policy initiatives under National Food Security Mission (NFSM), Bringing Green Revolution in the Eastern Region (BGREI), Crop Diversification Program (CDP) involving conduct of large scale cluster demonstrations, creation of 150 Seed-hubs for pulses, seed minikit distribution of high yielding new varieties, strengthening seed production infrastructures, seed village programme, creation of FPO's and enhanced MSP coupled with favourable EXIM policy has earned us a place of pride to achieve the highest ever production of 25.23 million tonnes of pulses during 2017-18 (4th estimates) making the nation self-sufficient in pulses. All these efforts have ushered in a mini green revolution in the pulses sector.

Any information on pulses is highly valuable since the crop is considered as incredible to mankind in terms of cultivation, food, nutritional and income security. I appreciate the sincere efforts of the authors in bringing out this valuable publication on **"Pulses Revolution- From Food to Nutritional Security"**. I hope this book will be of immense use to the farmers, students, extension workers, policy makers and researchers.

(S.K. Pattanayak)

New Delhi
14th September, 2018

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सत्यमेव जयते

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Foreword

Pulses in India have long been considered as good source of protein, thus play a crucial role in healthy diets, sustainable food production and above all, in food security. Food legumes are next to cereals in terms of agricultural importance and are the best options for diversification and intensification of contemporary agriculture on sustainable basis. India has appreciably 35% share in global area and production and is thus largest producer and consumer of pulses. Chickpea, pigeon pea, black gram, green gram, lentil and field pea are the major pulses crops grown in the country.

An improvement in pulses production technology can reduce the cost of production and hence prices and create scope for further increase in demand for pulse crops by replacing some portion of the disproportionably high level of cereals in the consumption basket for a balanced diet. Recent policy initiatives under National Food Security Mission – Pulses, implemented conduction of large scale cluster demonstrations, creation of 150 Seed-hubs for pulses, seed minikit distribution of high yielding new varieties, strengthening seed production infrastructures, seed village programme, creation of FPO's and enhanced MSP has earned pride to achieve the ever highest production of 25.23 million tonnes of pulses during 2017-18 (4th estimates) making the nation self-sufficient in pulses. The agriculture accounts for just 16 per cent of India's economic output, but provides a livelihood to more than 49 per cent of its total population. The interventions under NFSM-Pulses have realized the positive impact. During 2017-18 an approximate increase in pulses has been to the tune of 19% area and 34% production and 13% yield, consequently per capita availability of pulses has also increased during last 4 years.

Present publication provides a comprehensive plan-wise analysis on different interventions, pulse scenario, individual crop's status, their feasibility and scope, agro-climatic zone-wise constraints and suggestive strategy, issues on seed, demand-supply analysis in *"Pulses Revolution- From Food to Nutritional Security"* examines the past progress and provides future strategy.

I compliment the authors for their sincere efforts in bringing out this publication in record time. I am sure the publication shall serve as an encyclopedia for all those involved in the planning/development/research and trade in pulses commodity.

(Dr. S. K. Malhotra)

New Delhi
12th September, 2018

अशोक दलवाई, भा.प्र.से.
मुख्य कार्यकारी अधिकारी
भारत सरकार,
कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग
राष्ट्रीय वर्षा सिंचित क्षेत्र प्राधिकरण

सत्यमेव जयते

ASHOK DALWAI, IAS
Chief Executive Officer
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Department of Agriculture, Cooperation & Farmers Welfare
National Rainfed Area Authority (NRAA)

FOREW0RD

India's economy has been dominated by agriculture with its contribution to employment at 49 per cent. The staple cereals, namely, rice and wheat have been incentivized by MSP and procurement besides integration into public distribution (PDS). Similarly, cotton & sugarcane which enjoy robust procurement have also found favour with farmers.

Pulses have been a secondary choice, mostly confined to the rainfed ecology. Over the last four years, the on-going National Food Security Mission (NFSM) has been converged with multi–pronged strategies to enhance the production and productivity of pulses in the country. Across the country, pulses constituent of the daily dining plate of a majority of the people.

The NFSM-Pulses in flagship scheme that promotes pulses is being implemented in 638 districts of all 29 states. In addition, spring/summer pulses programmes, targeted in rice fallow areas (TRFA) are also being implemented in the potential states of the country. New initiatives include seed minikits, seed-hub, EBSP, CFLDs, Government guarantee to lender bank for enhancing credit limits to NAFED/SFAC for procurement, emphasis on irrigation etc.

Thanks to Government's comprehensive policy, there has been a leap frog in production since 2016-17, where in 'Five Year Roadmap' was adopted. The production of pulses to the tune of 25.23 million tonnes during 2017-18 is close to self sufficiency in pulses. The country is now confident of meeting the projected demand of 35 million tonnes by 2030.

The publication ***"Pulses Revolution- From Food to Nutritional Security"*** is based on critical analysis of pulses as a food crop, individual crops, state as also the plan period. It's a must read book for all those associated with the production, procurement, processing and consumption and marketing of pulses.

I acknowledge the commendable work done by Dr. B. Rajender, Joint Secretary (Crops), Dr. A.K. Tiwari, Director and his team in the DPD, Bhopal and Dr. S.S. Tomar, Addl. Commissioner(Crops) Min. of Agri. & FW, DAC&FW. I am sure this publication will be useful for a wide range of stake holders. These Officers have painstaking compiled all information, analyzed systematically and drawn appropriate lesson for road ahead.

I congratulate the team led by Dr. Rajender for this impressive output.

A Dalwai

New Delhi
September 14, 2018

(Ashok Dalwai)

सत्यमेव जयते

भारत सरकार
कृषि एवं किसान कल्याण मंत्रालय
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Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation
& Farmers Welfare

Dr. B. Rajender, IAS
Joint Secretary

PREFACE

Ensuring food and nutritional security at an affordable rate to > 1.25 billion population remains a national concern and a priority agenda for the current government. The government, since its assumption of power in May, 2014, Agriculture is the back bone of country with its contribution to more than 49 percent employment and 16 percent to national GDP.

In India the Agricultural growth volatility has substantially declined overtime, cereals production exhibiting robust growth to drought with real agricultural GDP growth during 2004-2016 at 3.2 percent. However, the levels of uncertainty growth are still high due to vagaries of the weather and the fact that of total 141.40 million hectares net sown area, 73.20 million hectares (52 percent) is still un-irrigated and rainfed. The government has, therefore, resolved to double the farmers' income by 2022.

The rainfed regions supports >40% of human population and 2/3rd of livestock of the country. More than 80% of total pulses are grown in this region. Pulses, historically vital constituent of cropping and consumption pattern are the only rich source protein (20-25%) for 43 percent vegetarians (Urban – 48%, rural – 41%). Besides the double the protein content of wheat and three times that of rice, food legumes tend to fix 72 to 350 kg per ha per year atmospheric nitrogen to N-compounds to soil.

With the twin objectives i.e. achieving food and nutritional security vis-à-vis enhancing income of the rainfed farmers, the government decided to harness the potential of pulses.

In 2015-16, many farmer centric strategies and programmes such as PMKSY, PMFBY, PKVY, SHM and SHC, e-NAM etc was initiated to achieve the targeted outcomes.

From 2016-17, distribution of pulses seed minikits, incentives on production of quality seeds, creation of seed hubs, enhancing breeder seed production, cluster frontline demonstrations through 578 KVKs etc also initiated for increasing the production and productivity of pulses in the country. Massive awareness campaign in conformity with International year of Pulses (IYOP – 2016) coupled with implementation of PSS at enhanced MSP; provision of PSF, imposing import duties (30%-gram / lentil, 50% yellow pea, 10% Tur) etc have paid dividends to consumers and pulse growers both.

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As a result of enhanced per hectare productivity, the year 2017-18 witnessed a record pulse production of 25.23 million tonnes, a grand success story and revolution in pulses self – sufficiency.

The publication ***"Pulses Revolution- From Food to Nutritional Security"*** provides the more descriptive review of the current crop year 2017-18, encompassing season-wise production performance of individual pulse crop, states and the previous 05 year plans.

The Directorate of Pulses Development, the crop/commodity development directorate of the DAC&FW has also devoted chapters on constraints associated with production, government interventions, general strategies, demand and availability of pulses.

I place on record and appreciate to Dr. A. K. Tiwari, Director, Govt. of India, Directorate of Pulses Development and Dr. S.S. Tomar, Additional Commissioner, Ministry of Agriculture & Farmers Welfare, DAC&FW for accomplishment of task of preparation of "Pulse Success Story" in a given time-frame.

I acknowledge Dr. A. K. Shivhare, Assistant Director, Ms. Ashwini Tikle, TA and Shri. Sarju Pallewar, SI, DPD, Bhopal who deserve special mention for their sincere association, dedication and hard work, beyond office hours, to accomplishing the task of bringing the document.

BRajender 30.8.2018

New Delhi
30th August, 2018

(B. Rajender)
Joint Secretary

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EXPLANATION TO ABBREVATIONS

AFC	Agriculture Finance Commission
AICRP	All India Coordinated Research Project
A,P,Y	Area, Production, Yield
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agricultural Produce Market Committee
ATARI	Agriculture Technology Application Research Institute
BAU	Bihar Agriculture University
BGREI	Bringing Green Revolution to Eastern India
BSP	Breeder Seed Production
CAZRI	Central Arid Zone Research Institute
CCEA	Cabinet Committee on Economic Affairs
CDP	Crop Diversification Programme
CFLD	Cluster Frontline demonstration
CHC	Custom Hiring Centres
CoS	Committee of Secretaries
CRIDA	Central Research Institute for Dryland Agriculture
CSBD	Cropping System Based Demonstration
CSBT	Cropping System Based Trainings
CZ	Central Zone
DACPs	District Agriculture Contingency Plans
DARE	Department of Agricultural Research and Education
DBT	Direct Benefit Transfer
DGCI&S	Director General of Commerce Intelligence and Statistics
DSR	Direct Seeded Rice
EBSP	Enhancing Breeder Seed Production
e- NAM	Electronic-National Agriculture Market
FAO	Food and Agriculture Organization
FCI	Food Cooperation of India
FFS	Farmer's Field School
FP	Farmers Practice
FPOs	Farmers Producers Organizations
FLD	Front Line Demonstration
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GOI	Government of India
HIL	Hindustan Insecticides Limited

HP	Horse Power
HYVs	High Yielding Varieties
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
ITD	Innovations in Technology Dissemination
ICAR	Indian Council of Agricultural Research
IFFCO	Indian Farmers Fertilizer Co-operative Ltd.
IFFDC	Indian Farm Forestry Development Co-operative Limited
IIPR	Indian Institute of Pulse Research
ISOPOM	Integrated Scheme on Oilseeds, Pulses, Oil palm and Maize
INM	Integrated Nutrient Management
IPGA	India Pulses and Grains Association
IPM	Integrated Pest Management
IYOP	International Year of Pulses
JNKVV	Jawaharlal Nehru Krishi Vishwa Vidyalaya
kg/ha	Kilogram per hectare
KVK	Krishi Vigyan Kendra
KRIBHCO	Krishak Bharti Co-operative Ltd.
Lha	Lakh hectare
LT	Lakh Tones
Min.	Minimum
Max.	Maximum
Mha	Million hectare
MT	Million Tones
MIDH	Mission for Integrated Development of Horticulture
MPKV	Mahatma Phule Krishi Vidyapeeth
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NAFED	National Agriculture Marketing Federation Ltd
NFSM	National Food Security Mission
NEPZ	North East Plain Zone
NGOs	Non-Government al organization
NHZ	North Hilly Zone
NITI	National Institution for Transforming India
NLMT	National Level Monitoring Team
NPDP	National Pulses Development Project
NSC	National Seed Corporation

NUE	Nutrient Use Efficiency
NWPZ	North West Plain Zone
PDS	Public Distribution System
PKVY	Paramparagat Krishi Vikas Yojana
PMKSY	Pradhan Mantri Krishi Sinchai Yojna
PMFBY	Pradhan Mantri Fasal Bima Yojna
PSB	Phosphorus Solubilising Bacteria
PSF	Price Stabilization Fund
PSS	Price Support Scheme
Qtls	Quintals
RARI	Rajasthan Agricultural Research Institute
R&D	Research and Development
RCT	Resource Conservation Technology
RKVY	Rashriya Krishi Vikas Yojna
RVSKVV	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
SAU	State Agriculture University
SAY	State Average Yield
SDA	State Department of Agriculture
SFAC	Small Farmers' Agribusiness Consortium
SHC	Soil Health Card
SHM	Soil Health Mission
SPPP	Strategic Pulses Production Programme
SRR	Seed Replacement Rate
ToT	Transfer of Technology
TRFA	Targeting Rice Fallow Area
YI	Yield Index

PULSES REVOLUTION
FROM FOOD TO NUTRITIONAL SECURITY

Executive Summary

1. A giant leap in production

- During 2017-18, pulses were cultivated over > 29 million ha (Mha) of area and recorded the highest ever production of 25.23 million tonnes (Mt) at a productivity level of 841 kg/ha. The exponential growth rate in production of pulses during last year was > 9 per cent.
- Twelve states were the major producers contributing > 90 per cent pulses. These were Madhya Pradesh (> 8 Mt), Rajasthan (>3 Mt), Maharashtra (>3 Mt) Uttar Pradesh (>2 Mt) Karnataka (2 Mt) and Andhra Pradesh (>1 Mt) followed by Gujarat, Jharkhand, Tamil Nadu, and Chhattisgarh producing <1.0 Mt each.
- Under individual crop category, Gram recorded a highest ever production of 11.23 Mt at a record productivity level of 1063 kg/ha in an area of 10.56 Mha. Major 07 states to contribute > 90 per cent in gram production have been Madhya Pradesh (4.60 Mt), Maharashtra (1.78 Mt), Rajasthan (1.67 Mt), Karnataka (0.72 Mt), Andhra Pradesh (0.59 Mt), Uttar Pradesh (0.58 Mt) and Gujarat (0.37 Mt).
- Tur (Arhar) remained at 2nd position in total pulse production with 4.25 Mt of production in an area of 4.43 Mha at a productivity level of 960 kg/ha, the ever highest yield. Major states to record the success have been Maharashtra (1.07 Mt), Madhya Pradesh (0. 84 Mt), Karnataka (0.77 Mt), Gujarat (0.34 Mt), Uttar Pradesh (0.33 Mt), Telangana (0.26 Mt) and Jharkhand (0.22 Mt).
- Urad (Blackgram), the 3rd important crop group, was cultivated over an area of 5.44 Mha (kharif + rabi) and recorded a production of 3.56 Mt at a productivity level of 655 kg/ha. This was the highest ever area, production and productivity in this crop. Major contributing states have been MP, Rajasthan, AP, UP, Tamil Nadu, Maharashtra, Jharkhand and Gujarat.
- Similarly, Mung (Greengram) was sown over an area of 4.26 Mha in (kharif + rabi) and recorded a production of 2.01 Mt at and yield level of 472 kg/ha. Rajasthan, MP, Maharashtra, Karnataka, Bihar, AP, Odisha, Tamil Nadu, Gujarat and Telangana have been the major states.
- Lentil also recorded an ever highest production of 1.61 Mt from area of 1.55 Mha at a productivity level of 1034 kg/ha, the ever highest yield level. Leading six lentil producing states have been Madhya Pradesh (0.68 Mt), Uttar Pradesh (0.50 Mt), West Bengal (0.15 Mt), Bihar (0.14 Mt), Jharkhand (0.06 Mt) and Rajasthan (0.03 Mt).

2. Equilibrium Production and demand

- As per the Report of the Working Group on Crop Husbandry, demand & supply projection for XII Plan (2012-17) of NITI Aayog (erstwhile Planning Commission), the demand of pulses @ 3.09 per cent per annum growth during 2016-17 and 2017-18 has been worked out at 22.74 Mt and 23.44 Mt respectively.
- It was for the first time since plan – interventions on pulses that the nation inscribed a success by achieving higher pulse production at 23.13 Mt and 25.23 Mt during 2016-17 and 2017-18.
- The country witnessed near self-sufficiency in pulses.

3. Significant growth with additional return

- During 2017-18, significant growth was registered under total pulse production, both over

the base year (2014-15) and the normal/XIIth Plan (2012-13 to 2016-17) at the level of 47 per cent and 34 per cent respectively.

- Major increment was recorded in kharif production i.e. 62 per cent mainly due to lion share contributed by urad (82 per cent) followed by tur (52 per cent) and mung (34 per cent).
- Rabi pulses recorded a 39 per cent hike over the base year (2014-15) and was mainly contributed by gram (53 per cent) and lentil (55 per cent).
- As a consequence of meticulous planning and strategy, the production increase was realized both by way of horizontal expansion i.e. pulses over new areas as well as vertical expansion by bridging the yield gaps through aggressive technology transfer, capacity building, workshops/seminars and consultations with the stake-holders during the aforesaid period.
- A total pulse area was increased to about 27 per cent over the period. Under seasonal increase, it was 41 per cent during kharif followed by rabi 17 per cent. Under individual crop category, major increment in area has been recorded in urad (68 per cent) followed by Mung (41 per cent), gram (28 per cent) and tur (15 per cent).
- The total pulse productivity increase during the same period has been about 15 per cent over the base year (2014-15), comprising rabi and kharif increment at about 19 per cent and 15 per cent respectively.
- As regards the crop-wise yield performance during 2017-18 over the period, the highest yield increments have been recorded in lentil (47 per cent) followed by tur (32 per cent), gram (20 per cent) and urd (8 per cent) over the base year (2014-15).
- The change over under Area Expansion (horizontal expansion) and production growth over Normal and base year are indicated under table I & II.
- The overall pulse change over per ha yield (vertical expansion) and consequently the per unit additional return to farmer to increase their income is about Rs. 6487 per ha and Rs. 5308 per ha over the base year and normal respectively. The crop-wise details indicated under Table-III.

(Table-I): Horizontal Expansion

(Area-Million ha)

Crop	Season	Area			Change over (+/-)	
		Normal*	2014-15	2017-18**	Normal	2014-15
Tur	Kharif	4.19	3.85	4.43	0.24	0.58
Urd	Kharif	2.70	2.48	4.50	1.80	2.02
	Rabi	0.81	0.76	0.94	0.13	0.18
	Total	3.51	3.25	5.44	1.93	2.19
Mung	Kharif	2.49	2.02	3.29	0.80	1.27
	Rabi	0.96	0.99	0.97	0.01	-0.02
	Total	3.46	3.02	4.26	0.80	1.24
Gram	Rabi	8.95	8.25	10.56	1.61	2.31
Lentil	Rabi	1.39	1.47	1.55	0.16	0.08
Other Pulses	Kharif	1.81	1.63	1.87	0.06	0.24
	Rabi	1.97	3.55	1.88	-0.09	-1.67
	Total	3.78	5.19	3.75	-0.03	-1.44
Kharif Pulses		**11.19**	**10.00**	**14.08**	**2.89**	**4.08**
Rabi Pulses		**14.08**	**13.56**	**15.91**	**1.83**	**2.35**
Total Pulses		**25.28**	**23.55**	**29.99**	**4.71**	**6.44**

Source: DES, Ministry of Agriculture & FW (DAC&FW), GoI
Normal-Avg. 2012-13 to 2016-17; 2017-18**- IVth Advance Estimate.*

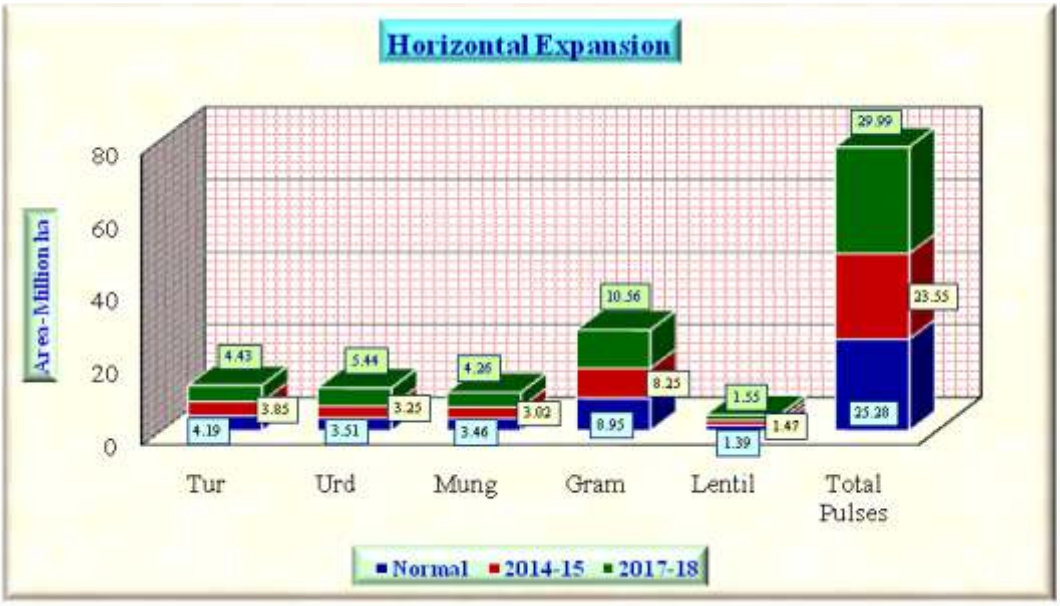


Fig.-I: Horizontal Expansion

(Table-II): Production Performance

(Production-Million Tones)

Crop	Production			Change over (+/-)	
	Normal*	2014-15	2017-18**	Normal*	2014-15
Tur	3.29	2.81	4.25	0.96	1.44
Urd	2.08	1.96	3.56	1.48	1.60
Mung	1.61	1.50	2.01	0.40	0.51
Gram	8.43	7.33	11.23	2.80	3.90
Lentil	1.08	1.04	1.61	0.53	0.57
Kharif Pulses	**6.55**	**5.78**	**9.34**	**2.79**	**3.56**
Rabi Pulses	**12.29**	**11.42**	**15.89**	**3.60**	**4.47**
Total Pulses	**18.84**	**17.20**	**25.23**	**6.39**	**8.03**

Source: DES, Ministry of Agriculture &FW (DAC&FW), GoI
Normal-Avg. 2012-13 to 2016-17; 2017-18**- IVth Advance Estimate.*

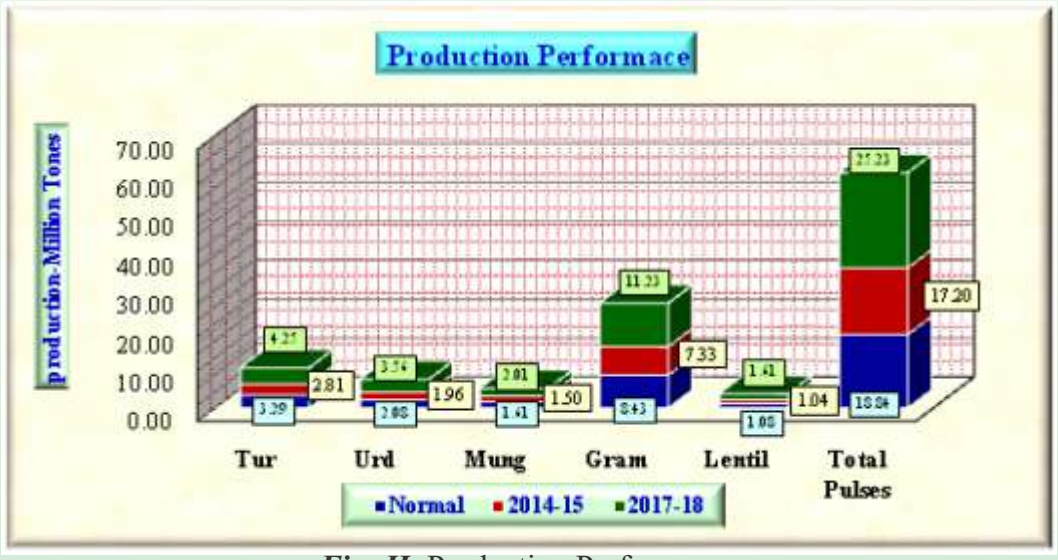


Fig.-II: Production Performance

(Table-III): Additional Return through Vertical Expansion

(Yield-kg/ha, Additional Return-Rs/ha)

Crop	Yield			Yield Gap		Addition Return	
	Normal*	2014-15	2017-18**	Normal*	2014-15	Normal	2014-15
Tur	785	729	960	175	231	8284	11336
Urd	593	604	654	61	50	3240	2646
Mung	466	498	472	6	-26	56	-1728
Gram	942	889	1063	121	174	4972	7304
Lentil	773	705	1039	266	334	9987.5	12878
Kharif Pulses	**585**	**578**	**663**	**78**	**85**		
Rabi Pulses	**873**	**843**	**999**	**126**	**156**		
Total Pulses	**745**	**730**	**841**	**96**	**111**		

Source: DES, Ministry of Agriculture &FW (DAC&FW), GoI
Normal-Avg. 2012-13 to 2016-17; 2017-18**- IVth Advance Estimate.*

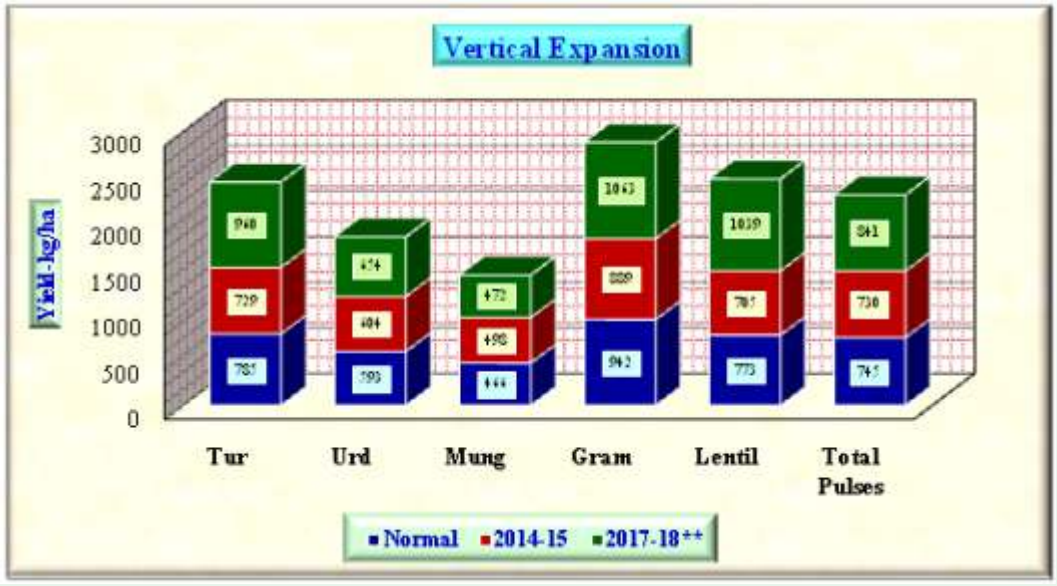


Fig.-III: Additional Return through Vertical Expansion

4. Pulses import falls by 03 million tonnes in financial year- 2018 (Saving of foreign currency)

- With the increase in population, consumer awareness and affordability of middle /lower middle and other category citizens up to some degree, the demand of pulses has also increased overtime.
- Despite being the largest producer, India is also the largest importer and consumer (23-24 million tonnes) of pulses in the world.
- The year 2014-15 and 2015-16 were adverse crop years owing to drought and erratic behavior of rainfall across the major pulse growing states.
- The government, however ensured the availability/supply as per demand by way of enhanced imports between 2014-15 to 2016-17 at about 5-6 million tonnes (Mt) per year in their buffer stock on one hand and swung in to action to combat the natural calamities through development programmes, risk management through PMFBY, PSS and PSF procurement etc., on the other.
- The CCEA has empowered the Committee headed by Secretary, Deptt. of Food and Public Distribution (DFPD) to review the export and

import policy on pulses and consider measures such as quantitative restrictions, prior registration and changes in import duties depending on domestic production and demand, local and international prices and global trade volumes.

- Farmer-friendly policy measures have helped to reduce import of pulses. Import of pulses during 2017-18 has declined by about 30 lakh tonnes from previous year, resulting in saving of foreign exchange amounting to Rs 7,698 crore. It is expected that pulses production will be sustained in the country and India's import dependence on pulses will come down substantially.
- To ensure that farmers get remunerative prices, the government has imposed import duty and introduced quantitative restrictions on the various varieties of pulses. Import duty on chickpea has been fixed at 60 per cent, while that for yellow pea is 50 per cent, lentil 30 per cent and tur 10 per cent on 21st Aug., 2017.

5. *Export of pulses allowed*

- Further, to safeguard farmers' interest, recently the Cabinet Committee on Economic Affairs (CCEA) has given its approval for removal of prohibition on export of all types of pulses to ensure that farmers have greater choice in marketing their produce and in getting better remuneration for their produce.
- The decision comes two months after the government lifted ban dated 15th September 2017 on export of tur, urad and moong dal, although shipments of these varieties were allowed only through permission from agriculture export promotion body APEDA. Export of organic pulses and kabuli chana is permitted in a limited quantity.
- Opening of exports of all types of pulses will help in creating market buoyancy and open access in global markets and enable the farmers dispose of their products at remunerative prices and encourage them to expand the area of sowing.

6. *Interventions which proved the trigger*

- To ensure availability of location specific/ recommended high yielding varieties and quality certified seeds at all levels, programmes initiatives during 2016-17 to 2018-19 are 150 Pulse Seed Hubs and strengthening of Infra-structure for Enhancing Breeder Seed Production (EBSP-12 Centres). The total fund flow for seed hub & EBSP has been Rs. 245.39 crore.
- Incentives for production of certified seeds and seed distribution of pulses were instrumental both in varietal replacement as well as area expansion.
- To ensure availability of quality bio-inputs-rhizobium culture/PSB, micro-nutrients, bio-intensive/bio-pesticides etc.
- To reduce cost of cultivation and timely operations in rainfed areas, where > 80% pulses are grown, availability of implements like seed drills, zero-till seed machine/rotavator and ridge-maker etc ensured through Resource Conservation Technology (RCT) components and Custom Hiring Centres (CHCs), especially in Bundelkhand region of U.P./M.P, yielded the result.
- In view of favorable response of pulses to 1-2 critical irrigations, priority was given to pulses under MIDH and PMKSY (Per Drop More Crop Component).
- For processing and value addition, domestic milling support provided through mini dal mills under local initiative/flexi fund component various states including UP., Gujarat, and Maharashtra.
- To ensure effective transfer of technology, Cropping System Based Trainings (CSBTs) were provided to extension workers. Quality cluster demonstrations, both on sole crop and CSBDs were organized which helped in bridging the yield gaps.

- Strong interface mechanism between State Department of Agriculture and State Agricultural Universities (SAUs), ICAR and KVKs was developed through seminars / workshops/Annual Group Meetings of ICAR etc. These activities were systematically organized during the International Year of Pulses (IYOP-2016).
- Robust monitoring and field visits in all 638 NFSM districts across the country and comprehensive approach in implementation of programme, including all components from seed to post-harvest management, marketing aspects and capacity building etc, yielded wonderful results.
- Dissemination of information through Literature on Pulses (bulletin/leaflet and articles) in Hindi and languages by print media as well as digital (dpd.gov.in/Farmers portal/mKisan Portal) including advisories on pulses on monthly basis by the Department including Directorate of Pulses Development, Bhopal.
- In 2015-16, All XI – ATARI's/578 KVKs were involved in conducting of Cluster Front Line Demonstrations (CFLDs) of pulses with need based thematic areas on farmers' field. An amount of Rs.63.38 crore has so far been utilized for ToT through CFLD and 2.95 crore under regular ICAR-IIPR FLDs.
- In 2016-17 Seed minikits programme of newer varieties of pulses was initiated to popularize improved varieties of pulses. An amount of Rs.137 crore has so far been utilized and 76.71 crore allocated for 2018-19.
- Applied and Action-Research Projects to ICRISAT, ICARDA, ICAR/SAUs to address biotic and abiotic stress/assessment and providing varieties /recommendations.

Conclusion

- Ever since the government assumed resumed the office in May 2014, it resolved the Union government's commitment to achieve/sustain the ambitious twin objectives of food and nutritional security and raising agricultural productivity to make farming remunerative to double the farmer's income by 2022.
- Pulses production programme was brought centre stage owing to their nutritional importance to contain the protein malnutrition vis-à-vis their role in the economy of >40 per cent human population and 2/3rd live-stock rearing in the rainfed regions of the country. About 80 per cent of total pulse area falls in rainfed region.
- To enhance the production and productivity of pulses, in addition to enhanced financial provision under NFSM, the DAC&FW encouraged/ propagated adaptation of multi-dimensional seven point strategy suggested by the Prime Minister, which include: Emphasis on irrigation along with end to end solution on creation of resources for more crops per drop; Provision of quality seeds and nutrients according to the soil quality of each farm; Large investment in warehouse and cold chains to prevent post harvest losses; Promotion of value addition through food processing; Implementation of National Agricultural Markets and e- platform (e-NAM) to eliminate shortcomings of all the 585 centers.; To mitigate the risk by introduction of crop insurance scheme (PMFBY) at a lower cost.; Promotion of allied activities such as Dairy, Animal Husbandry; Poultry, Bee-keeping, Har med per ped, Horticulture & fisheries.
- The years 2014-15 and 2015-16 were two consecutive drought years. The following years have been normal monsoon seasons. Supported by focused approach of centre supported by the states, the pulse production look a leap forward in the following two years. These two years registered record production of 23.13 million tonnes (Mt) from 29.45 million hectares at 786 kg/ha yields; 25.23 Mt from 29.99 Mha at a productivity level of 841 kg/ha during 2016-17 and 2017-18, respectively. Record area coverage

under pulse crops and productivity are an outcome of a 'Five Year Road map' adopted and rolled out by the Deptt. of Agriculture, Cooperation & Farmers Welfare (DAC&FW).

- Appropriate policy support, timely availability of quality inputs, enhanced MSP based procurement checking by NAFED/SFAC/FCI, pro-active policies of the states, such as marketing under Bhavantar Yojana in MP, bonus/incentives in Chhattisgarh (@ Rs 1500 per acres) as provision for buffer stocks, imposition of import duties on pulses (Peas-50% from Nov.8, 2017; gram-40% w.e.f. Feb 06, 2018 revised to 60 % w.e.f. from March 2018; lentil-30% w.e.f. Dec 21st, 2017; Tur 10% w.e.f. March 28, 2017), risk management under PMFBY coupled with the implementation of district crop contingency plans (DCCPs) involving pulses etc., were instrumental in encouraging the farmers to take pulses and adopt new technologies.
- The new initiatives under the road map include Seed Minikits of newer varieties; Creation of Pulses Seed Hubs/ Infrastructures for production of quality seeds; Enhancing Breeder Seed Production (EBSP) at 12 centres in 8 states; Cluster FLDs through ICAR/ATARI/578 KVKs; National Workshops on "Promotion of Pulses in non-traditional Niches; Summer Cultivation" and capacity building activities; Targeted INM-NFSM; Seed production; Strengthening of Bio-agent/Bio Control labs (24 Centres SAUs/ICAR); National Demonstration Project & value Chain Development of Pulses & Millets (111 FPOs), etc. These have been first time introductions.
- Area expansion strategy under RKVY/NFSM as 'Targeting Rice fallow Areas (TRFA)' in 6 eastern states in about 3 Mha; additional area coverage in spring/summer inter-cropping of pulses, tur on rice bunds and transplanting of tur (Dharwad system) Crop Diversification Programmes (CDP) and changing cropping pattern strategies between 2015-16 to 2017-18, paid rich dividends. An area of >29 Mha could be stabilized in consecutive two years of 2016-17 & 2017-18.
- Massive programme of pulse seed minikits, production incentives to farmers/seed societies and public sector seed production agencies had the requisite impetus in record production of pulses.
- Decentralized planning of the government also prompted the states to fetch further funding support on pulses development programmes. The Andhra Pradesh initiated procurement and supplied minikits at 75 per cent subsidy and promoted inter-cropping of redgram in 4.8 million hectare with groundnut and cotton; Jharkhand, Karnataka, Odisha, Telangana, Uttar Pradesh and Maharashtra distributed mini dal mills to support processing & value addition.
- Mechanization, line sowing, strengthening of irrigation infrastructure under RKVY and NFSM in convergence with MIS (drip/sprinkler/water carrying pipes) etc played a critical role in harvest of higher yields. Critical irrigation support was provided through NFSM and PMKSY and 20 per cent of total pulse area brought in the ambit of irrigation.
- Large scale technological demonstrations through cluster frontline demonstrations (CFLDs) by ICAR/ATARI in thematic areas (line sowing, BBF, INM, IPM; seed treatment FIR etc.) coupled with capacity building/training activities under CSBT, proved effective. ICAR-IIPR and AICRPs also undertook such demonstrations.
- Promising state specific varieties were promoted along-with adoption of good agricultural practices and they played a major role, these include:
- The high yielding varieties GNG 1581, JG 11, JG 63, JG 130, JG 14, JAKI 9218 and Vijay in chickpea; BDN 711, TJT 501, BSMR 736, Maruti, Bahar, Narendra Arhar-1, Asha in pigeonpea; MH

421, SML 668, IMP 2-3, GM-4, HUM 16, IPL 2-14, Pant Mung 5 and PDM 139 in mungbean; PU 30, PU 31, IPU 02-43, KU 96-3, TAU-1, LBG-752, Uttara and KU-300 of urdbean; Pant L-8, Pant L-7, Pant L-6, JL-3, HUL 57, WBL 77 and K 75 and HUDP 15, Prakash, KPMR-400, KPMR 522, Vikas, Aman and Adarsh under Field pea significantly contributed to harvest the highest production.

- Such impressive achievements not with standing, there still remains large untapped yield potential reservoir, which can be gainfully harvested. A gap between the potential yield that can be achieved at farmer's field level and what they actually get is very wide. Bridging this yield gap offers an opportunity to produce more even by using the existing technologies.
- To meet the domestic demand of pulse requirement and ensure self-sufficiency in pulses, a sustainable production and productivity approach has to be maintained by deploying multi-pronged short-term and long-term strategies. Imports can help tide over supply deficits in the short term. In the long run measures would need to focus on sustainable production system with increased productivity envisaging public capital formation in irrigation, quality seeds of promising varieties and their availability to meet a minimum 33% SRR, research and efficient use of water, plant nutrition and other necessary inputs including the remunerative prices to the farmers.
- Policy initiatives must lead to efficient domestic production and help maintain balance between domestic production and demand. If potential yield levels are achieved, then increasing demand in the country can be met in future.
- The new initiative of ensuring that farmers get their entitlements rightly through Direct Benefit Transfer (DBT) under Crops Development Programme (NFSM-Pulses) will also help. The assistance towards critical inputs was transferred into the accounts of the beneficiaries belonging to SCP/TSP/Woman /SMF Categories. A large section of farmers/pulse growers are happy with the DBT and the assistance provided is getting utilized more effectively.
- During the 3 years of programme implementation i.e. 2016-17 to 2018-19 there has been substantial growth in production and productivity of pulses with the support and extension work taken-up by both central and state governments. The results demonstrate the effectiveness of policy interventions.

Chapter-1

GARNERING DEMOGRAPHIC DIVIDEND IN AGRICULTURE

- Demographic dividend refers to the rise in the rate of economic growth due to rising share of working age people in a population. India's demographic dividend- i.e. its working-age (15-59 years) population, largely consisting of youth between 15-34 years of age, provide an inherent edge and potential to its economy to grow much faster than that of most other countries, including neighbouring China.
- India is the second most populous country in the world with >1/6th of the world's population. The size of population changed from 102 crore in 2001 to 121 crore in 2011, the exponential population growth rate being 1.64 during 2001 to 2011. Although, India occupies only 2.2 per cent of the world's land area, it supports approx 18 per cent of the world's population.
- The census projection report has further revealed that the proportion of the working age population between 15 and 59 years is likely to increase from 58 per cent in 2001 to > 64 per cent by 2021. Such a trend would make the country one of the youngest nations in the world. Thus, one of the India's competitive advantages is its demographic dividend.
- The demographic dividend has been regarded as a key factor for economic growth. The existing demographic dividend provides a great opportunity. Simultaneously, it also poses a great challenge. The growth in the working-age ratio is likely to be concentrated in the rainfed and poorest states, mainly cultivating pulses, oilseeds and rearing livestock. Here, the youth need to be supported by proper nourishment and skill development in agriculture and allied sectors.
- The future agricultural operations are likely to be highly skilled and competitive. The serious challenges to the workforce/youth of the resource poor and rainfed regions are lack of skill in scientific crop cultivation, absence of repair and maintenance of farm machineries and implements, inadequacy of quality seeds, primary processing & value addition facilities, poor infrastructure (irrigation, go downs/ware houses, trading centres) and absence of organized pulse markets etc. These have been examined by the government while formulating the strategy and roadmap to increase the production of pulses.
- According to the Human Development Report (HDR) published by the United Nations Development Programme (UNDP), India is still in the medium human development category with countries like China, Sri Lanka, Thailand, Philippines, Egypt, Indonesia, South Africa, and Vietnam. Therefore health and education parameters need to be improved substantially to make the Indian workforce efficient and skilled. At the primary level, there are serious problems of health and nutrition that impact the effectiveness of education, learning capacity etc.
- The poor nutritional status of the population is a major challenge. The government is responding by adopting nutrition-sensitive agriculture interventions, focusing on pulse crops having multiple nutritional values with essential source of vitamins, micro-nutrient and protein. Pulse crops are well suited to promoting both nutritional security of the population and climate resilient agriculture, which is highly relevant in the context of climate change implications.
- Focus on pulses production and consumption can help overcome malnutrition: India should include pulses in the public distribution system
- India, a country with high concentrations of poor and malnourished people, has for long promoted a cereal-centric diet composed of subsidized staples such as rice and wheat. Today, however, dietary

patterns are changing. Policy makers, researchers, and health activists are looking for ways to fight malnutrition in the country and not just hunger. As attention is shifted from calorie intake to nutrition, neglected foods such as pulses (the dried, edible seeds of legumes) are gaining popularity. There are three kinds of hunger that need to be dealt with – calorie inadequacy, protein deficiency and micronutrient deficiency.

The Global Nutrition Report 2017

- India is facing a serious burden of under-nutrition, according to a global report which shows that more than half the women of reproductive age in the country suffer from anaemia. The significant burdens of three important forms of malnutrition, used as an indicator of broader trends are i.) childhood stunting-38 per cent of children under five are affected by stunting, which means the children are too short for their age due to lack of nutrients, suffering irreversible damage to brain capacity , ii.) anaemia in women of reproductive age; and iii.) over weight adult women.
- About 21 per cent of children under 5 are defined as 'wasted' or 'severely wasted'—meaning they do not weigh enough for their height.
- Over half of women of reproductive age—51 per cent — suffer from anemia— a serious condition that can have long-term health impacts for mother and child.
- More than 22 per cent of adult women are overweight, a rising concern as women are disproportionately affected by the global obesity epidemic.
- While the country has shown some progress in addressing under-5 stunting, it has made no progress or presents worse outcomes in the percentage of reproductive-age women with anemia, and is of course in terms of reaching targets for reducing adult obesity and diabetes, the report said.
- The Global Nutrition Report, highlights that the double burden of under-nutrition and obesity needs to be tackled as part of India's national nutrition strategy.
- The Global Nutrition Report, 2017 calls for nutrition to be placed at the heart of efforts to end poverty, fight disease, raise educational standards and tackle climate change. A well-nourished child is more likely to escape poverty by a factor of one third. They will learn better in school, be healthier and grow into productive contributors to their economies. Good nutrition provides the brainpower, the 'grey matter infrastructure' to build the economies of the future,"
- With one of the highest rates of child malnutrition in the world, the issue needs priority attention and time bound action. Although India has witnessed significant progress in its battle against child malnutrition over the past decade, the progress has been quite uneven, and child malnutrition rates still remain high in many parts of the country. Hence regional focus is essential.
- As in the case of adult nutrition under rates, districts with the highest levels of under nutrition seem to be clustered largely in the central parts of the country. The bottom quartile of districts ranked according to child malnutrition rates includes not just districts from the most deprived tribal belts of central and eastern India, but also some of the more urbanized districts of the country such as Udaipur in Rajasthan, Aurangabad in Maharashtra, Lucknow in Uttar Pradesh, Patna in Bihar, and Ranchi in Jharkhand. However, overall urban child malnutrition rates are lower than that of rural India.
- In recent years, there have been several government initiative to impart skill to the Indian workforce to reap the benefits of demographic dividend and to make them employable for a productive job and income. The National Skill Development Corporation India (NSDC) targets to contribute significantly (about 30 per cent) to the overall target of skilling / up-skilling 500 million people in India by 2022, mainly by fostering private sector initiatives in skill development programmes and providing funding.

Chapter-2

PULSES IN INDIAN CONTEXT

Background

- The Food Security Act-2013 mandatorily envisages the right to nutritional security as well. To ensure access to adequate quantity of quality food at affordable prices to each individual, as per FSA-2013, is government's top priority.
- Pulses are an important group of food crops that can play a vital role to address national food and nutritional security and also tackle environmental challenges. The share of pulses to total food grain basket is around 9-10 per cent and is a critical and inexpensive source of plant-based proteins, vitamins and minerals. Pulses are critical in food basket (dal-roti, dal-chawal), are a rich source of protein (@20-25 per cent, it is double the protein content of wheat and thrice that of rice) and help address obesity, diabetes malnutrition etc. Pulse-wise nutritional status is given in Table-2.1.

(Table–2.1): Nutritional label of various pulses *(Unit– mg/100 g)*

Name of foodstuff	Gram	Urd	Mung	Kulthi	Lentil	Pea	Tur	Moth	Khesari	Cowpea
Protein (%)	20	24	25	22	25	22	22	25	31	23
Vit. A (I.U.)	316	64	83	119	450	31	220	16	200	60
Vit. C	3			1				2		
Vit. K	0.29	0.19	-	-	0.25	-	-	-		
Thiamine	0.3	0.41	0.72	0.42	0.45	0.47	0.45	0.45	0.39	0.5
Ribo-flavin	0.51	0.37	0.15	0.2	0.49	0.21	0.51	0.09	0.41	0.48
Nicotinic-acid	2.1	2	2.4	1.5	1.5	3.5	2.6	1.5	2.2	1.3
Biotin (g/100g)	10	7.5	-	-	13.2	-	7.6	-	7.5	202
Choline	194	206	-	-	299	-	183	-	-	-
Folic-acid (g/100g)	125	144	-	-	107	-	83	-	100	-
Inositol	240	90	-	-	130	-	100	-	140	-
Pantothenic-acid	1.3	3.5	-	-	1.6	-	1.5	-	2.6	-
Total No. of Vitamins/Minerals	**12**	**11**	**5**	**6**	**11**	**5**	**10**	**6**	**9**	**6**

- In India, pulses are generally produced in poor soils not suited to other crops, with a minimum use of resources and have a very low water footprint. They are vital constituent of cropping and consumption pattern. Of the total net sown area of 141.40 million hectares, 52 per cent i.e. 73.20 million hectares is rainfed. The pulse cultivation occupies major area under this ecology. The rainfed regions of the country support 40 per cent of human population and 2/3rd of livestock. As high as 90% of nutri-cereals (millets), 80% pulses, 74% oilseeds, 65% cotton and 48% rice crops are rainfed.
- Pulses play a greater role in sustaining the economy of the rainfed farming community in a variety of ways. Besides improving soil fertility and physical structure, pulses fit well in mixed/inter-cropping systems, crop rotation and dry farming, provide green vegetable (pods/beans) and nutritious fodder for cattle as well thereby contributing to a more sustainable

food system. Cultivation of pulses builds-up a mechanism to fix atmospheric nitrogen to N-compounds in their root nodules and tend to fix 72 to 350 kg N per ha per year, thereby meeting their own nitrogen requirements to a great extent. The cultivation of the pulses under irrigation is only about 20% of their cropped area, with remaining 80% are being grown under rainfed conditions. Gram with 35% area under irrigation is the highest pulse crop followed by other pulses crop within <10% irrigated area.

- In addition to their nutritive value, by virtue of broad genetic diversity in food legumes and climate resilience to sustain well in adverse weather situations, the Government of India is also targeting to address agrarian challenges by adopting an income based agriculture. The goal is to double farmers' income by 2022.

India's status of pulse production

- The total world acreage under pulses is about 85.40 (Mha) with production of 87.40 (Mt) at 1023 kg/ha yields level. India, with >29 Mha pulses cultivation area, is the largest pulse producing country in the world. It ranks first in area and production with 34 per cent and 26 per cent respectively. During 2017-18 the country's productivity at 835 kg/ha, is a significant increase over Eleventh (662 kg/ha) and Twelfth plans (745 kg/ha).
- Thanks to pro-active pulse programme implementation strategies and robust monitoring mechanism of DAC&FW significant growth in area, production and productivity of pulses has been recorded in the XIIth Plan (2012-13 to 2016-17), especially during the last 03 years of this Plan period, despite two consecutive drought years of 2014-15 & 2015-16. More visible and significant increasing trends during 2016-17 and 2017-18, whereby the pulses production reached at 23 Mt and 25.23 Mt respectively, is a success story in itself. The productivity of pulses has increased by 13 per cent to reach 841 kg/ha during 2017-18 from the level of 743 kg/ha during 2014-15. The production growth has been (43 per cent) and is the highest.

Share of pulses in total foodgrain basket

- In India foodgrains occupy 65 per cent of total gross cropped area comprising cereals in 50% and pulses in about 15%. Within pulses, gram occupies 5% area followed by urad 3%, arhar 2% and mung 2%. Other pulses cover about 3% of gross cropped area.
- Percent share of pulses to total foodgrain production basket stagnated between 6-7 percent uptill 2015-16 after the Green Revolution period (1960-70). The area also remained stagnant between 22-24 Mha i.e. 19 per cent of total foodgrain area till this period.
- Deceleration of percent production contribution of pulses to total foodgrains basket prompted the Ministry of Agriculture & FW to adopt and pursue vigorously NFSM-Pulses with a bouquet of interventions, viz, Research & Development, procurement, marketing, and import-export policies etc.
- The multi-pronged strategy of the government to protect the interest of farmers and the consumers has resulted into enhanced percent contribution of about 9 per cent pulses to total foodgrains during 2017-18 from the earlier 6-7 percent till 2015-16. This is the ever highest after 1980-81. The year wise production of foodgrains and contribution of pulses to total foodgrains basket is depicted in Table-2.2.

(Table–2.2): Contribution of pulses to food grains basket

{Area- Million ha, Production- Million Tones, Yield- kg/ha}

Year	Pulses			Food grains			Pulses share to foodgrains (%)	
	A	P	Y	A	P	Y	A	P
1950-51	19.09	8.41	441	97.32	50.82	522	19.62	16.55
1960-61	23.56	12.70	539	115.58	82.02	710	20.38	15.48
1970-71	22.54	11.82	524	124.32	108.42	872	18.13	10.90
1980-81	22.46	10.63	473	126.67	129.59	1023	17.73	8.20
1990-91	37.25	20.36	547	140.83	182.49	1300	26.45	11.16
2000-01	20.35	11.08	544	121.05	196.81	1626	16.81	5.63
2010-11	26.40	18.24	691	126.67	244.49	1930	20.84	7.46
2011-12	24.46	17.09	699	124.76	259.32	2079	19.61	6.59
2012-13	23.25	18.34	789	120.77	257.12	2129	19.25	7.13
2013-14	25.21	19.25	764	125.04	265.04	2120	20.16	7.26
2014-15	23.10	17.16	743	122.07	252.67	2069	18.92	6.79
2015-16	24.91	16.35	656	123.22	251.57	2042	20.22	6.50
2016-17	29.44	23.13	786	129.23	275.11	2129	22.78	8.40
2017-18*	29.36	24.51	835	126.98	279.51	2201	23.12	8.77

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrd Adv. Est.*

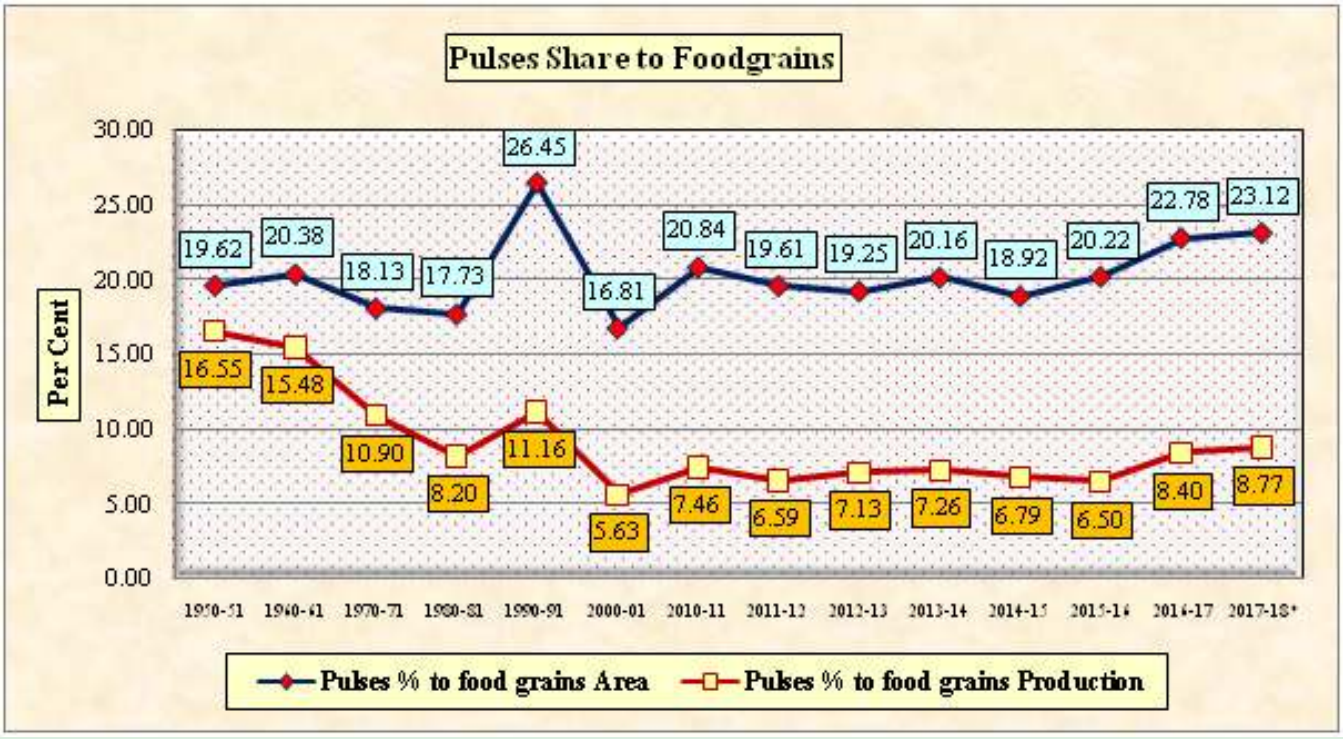


Fig-2.1: *Contribution of Pulses to Foodgrains Basket*

Season & crop contribution in total pulse production (2017-18)

- Under individual crop category, gram with 46 per cent production share in total pulses is the highest contributor followed by tur (17 per cent), urad (>13%) and mung (8%). The crop-wise APY and per cent share to total pulses is given below (Table-2.3).

(Table -2.3): Crop contribution to total pulse production

{Area-lakh ha, Production-lakh tons, Yield-kg/ha}

Crop	2017-18			Contribution (%)	
	Area	Production	Yield	Area	Production
Gram	105.73	111.58	1056	36.01	45.53
Tur	44.59	41.80	937	15.19	17.06
Urd	50.31	32.84	653	17.13	13.40
Mung	40.70	19.01	467	13.86	7.76
Other Kharif Pulses	18.74	7.99	426	6.38	3.26
Other Rabi Pulses	33.53	31.83	903	11.42	12.99
Total Kharif Pulses	**137.60**	**90.06**	**654**	**46.87**	**36.75**
Total Rabi Pulses	**156.00**	**155.00**	**994**	**53.13**	**63.25**
Total	**293.60**	**245.06**	**835**		

Source: DES, Ministry of Agri. & FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*
OKP – other kharif pulses, ORP – other rabi pulses

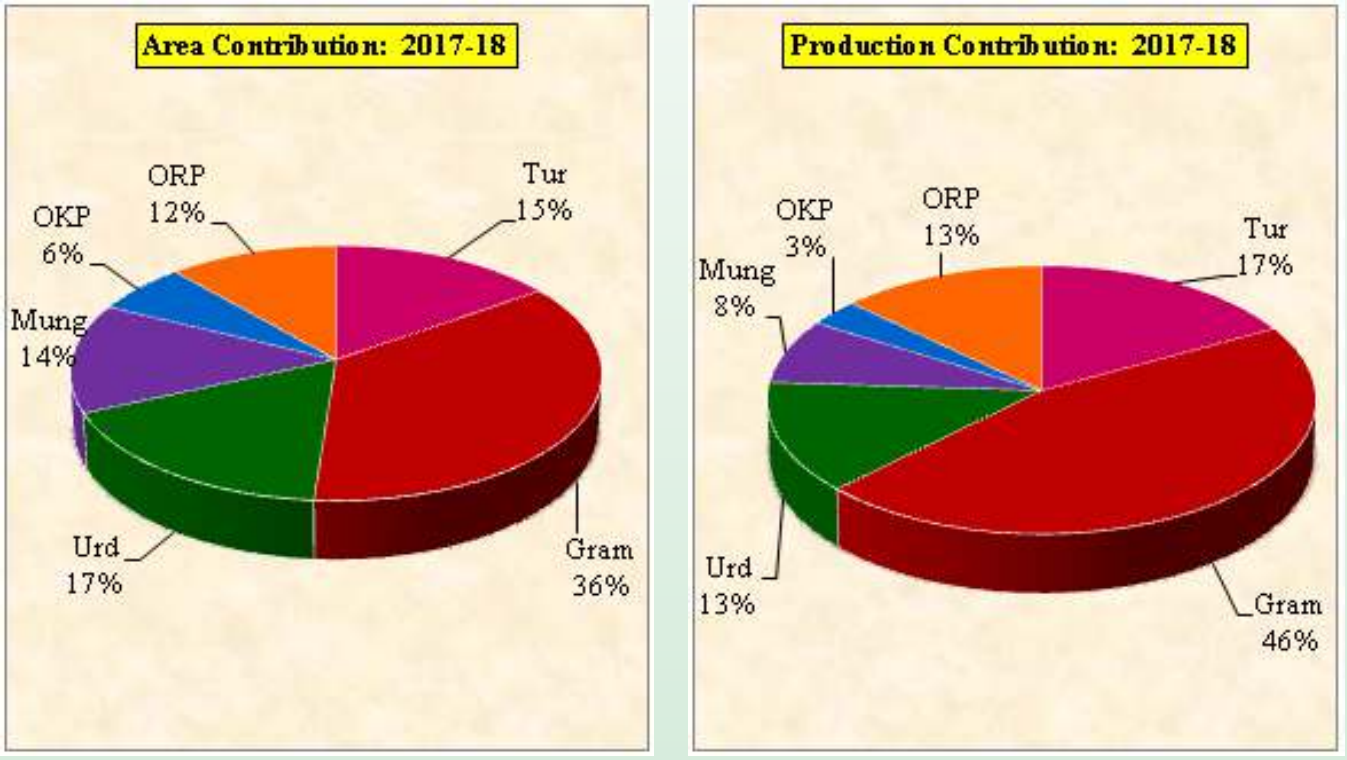


Fig-2.2: Crop contribution in Total Pulses

State-wise contribution in the year 2017-18

Total Pulses

- In India, total pulse area and production during 2017-18 has been >293 lakh hectares (Lha) and 245 lack tonnes (Lt) respectively. Out of the total area, >73 Lha is in Madhya Pradesh alone, earning a prime status in pulse production commodity registering a remarkable 25% of the country's pulse area with 33% production, thereby ranking first both in area and production. This is followed by Rajasthan in respect of area (16 per cent) and Maharashtra in case of total production (13 per cent).
- Compared to normal production, the estimated production during 2017-18 is 30% higher in case of total pulses, 32% gram, 27% arhar, 58% uradbean, 18% mungbean and 40% higher lentil production.
- More than 90 per cent of total pulse production has been the contribution of 10 states namely, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, Andhra Pradesh, Gujarat, Jharkhand, Tamil Nadu and Telangana.

(Table-2.4): States' Contribution in Area & Production – Total Pulses (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	73.23	25	Madhya Pradesh	80.38	33
Rajasthan	48.19	16	Maharashtra	32.65	13
Maharashtra	43.50	15	Rajasthan	29.78	12
Karnataka	31.13	11	Uttar Pradesh	22.34	9
Uttar Pradesh	23.61	8	Karnataka	18.52	8
Andhra Pradesh	13.69	5	Andhra Pradesh	12.36	5
Gujarat	9.06	3	Gujarat	9.03	4
Tamil Nadu	8.16	3	Jharkhand	7.95	3
Chhattisgarh	8.14	3	Tamilnadu	5.72	2
Jharkhand	7.94	3	Telengana	5.19	2
Others	26.97	9	Others	21.14	9
All India	**293.62**		**All India**	**245.06**	

Source: DES, Ministry of Agri. & FW (DAC&FW), Govt. of India; 2017-18- IIIrd Adv. Est.*

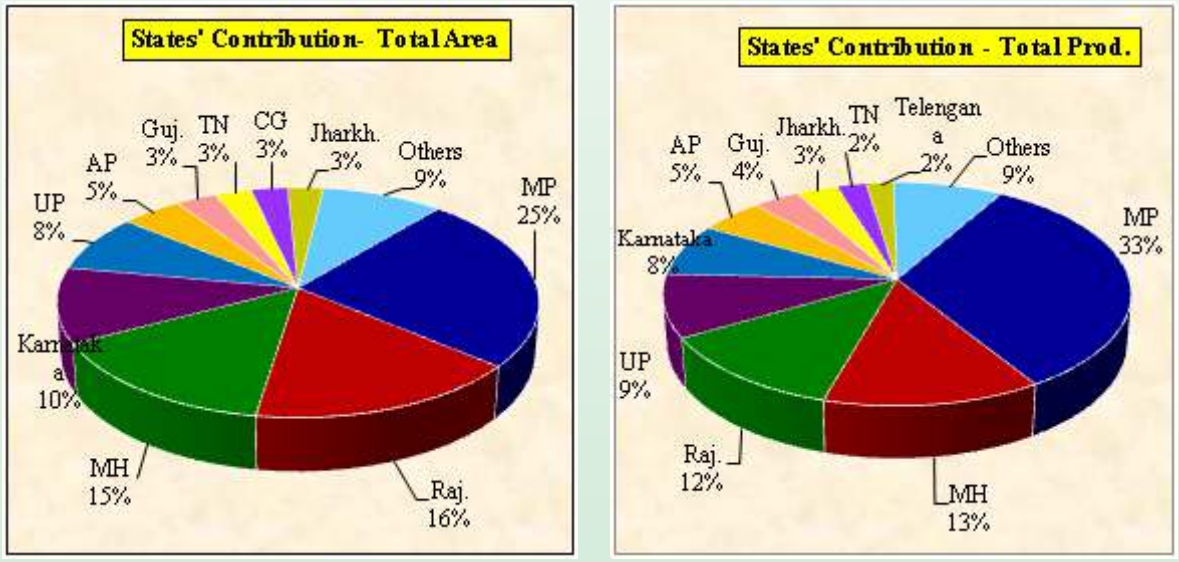


Fig-2.3: States' Contribution in Area & Production – Total Pulses (2017-18)

Kharif Pulses

- The total area coverage and production of Kharif pulses during 2017-18 has been 138 Lha and 90 Lt respectively. Madhya Pradesh outshined with first rank in production with >25 per cent production followed by Rajasthan and Maharashtra with 16% each and Karnataka at 11%.
- More than 90 per cent of total kharif production was realized from 10 states of MP, Rajasthan, Karnataka, Uttar Pradesh, Gujarat, Jharkhand, Telangana and Odisha. (Table-2.5)

(Table-2.5): States' Contribution in Area & Production– Kharif Pulses (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Prod.	% Contri.
Rajasthan	34.10	24.77	Madhya Pradesh	22.82	25.33
Madhya Pradesh	26.80	19.47	Rajasthan	14.55	16.15
Maharashtra	22.47	16.33	Maharashtra	14.53	16.13
Karnataka	16.01	11.63	Karnataka	9.66	10.73
Uttar Pradesh	8.92	6.48	Uttar Pradesh	6.04	6.71
Gujarat	5.60	4.07	Gujarat	5.08	5.64
Telengana	4.57	3.32	Jharkhand	4.11	4.56
Jharkhand	4.12	2.99	Telengana	3.51	3.90
Odisha	3.86	2.80	Odisha	2.37	2.63
Andhra Pradesh	3.66	2.66	Andhra Pradesh	1.81	2.01
Others	7.56	5.49	Others	5.60	6.22
All India	**137.66**		**All India**	**90.07**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India,; 2017-18-IIIrdAdv. Est.*

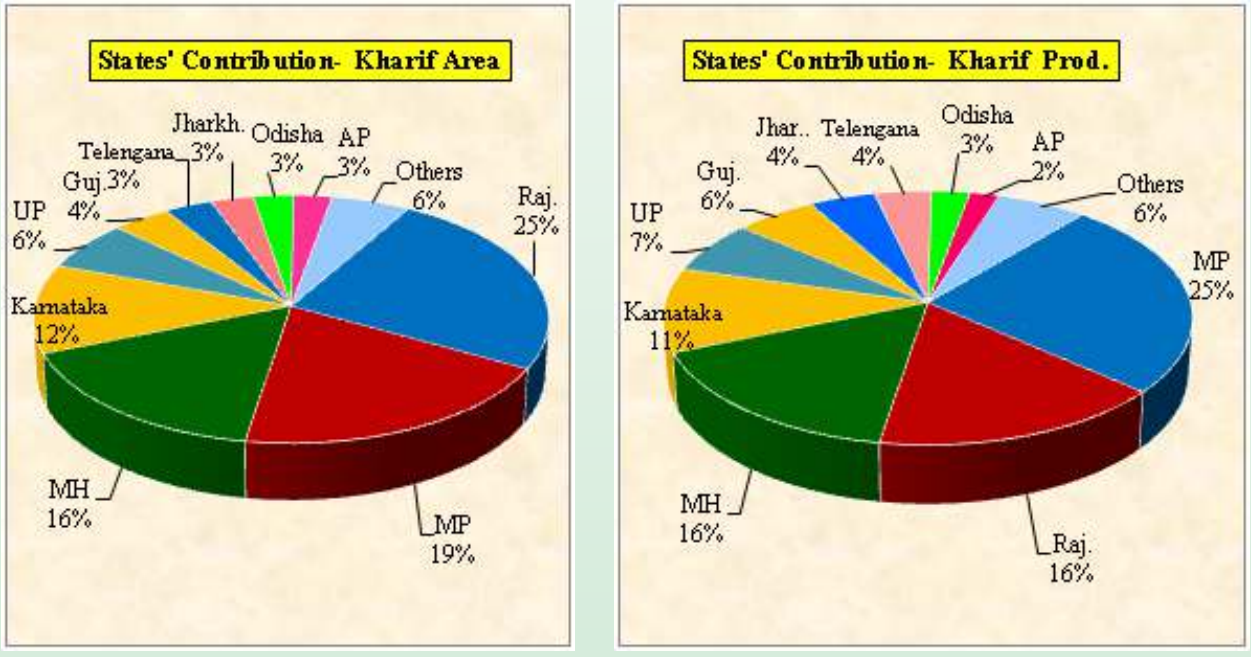


Fig-2.4: States' Contribution in Area & Production– Kharif Pulses (2017-18)

KHARIF PULSES

Mothbean

Horsegram

Cowpea

Rabi Pulses

- All India Rabi pulse acreage was 150 Lha and production was 154 Lt. Madhya Pradesh with 30 per cent of area and 37 per cent of total rabi pulse production in the country ranked first among the states.
- More than 90 per cent pulse production was recorded from 10 states of MP, MS, UP, Rajasthan, AP, Karnataka, TN, Gujarat, Jharkhand and Bihar (Table-2.6).

(Table-2.6): States' Contribution in Area & Production- Rabi Pulses (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	46.43	29.77	Madhya Pradesh	57.56	37.14
Maharashtra	21.03	13.48	Maharashtra	18.12	11.69
Karnataka	15.12	9.70	Uttar Pradesh	16.30	10.52
Uttar Pradesh	14.69	9.42	Rajasthan	15.24	9.83
Rajasthan	14.10	9.04	Andhra Pradesh	10.55	6.81
Andhra Pradesh	10.03	6.43	Karnataka	8.86	5.71
Tamilnadu	5.93	3.80	Tamilnadu	3.96	2.55
Chhattisgarh	5.9	3.75	Gujarat	3.95	2.55
Bihar	4.39	2.82	Jharkhand	3.84	2.48
Jharkhand	3.82	2.45	Bihar	3.71	2.39
Others	14.56	9.34	Others	12.90	8.32
All India	**155.95**		**All India**	**154.98**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India,; 2017-18-IIIrdAdv. Est.*

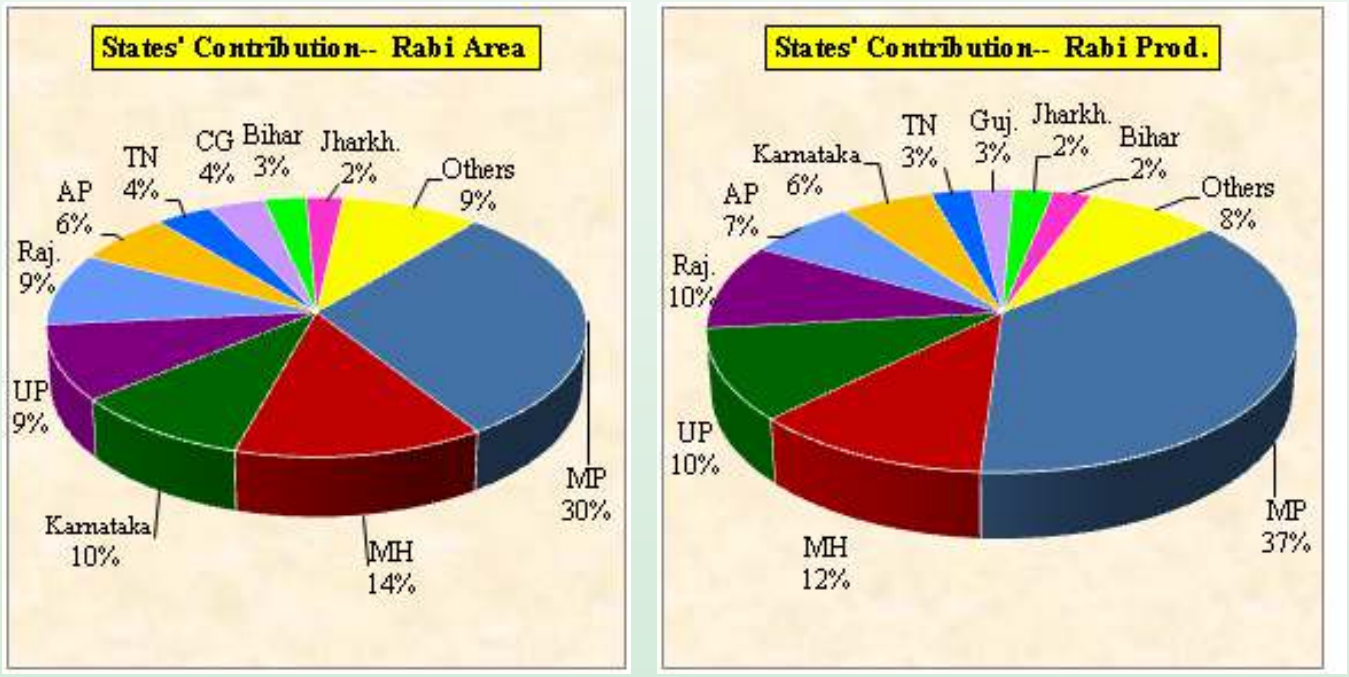


Fig-2.5: States' Contribution in Area & Production– Rabi Pulses (2017-18)

RABI PULSES

Fieldpea

Lathyrus

Rajmash

Gram (Chickpea)

- In 2017-18, chickpea was cultivated in about 106 Lha. The country harvested a record production of > 111 Lt at the ever highest productivity level of 1056 kg/ha. As usual, MP has contributed a significant 34% of the total gram area and 41% of total gram production in the country, thereby ranking first both in area and production. Maharashtra (18%) and Rajasthan (13%) were the next in terms of area.
- More than 90 per cent of gram production of the country during the period under report has been realized by 10 states of MP, MS, Rajasthan, Karnataka, UP, AP, Gujarat, Jharkhand, CG and Telangana (Table-2.7).

(Table-2.7): States' Contribution in Area & Production- Gram (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	35.90	33.95	Madhya Pradesh	45.95	41.18
Maharashtra	20.00	18.92	Maharashtra	17.61	15.78
Rajasthan	13.75	13.01	Rajasthan	14.71	13.19
Karnataka	13.75	13.00	Karnataka	8.25	7.39
Uttar Pradesh	6.11	5.78	Uttar Pradesh	6.84	6.13
Andhra Pradesh	5.21	4.93	Andhra Pradesh	6.76	6.06
Gujarat	2.95	2.79	Gujarat	3.62	3.24
Chhattisgarh	2.93	2.77	Jharkhand	2.60	2.33
Jharkhand	2.33	2.20	Chhattisgarh	2.03	1.82
Telengana	1.03	0.97	Telengana	1.50	1.34
Others	1.77	1.67	Others	1.70	1.52
All India	**105.73**		**All India**	**111.58**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

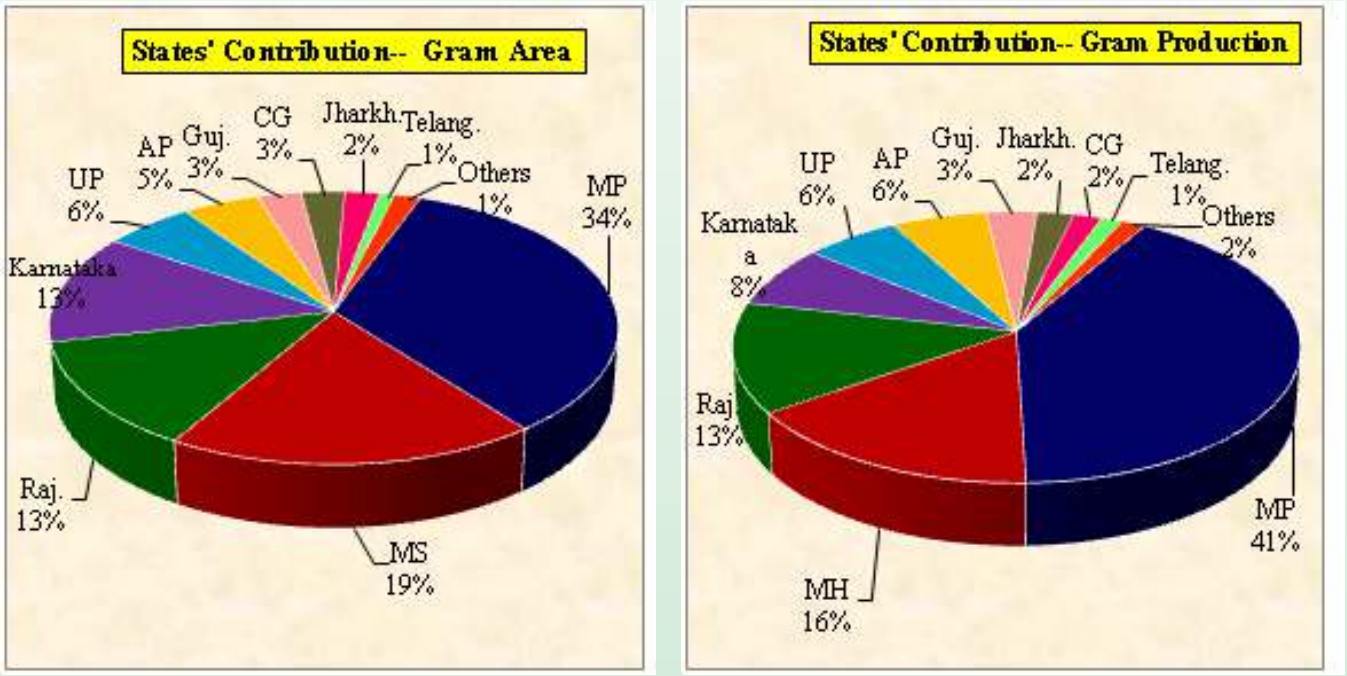


Fig-2.6: States' Contribution in Area & Production–Gram (2017-18)

GRAM PRODUCTION TECHNOLOGY

Arhar (Pigeonpea)

- The country's total area coverage and production of tur has been about 45 Lha and 42 Lt respectively. As known traditionally, Maharashtra has contributed >27 per cent of area and 25 per cent of total production during this period. With aggressive Transfer of Technology (ToT) in various thematic areas, highest ever productivity level of 937 kg/ha was achieved during 2017-18 (Table-2.8).
- More than 80 per cent of arhar production of the country during the period under report has been realized from 10 states of MS, MP, Karnataka, Gujarat, UP, Telangana, Jharkhand, Odisha, AP and TN (Table-2.8).

(Table-2.8): States' Contribution in Area & Production – Pigeonpea (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Maharashtra	12.29	27.56	Maharashtra	10.59	25.33
Karnataka	8.85	19.85	Madhya Pradesh	8.39	20.07
Madhya Pradesh	6.47	14.51	Karnataka	7.29	17.44
Telengana	3.31	7.42	Gujarat	3.21	7.68
Uttar Pradesh	2.82	6.32	Uttar Pradesh	3.03	7.25
Andhra Pradesh	2.78	6.23	Telengana	2.64	6.32
Gujarat	2.71	6.08	Jharkhand	2.22	5.32
Jharkhand	1.94	4.34	Odisha	1.28	3.05
Odisha	1.38	3.09	Andhra Pradesh	1.18	2.82
Chhattisgarh	0.86	1.93	Tamilnadu	0.61	1.47
Others	1.19	2.67	Others	1.36	3.25
All India	**44.59**		**All India**	**41.80**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

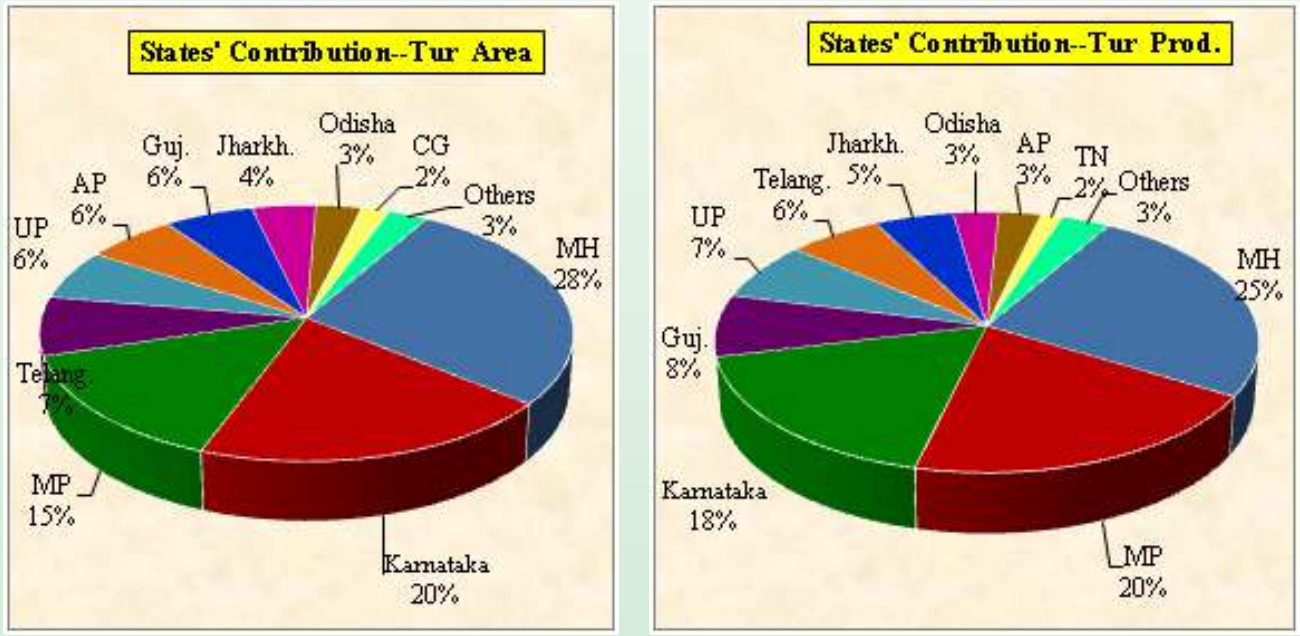


Fig.-2.7: States' Contribution in Area & Production – Arhar/Tur (2017-18)

ARHAR PRODUCTION TECHNOLOGY

Mungbean (Greengram)

- During 2017-18, the total coverage under mungbean has been about 41 Lha with a production of 19 Lt. There has been phenomenal increase in area of mungbean in the country from 2015-16 onwards. Rajasthan with >42 per cent area and 39 per cent of production outshined in the total mungbean contribution in the country during year report.
- More than 80 per cent of mungbean production comes from 10 states of Rajasthan, Madhya Pradesh, Maharashtra, Bihar, Karnataka, TN, Gujarat, Andhra Pradesh, Odisha and Telangana (Table-2.9).

(Table-2.9): States' Contribution in Area & Production – Mungbean (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Rajasthan	17.19	42.23	Rajasthan	7.42	39.06
Maharashtra	4.53	11.13	Madhya Pradesh	2.20	11.57
Karnataka	3.97	9.75	Maharashtra	1.63	8.57
Madhya Pradesh	2.97	7.30	Bihar	1.05	5.54
Odisha	2.21	5.42	Karnataka	0.96	5.05
Tamilnadu	1.85	4.55	Tamilnadu	0.95	5.02
Bihar	1.70	4.17	Gujarat	0.88	4.63
Gujarat	1.53	3.76	Andhra Pradesh	0.82	4.31
Andhra Pradesh	1.24	3.05	Odisha	0.80	4.22
Telengana	0.99	2.43	Telengana	0.65	3.42
Others	2.53	6.22	Others	1.63	8.58
All India	**40.70**		**All India**	**19.01**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

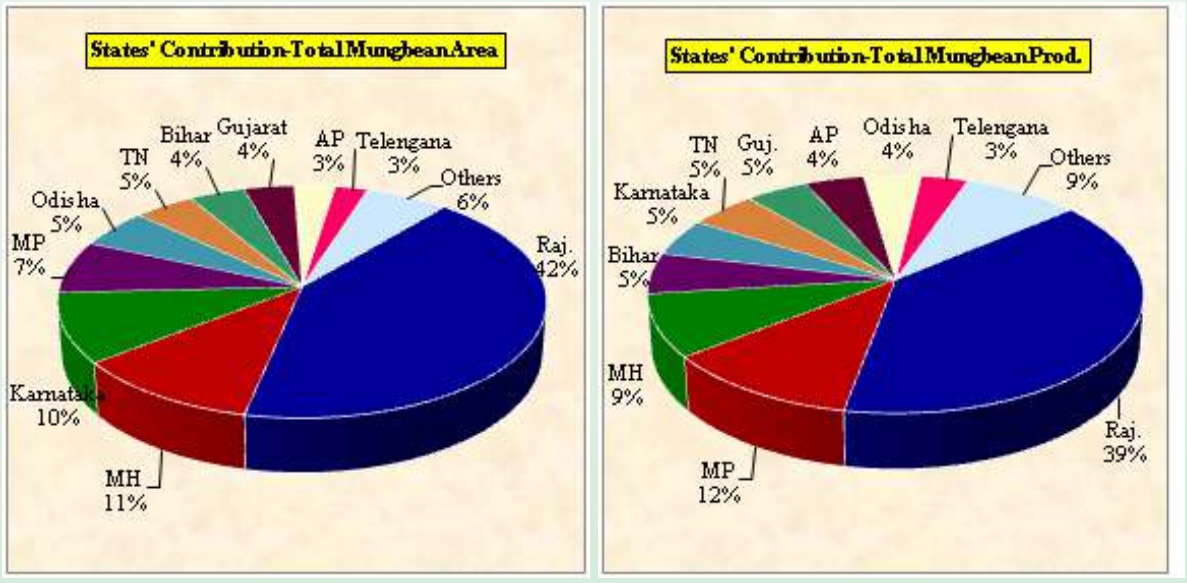


Fig.-2.8: State's Contribution in Area & Production-Mungbean (2017-18)

MUNGBEAN PRODUCTION TECHNOLOGY

Uradbean (Blackgram)

- Uradbean crop is also gaining momentum since 2015-16 and there has been phenomenal increase in its coverage. During 2017-18 the crop was cultivated over an area of > 50 Lha. The success of this crop was released with a harvest of about 35 Lt at an ever highest yield levels of 352 kg/ha.
- More than 90 per cent of uradbean production comes from 09 states of Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Maharashtra, Jharkhand, Gujarat and West Bengal. (Table-2.10)

(Table-2.10): States' Contribution in Area & Production- Urdbean (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	18.04	35.86	Madhya Pradesh	13.20	40.19
Uttar Pradesh	6.14	12.20	Rajasthan	3.37	10.26
Rajasthan	5.40	10.73	Uttar Pradesh	3.15	9.59
Maharashtra	4.84	9.62	Andhra Pradesh	3.13	9.53
Tamilnadu	4.06	8.06	Tamilnadu	3.01	9.17
Andhra Pradesh	3.81	7.57	Maharashtra	1.77	5.39
Jharkhand	1.48	2.94	Jharkhand	1.36	4.13
Karnataka	1.38	2.74	Gujarat	0.96	2.92
Gujarat	1.33	2.64	West Bengal	0.63	1.91
West Bengal	0.82	1.63	Karnataka	0.47	1.43
Others	3.02	6.00	Others	1.79	5.46
All India	**50.31**		**All India**	**32.84**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India,; 2017-18-IIIrdAdv. Est.*

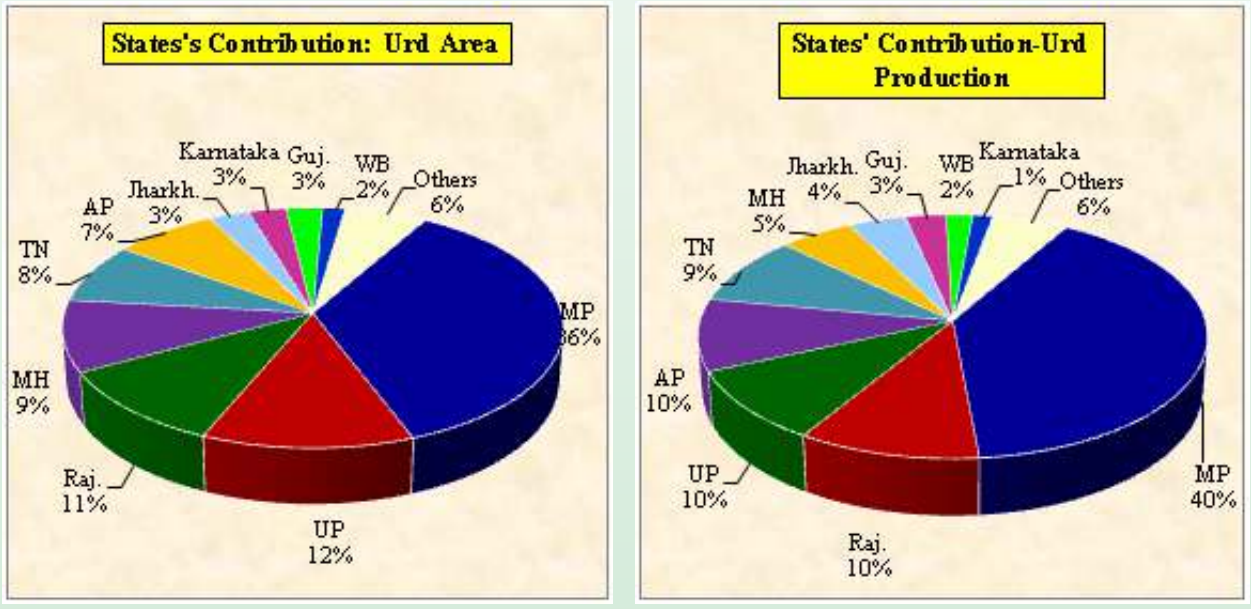


Fig.-2.9: States' Contribution in Area & Production- Urdbean (2017-18)

URDBEAN PRODUCTION TECHNOLOGY

Masoor (Lentil)

- The total area covered under lentil has been 15 Lha during 2017-18. The highest ever production of 15 Lt at 1008 kg/ha is a remarkable success.
- More than 90 per cent has been realized from 05 states of Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal and Jharkhand (Table-2.11).

(Table-2.11): States' Contribution in Area & Production-Lentil (2017-18)

(Area-Lakh ha, Production-Lakh tons)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	5.96	39.89	Madhya Pradesh	6.79	45.09
Uttar Pradesh	4.78	31.99	Uttar Pradesh	4.47	29.69
Bihar	1.50	10.03	Bihar	1.43	9.47
West Bengal	1.00	6.71	West Bengal	0.99	6.59
Jharkhand	0.69	4.65	Jharkhand	0.52	3.46
Rajasthan	0.31	2.05	Rajasthan	0.43	2.87
Assam	0.27	1.81	Assam	0.20	1.33
Chhattisgarh	0.16	1.04	Uttarakhand	0.07	0.46
Odisha	0.11	0.71	Odisha	0.06	0.38
Uttarakhand	0.10	0.67	Chhattisgarh	0.05	0.34
Others	0.07	0.44	Others	0.05	0.30
All India	**14.94**		**All India**	**15.06**	

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

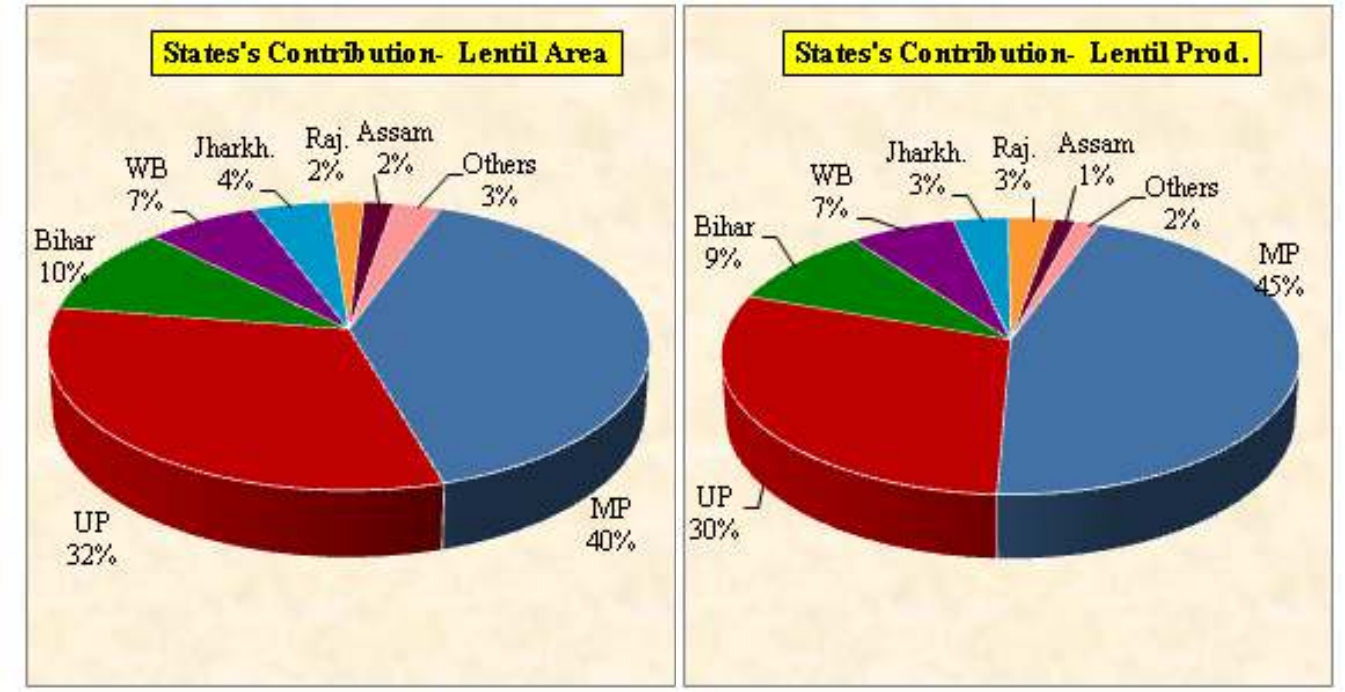


Fig.-2.10: States' Contribution in Area & Production-Lentil (2017-18)

LENTIL PRODUCTION TECHNOLOGY

Chapter-3

AREA, PRODUCTION AND YIELD TRENDS

Trend of area, production and yield

- The area, production and yield trends during 2014-15 to 2017-18 reveal an overall increasing trend in both the crop kharif and rabi crop seasons, as well as under total pulses, and more significantly during 2016-17 and 2017-18.
- It is noteworthy to record that despite two consecutive droughts/erratic mansoon year during 2014-15 to 2015-16 normal pulse area stabilization was ensured with the governmental interventions. The sustained efforts, funding support and coupled with robust monitoring at all levels ensured higher crop coverage, production and productivity during 2016-17 and 2017-18, resulting in record output of pulses.

(Table -3.1): Trend of area, production and yield of kharif, rabi & total pulses

{Area- Million ha, Production- Million tons, Yield-kg/ha}

Year	Kharif Pulses			Rabi Pulses			Total Pulses		
	A	P	Y	A	P	Y	A	P	Y
1980-81	10.41	3.76	361	12.03	6.87	571	22.46	10.63	473
1990-91	18.78	8.19	436	18.47	12.17	659	37.25	20.36	547
2000-01	10.66	4.45	417	9.67	6.61	684	20.35	11.08	544
2010-11	12.32	7.12	578	14.08	11.12	790	26.40	18.24	691
2011-12	11.19	6.06	541	13.27	11.03	831	24.46	17.09	699
2012-13	9.95	5.96	599	13.30	12.43	934	23.25	18.34	789
2013-14	10.33	6.04	585	14.89	13.26	891	25.21	19.25	764
2014-15	**10.00**	**5.78**	**578**	**13.56**	**11.42**	**843**	**23.10**	**17.16**	**743**
2015-16	**11.31**	**5.58**	**493**	**13.60**	**10.82**	**796**	**24.91**	**16.35**	**656**
2016-17	**14.36**	**9.58**	**667**	**15.08**	**13.54**	**898**	**29.44**	**23.13**	**786**
2017-18*	**13.77**	**9.01**	**654**	**15.60**	**15.50**	**994**	**29.36**	**24.51**	**835**

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

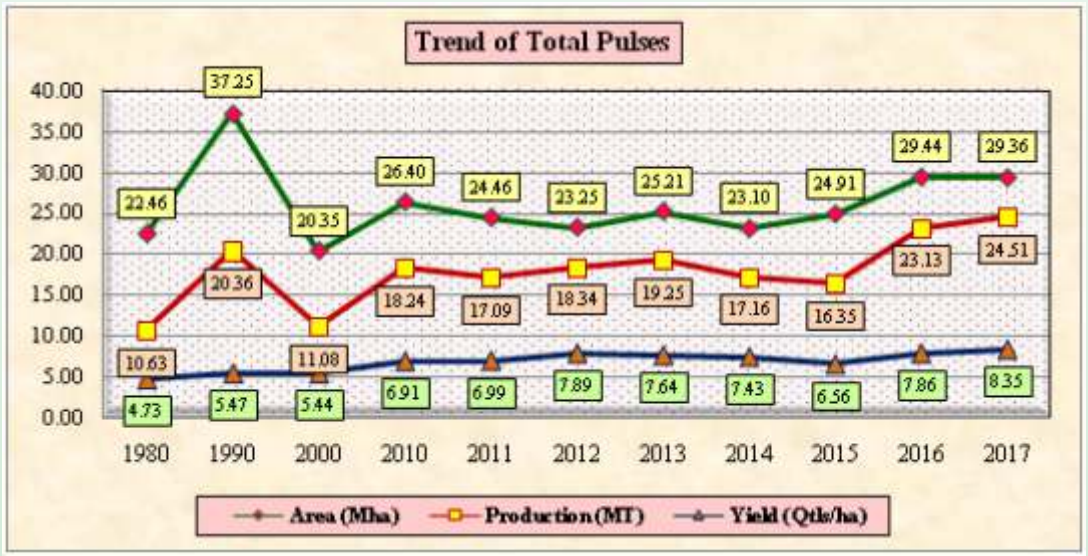


Fig.-3.1: Trend of Total Pulses

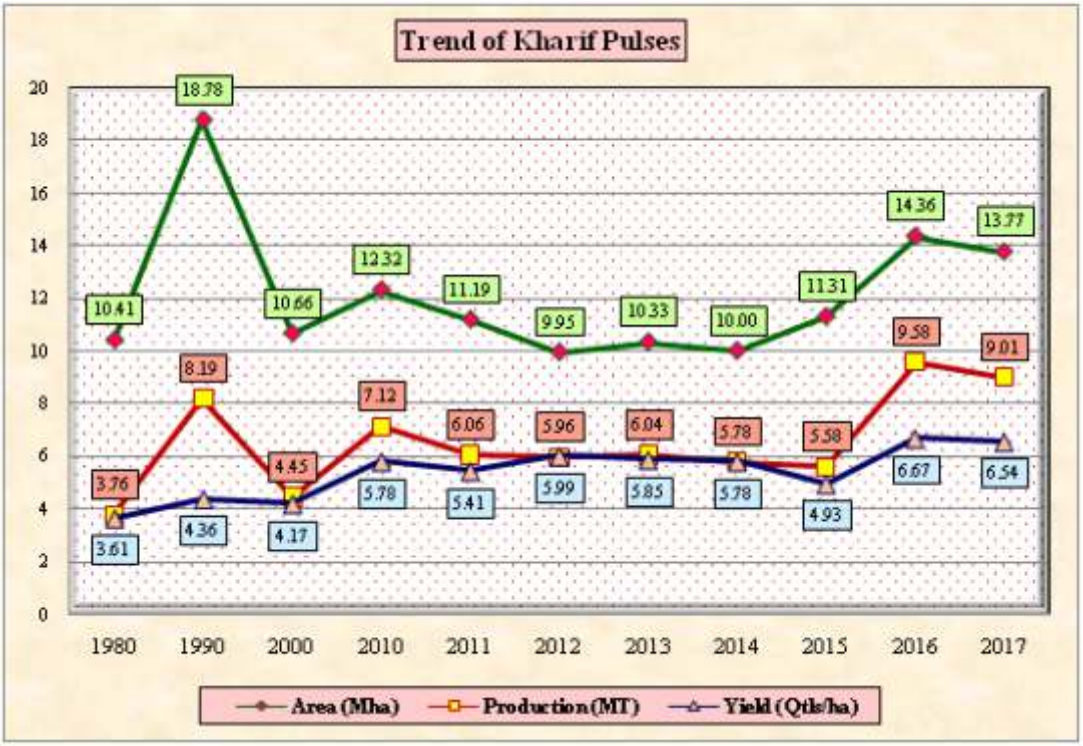


Fig.-3.2: Trend of Kharif Pulses

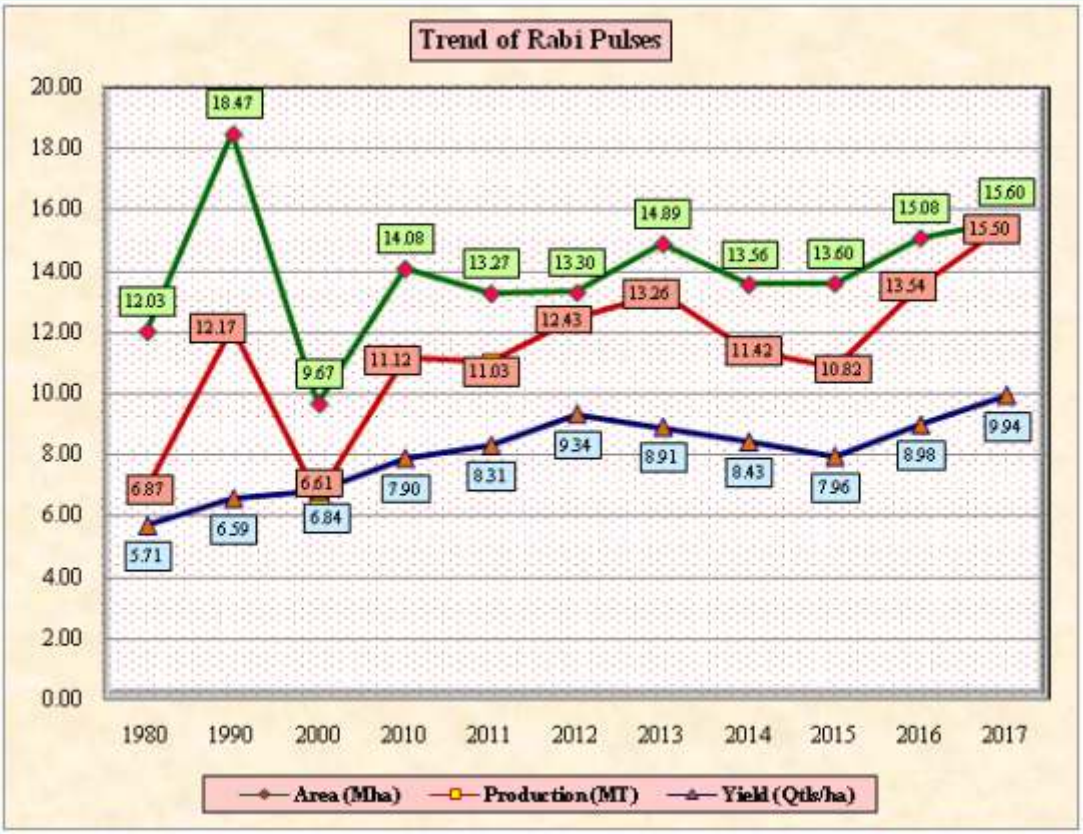


Fig.-3.3: Trend of Rabi Pulses

(Table-3.2): Crop-wise trend of area, production and yield

{Area- Million ha, Production- Million tons, Yield-kg/ha}

Crop/ Year	Gram			Tur			Mungbean			Urdbean			Lentil		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1980-81	6.58	4.33	658	2.84	1.96	690	2.84	0.98	345	2.83	0.96	339	0.93	0.47	498
1990-91	7.52	5.36	712	3.59	2.42	674	3.36	1.38	411	3.48	1.65	474	1.19	0.85	717
2000-01	5.19	3.86	744	3.63	2.25	620	3.01	1.02	339	3.01	1.3	432	1.48	0.92	619
2010-11	9.19	8.22	894	4.37	2.86	654	3.51	1.8	513	3.25	1.76	542	1.60	0.94	591
2011-12	8.30	7.70	928	4.01	2.65	661	3.39	1.63	481	3.22	1.77	550	1.56	1.06	678
2012-13	8.52	8.83	1036	3.89	3.02	776	2.72	1.19	438	3.15	1.97	625	1.42	1.13	797
2013-14	9.93	9.53	960	3.9	3.17	813	3.38	1.61	476	3.06	1.70	556	1.34	1.02	759
2014-15	8.25	7.33	888	3.85	2.81	730	3.02	1.50	497	3.25	1.96	603	1.47	1.04	705
2015-16	8.40	7.06	840	3.96	2.56	646	3.83	1.59	415	3.62	1.95	539	1.28	0.98	765
2016-17	9.63	9.38	974	5.34	4.87	912	4.33	2.17	501	4.48	2.83	632	1.46	1.22	838
2017-18*	10.57	11.16	1056	4.46	4.18	937	4.07	1.9	467	5.03	3.28	652	1.49	1.51	1008

Source: DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18- IIIrdAdv. Est.*

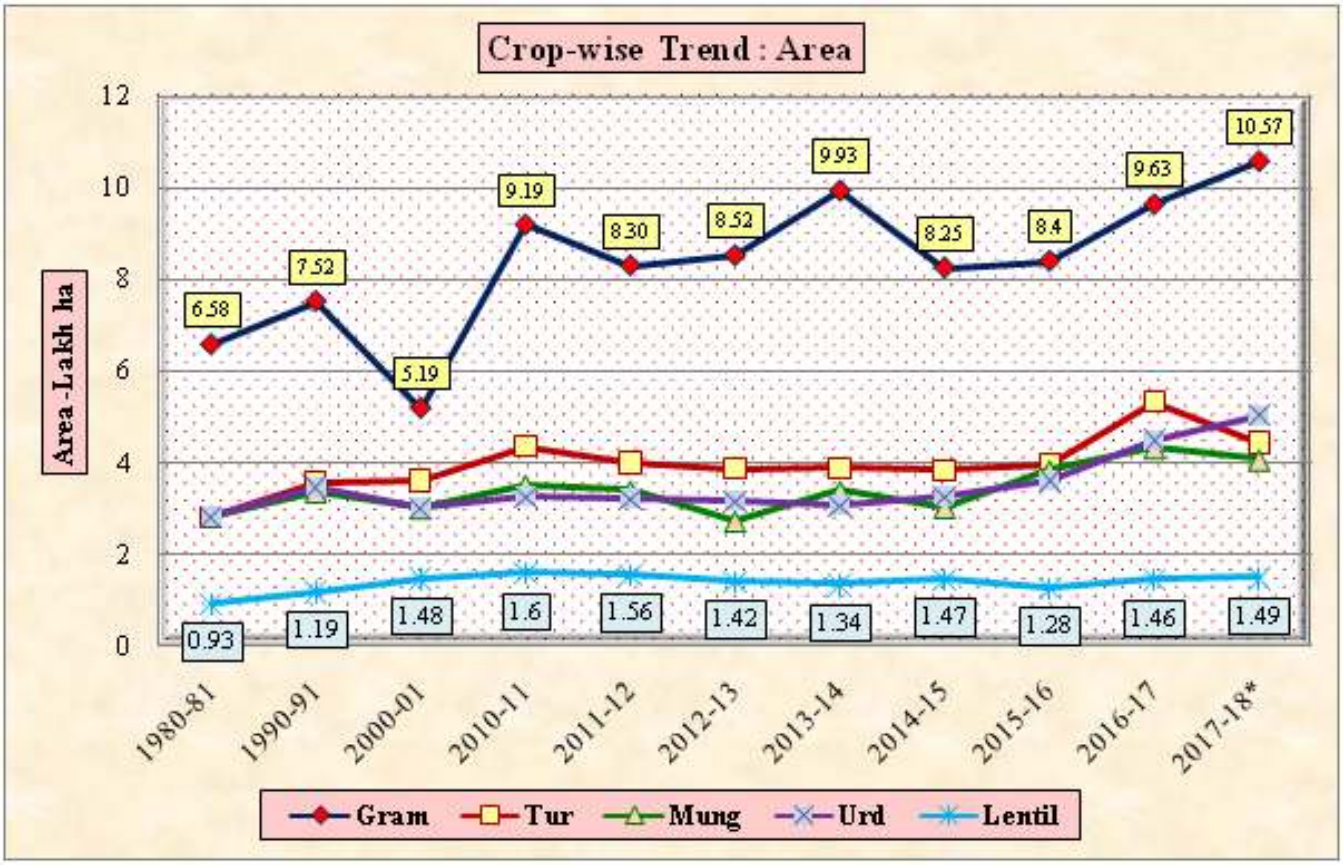


Fig.-3.4: Crop-wise trend - Area

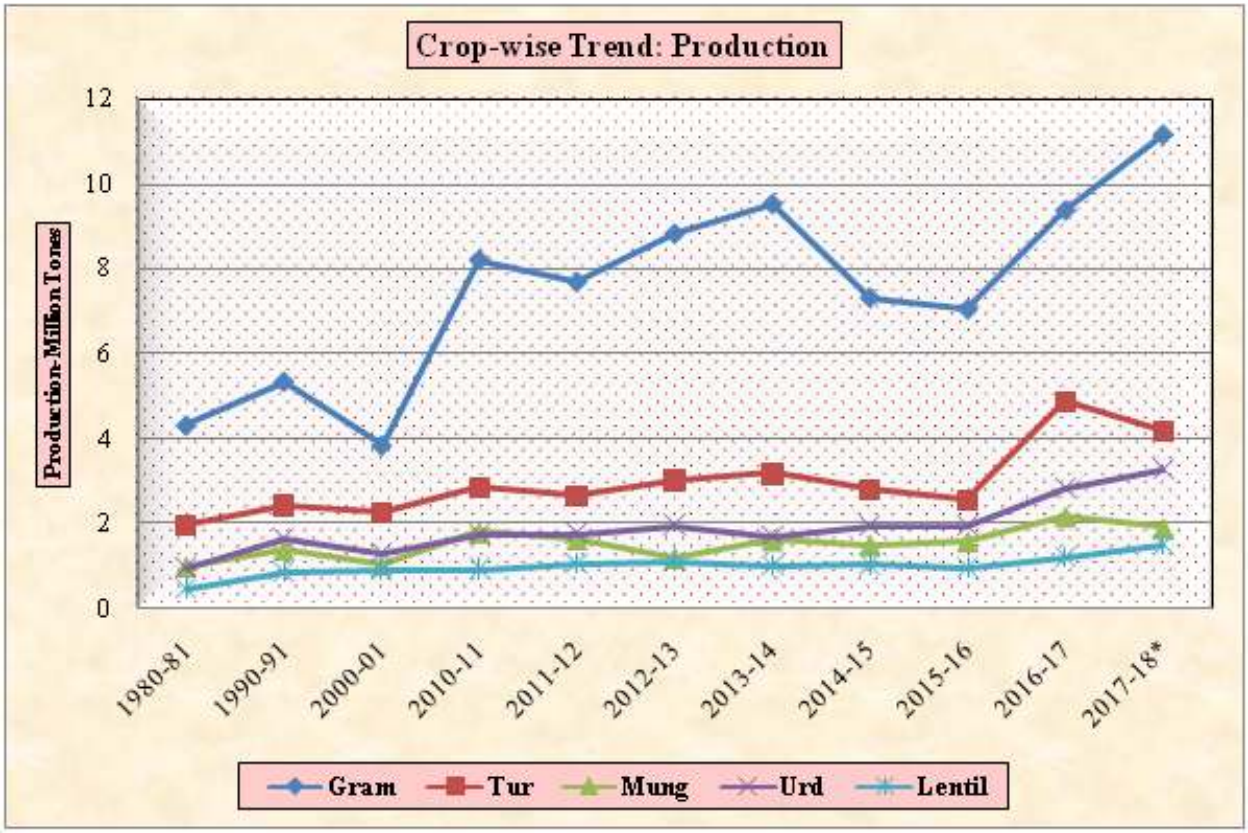


Fig.-3.5: Crop-wise trend – Production

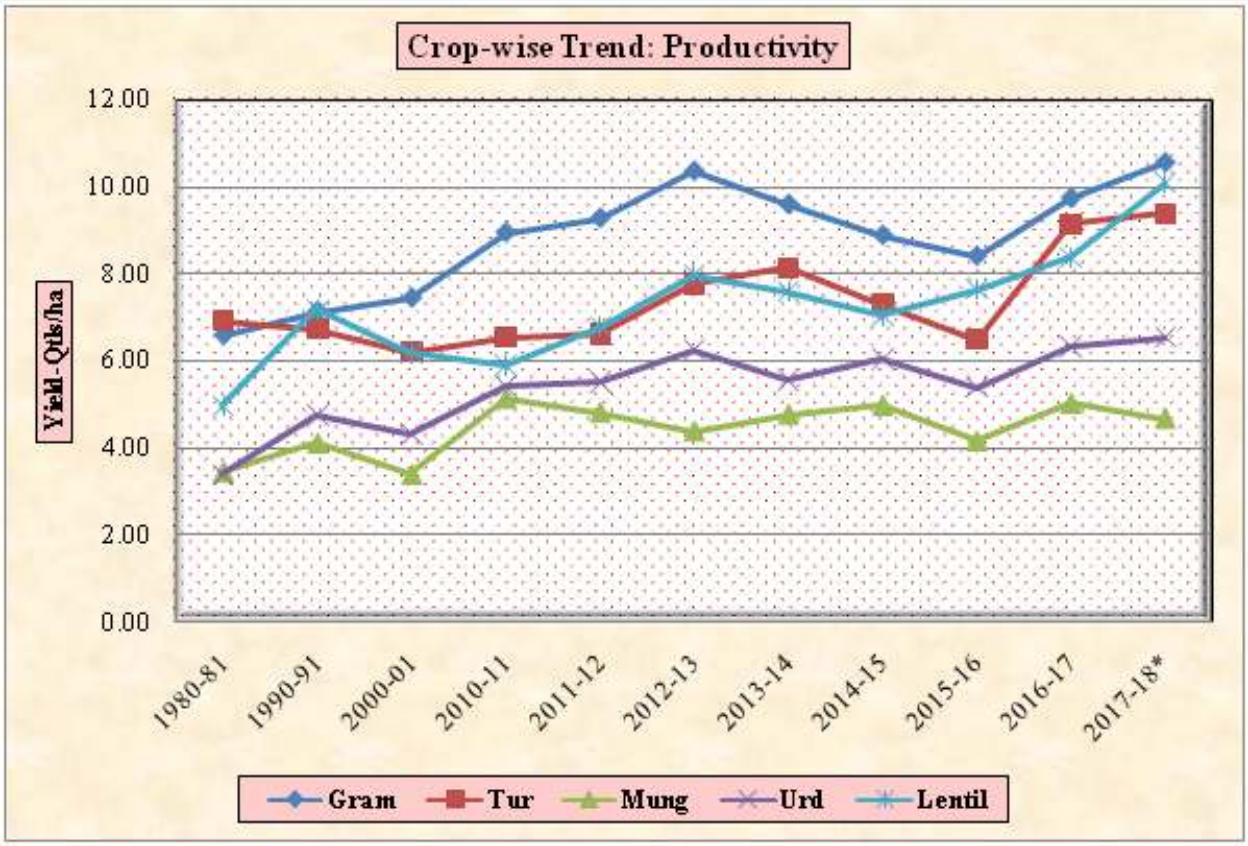


Fig.-3.6: Crop-wise trend – Productivity

A step forward to nutritional security

- Per capita availability enhanced during 2017-18. In conformity to the objective of FSA-2013 to ensure nutritional security, the per capita per day availability of pulses has risen to 53 g per head/day i.e.> 19 kg/annum/person from a low level of 41-42 g (15-16 kg/annum/person) between 1991 to 2013 (Table-3.3).

(Table- 3.3): Per capita availability of pulses in India

Year	Pulses Availability	
	per capita per day (g)	*per capita* per year (kg)
1951	60.7	22.1
1961	69.0	25.2
1971	51.2	18.7
1981	37.5	13.7
1991	41.6	15.2
2001	30.0	10.9
2011	43.0	15.7
2012	41.6	15.2
2013	43.3	15.8
2014	46.4	16.9
2015	43.8	16.0
2016	43.0	15.7
2017 (P*)	52.9	19.3

P - Provisional figures are based on IIIrd Advance Estimates of production for 2017-18,*
Source: Press Information Bureau, Ministry of Agriculture & Farmers Welfare.

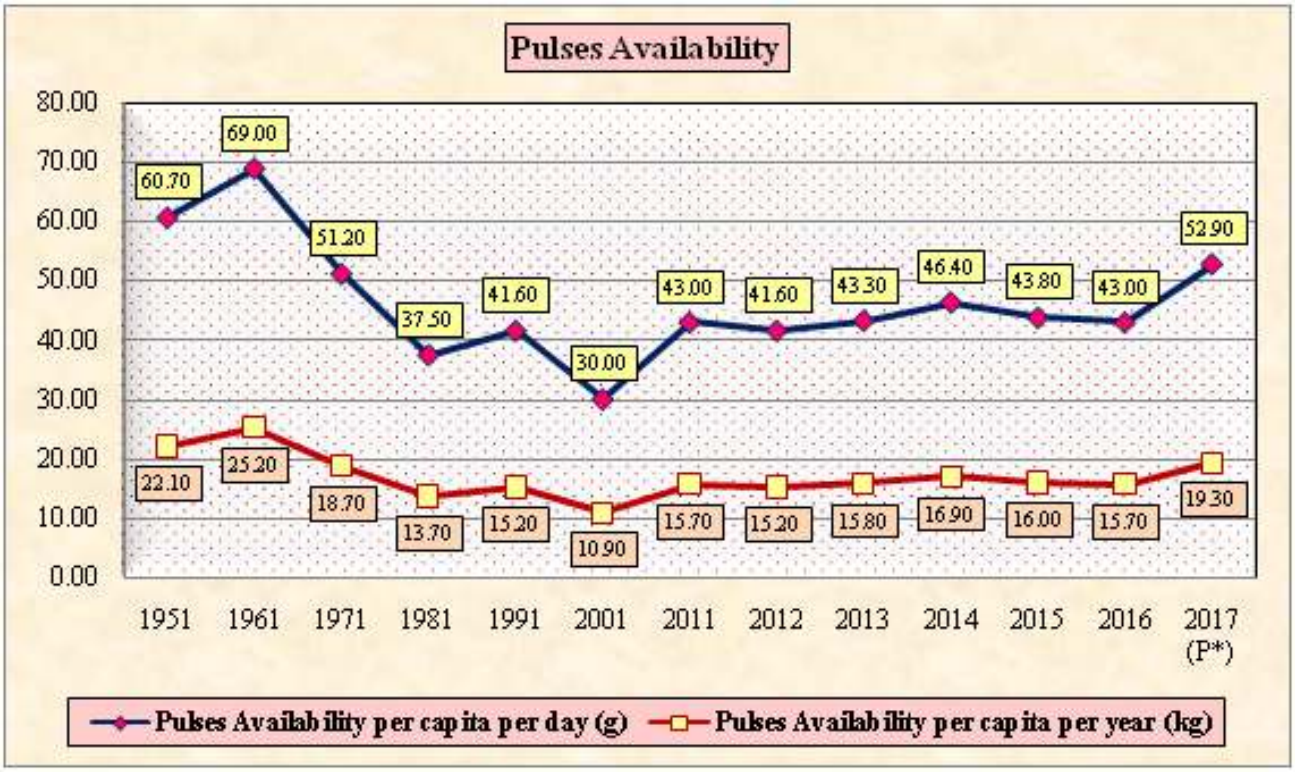


Fig.-3.7: Pulses Availability

Equilibrium production and demand

- The XII Plan Working Group of Planning Commission (now NITI Aayog) had worked-out demand of pulses from 2012-13 to 2017-18 as presented in Table-3.4. The working group projected a production gap of 1.79 to 5.70 Mt uptill 2015-16.
- As a result of phenomenal increase in production of pulses during 2016-17 & 2017-18, consequent upon the implementation of a dedicated road map. The country is moving towards self-sufficiency. The intervention comprise short term, medium term and long term, which have been rolled out can be expected to achieve self-sufficiency over the next few years.

(Table- 3.4): Demand, Production and Production Growth

(Qty: Million Tons)

Year		Demand	Production	
			Production	Growth (*per cent*)
2007-08	XIthPlan	17.29	13.61	
2008-09		17.82	13.65	0.29
2009-10		18.37	13.68	0.22
2010-11		18.94	13.72	0.29
2011-12		19.53	13.75	0.22
2012-13	XIIthPlan	20.13	18.34	33.38
2013-14		20.75	19.25	4.96
2014-15		**21.39**	**17.15**	**-10.91**
2015-16		**22.05**	**16.35**	**-4.66**
2016-17		**22.74**	**23.13**	**41.47**
2017-18		**23.44**	**24.51**	**5.97**

*Note: *Demand includes seed, feed and wastage and based on behaviouristic approach.*
Source: XIIth Plan Working Group (Planning Commission) @3.09% growth rate.

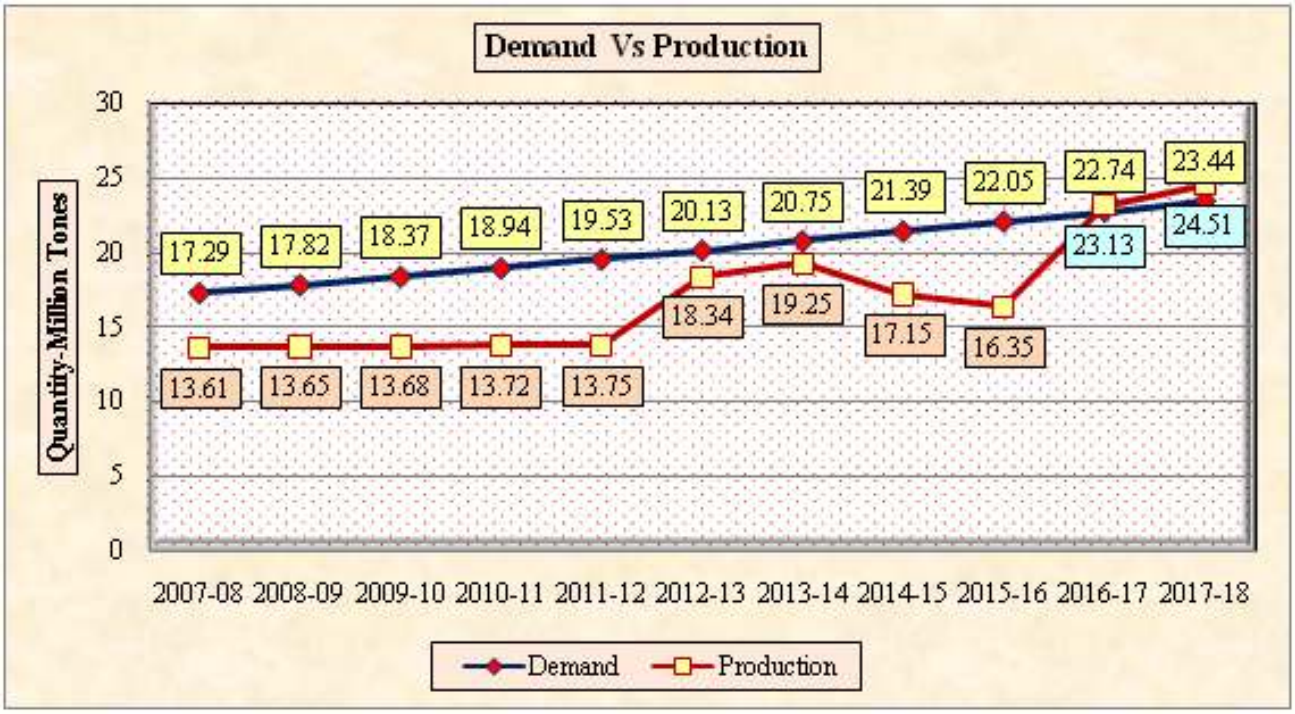


Fig.-3.8: Demand vs Production

Exim policies in favour of pulses have paid

Import

- The Cabinet Committee on Economic Affairs (CCEA) as a major step empowered the Committee headed by Secretary (DFPD) to review the export and import policy on pulses and consider measures such as quantitative restrictions, prior registration and changes in import duties of pulses depending on domestic production and demand, local and international prices and global trade volumes. The Committee comprises Secretaries of DAC&FW and Deptt. of Consumer Affairs. (DoCA) as member too. This is bringing a balanced approach to managing the interests of producers and consumers.
- Farmer-friendly policy measures have helped reduce import of pulses. Import of pulses declined by 30 lakh tonnes in the year from the previous year, resulting in saving of foreign exchange amounting to Rs 7,698 crore.
- The government ensured the availability supply as per demand by way of enhanced imports between 2014-15 to 2016-17 at about 5-6 million tons per year. In addition to building buffer stock, other measures with combating natural calamities through contingency plans, development programmes and risk management through PMFBY were also initiated. Robust procurement under PSS and PSF also built confidence in the farmers.
- Due to back to back record production, imports needed to be checked. Hence, import duty on chickpeas has been fixed at 60%, for yellow peas and at 50%, 30% for lentils and 10% for tur. Peas which accounted for major share in India's pulses import saw a decline as a result.
- The government has also imposed a quantitative cap of 2 lakh tonnes per year on tur dal (Mozambique) and 3 lakh tonnes on urad and moong (Mynmar). Quantitative restrictions have been imposed to check import of cheap pulses and the thereby induce market buoyancy domestically.

Export

- The duties on import were imposed and simultaneously export was also encouraged to support the farmers. "The Cabinet Committee on Economic Affairs (CCEA) has given its approval for removal of prohibition on export of all types of pulses to ensure that farmers can exercise greater choice in marketing their produce and in getting better remuneration for their produce.
- The government lifted ban on export of tur, urad and moong dal, although shipments of these varieties were allowed only through permission from agriculture export promotion body APEDA. All varieties of pulses, including organic pulses, have been made 'free' for export. Kabuli chana has also been permitted in limited quantity. Gram which accounted for major share in India's pulse exports increased.
- Opening of exports of all types of pulses will help the farmers dispose of their products at remunerative prices and encourage them to expand the area of sowing.

Buffer stock

- As a major policy to support the consumers as well, the government has taken a number of steps to sustain high pulses production and procured 20 lakh tonnes of pulses directly from the farmers at minimum support price or market rates, whichever is higher.
- India Pulses and Grains Association (IPGA) has appreciated the buffer stocking policy as a measure to correct price distortions, offer support to pulses selling below MSP (minimum support price) and revitalize the milling industry.

(Table- 3.5-a): India's imports and exports of pulses Vs agriculture

(Rs. in Crore)

Year	Import					Exports				
	Total Pulses		Total Agriculture		Total National Imports	Total Pulses		Total Agriculture		Total National Exports
	Actual Value	% to Agri.	Actual Value	% to National		Actual Value	% to Agri.	Actual Value	% to National	
2007-08	5375	23.84	22550	2.23	1012312	526	0.70	74673	11.39	655864
2008-09	6246	21.75	28719	2.09	1374436	540	0.67	81065	9.64	840755
2009-10	9813	18.05	54365	3.99	1363736	408	0.48	84444	9.99	845534
2010-11	7512	14.71	51074	3.03	1683467	870	0.77	113047	9.94	1136964
2011-12	9448	13.47	70165	2.99	2345463	1068	0.58	182801	12.47	1465959
2012-13	13345	13.94	95719	3.59	2669162	1285	0.57	227193	13.90	1634318
2013-14	11037	12.87	85727	3.16	2715434	1749	0.67	262779	13.79	1905011
2014-15	17063	14.06	121319	4.43	2737087	1218	0.51	239681	12.64	1896445
2015-16	21176	18.26	140289	5.63	2490298	1553	0.77	215396	12.55	1716378
2016-17	22160				2577666	1228				1849429
2017-18	14462				3001016	1120				1955541

Source: DGCI&S, Ministry of Commerce, Kolkata.

(Table-3.5-b): India's imports and exports of pulses

(Quantity -000 tonnes, Values -Crore)

Year	Import		Exports	
	Import Quantity	Import Value	Export Quantity	Export Value
2007-08	2835.05	5375	164.20	526
2008-09	2474.11	6246	136.27	540
2009-10	3509.58	9813	100.13	408
2010-11	2777.83	7512	209.02	870
2011-12	3495.84	9448	173.50	1068
2012-13	4013.24	13345	202.67	1285
2013-14	3177.89	11037	345.55	1749
2014-15	4584.85	17063	222.14	1218
2015-16	5797.71	21176	255.74	1553
2016-17	11281.63	22160	153.86	1228
2017-18	8296.04	14462	135.42	1120

Source: DGCI&S, Ministry of Commerce, Kolkata;

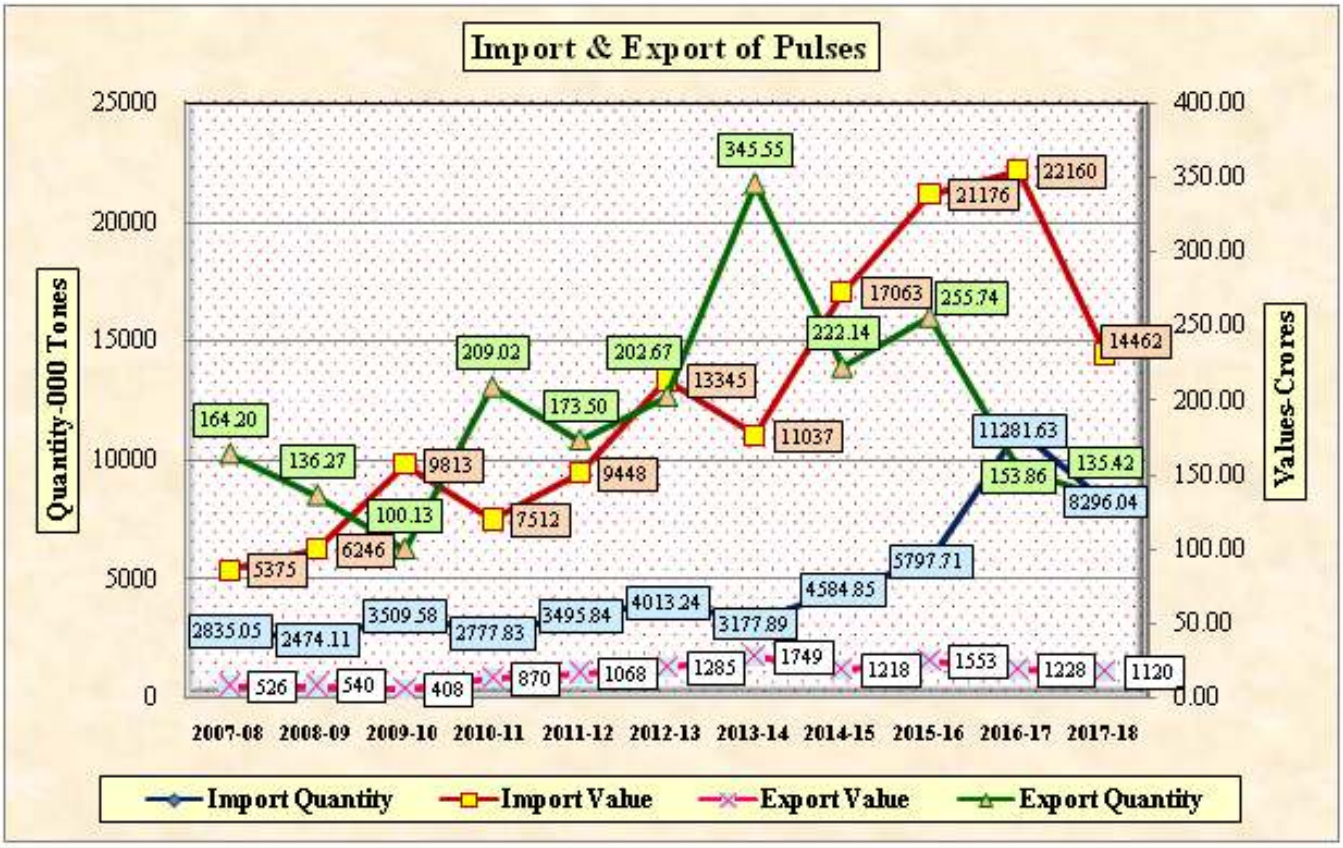


Fig.-3.9: Import & Export of Pulses

Chapter-4

PRODUCTION AND SUSTAINABILITY CONSTRAINTS IDENTIFIED

Based on the review of the planned agricultural development programmes under NFSM-pulses/RKVY/BGREI etc., across the states, Mid-term evaluation, Impact evaluation of NFSM and studies /NLMT reports of Directorate of Pulses Development on reasons for low production, coverage and productivity in pulses, the policy initiatives/interventions were taken under four major categories viz.,

I) Production

ii) Inputs

iii) Marketing and

iv) Technology dissemination.

Constraints related to production

Production potential exhibited under different crops in analysis of yield gaps among major states, districts and within districts under the FLDs were considered. Here complete package of technology i.e. integration of all components viz. timely sowing, high yielding varieties, fertilizer management based on soil testing (including foliar nutrition), rhizobium inoculation, weed management, IPM etc., programme were felt necessary to be pursued vigorously for adaptation (Table-4.1 and 4.2).

(Table-4.1): Technological yield gap exhibiting the production related constraints-FLDs.

(Yield: kg/ha)

Crop	Yield (kg/ha)			Gap over FP		Gap over SAY	
	IP	FP	SAY	Actual	%	Actual	%
Pigeonpea	1394	1078	863	316	29	530	61
Chickpea	1502	1244	907	257	21	594	66
Rice fallow Chickpea	1275	960	976	315	33	299	31
Mungbean(Kh)	781	608	435	173	28	345	79
Mungbean (R)	1398	1228	704	170	14	694	99
Mungbean (RF)	960	723	532	237	33	428	80
MungbeanSummer/Spring	931	559	674	372	66	257	38
Urdbean (Kh)	813	622	368	191	31	445	121
Urdbean (R)	1203	986	774	217	22	429	55
Urdbean (RF)	1185	1002	774	183	18	411	53
Lentil	1289	966	777	323	33	512	66
Field pea	1225	933	904	292	31	321	36
Average (All Pulses)	**1163**	**909**	**724**	**254**	**30**	**439**	**65**

Source-Annual Report -2017-18, GoI, DPD, Bhopal (Ave. 2013-14 to 2015-16)
State Average Yield (SAY-E&S (Ave. 2011-12 to 2015-16) IP: Improved Practice, FP :Farmers Practices.

(Table-4.2): Yield gap exhibiting the production related constraints among the states

(Yield-kg/ha)

Crop/Season	National Yield	Highest/ Lowest Yield	States > National Avg.	States < National Avg.
Total Pulses	835	HP (1338) /J&K (397)	AP, Bihar, Gujarat, HP, Jharkhand, kerela, MP, Punjab, Telengana, UP, Uttarakhand, WB	Assam, CG, Haryana, J&K, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil nadu,
Total Kharif	654	Kerela (1499) / J&K (373	Assam, Bihar, Gujarat, Haryana, HP, Jharkhand, kerela, MP, Punjab, Tamil nadu, Telengana, UP, Uttarakhand, WB	AP, CG, J&K, Karnataka, Maharashtra, Odisha, Rajasthan
Total Rabi	994	HP (2198)/Odisha (516)	AP, Gujarat, Jharkhand, HP, Rajasthan, MP, Telangana, UP, WB	Assam, Bihar, CG, Haryana,J&K, Karnataka, Kerela, Maharashtra, Odisha, Punjab, Tamil nadu, Uttarakhand
Tur	937	MP (1297)/ HP (360)	Bihar, Gujarat, Haryana, Jharkhand, Kerela, MP, Rajasthan, TN, UP, Uttarakhand, WB	AP, Assam, CG, HP, Karnataka, Maharashtra, Odisha, Punjab
Mungbean (K)	429	WB(900)/ Karnataka (237)	AP, Assam, Bihar, MP, Gujarat, Karnataka, UP, Punjab, TN, Telangana, WB	CG, Odisha
Urdbean (K)	630	Jharkhand (918)/ CG (320)	AP, Bihar, Gujarat, Jharkhand, MP, TN, Telangana, Uttarakhand, WB	CG, Haryana, HP, Karnataka, Maharashtra, Odisha, Punjab, Rajasthan, UP
Gram	1055	Telangana (1456) / Karnataka (600)	AP, Gujarat, HP, Jharkhand, MP, Punjab, Telangana, Rajasthan, UP,WB	Assam, CG, Haryana, Karnataka, Maharashtra, odisha, Tamilnadu, Uttarakhand
Urd (Rabi)	764	Madhya Pradesh (1400)/Chhattisgarh (264)	AP, MP, Telangana, WB	Assam, CG, Gujarat, Karnataka, odisha, TN, UP
Mungbean (Rabi)	618	MP (1203)/ Chhattisgarh (234)	AP, Assam, Bihar, MP, Punjab, Telangana, UP, WB	Bihar, CG, Gujarat, Karnataka,Odisha, TN
Lentil	1008	Rajasthan (1408)/ CG (325)	MP, Rajasthan	Assam, Bihar, CG, HP, Jharkhand, Odisha, Punjab, Uttarakhand, WB

Source-Annual Report -2017-18, GoI, DPD, Bhopal

Based on the production related constraints, state-wise interventions were identified and States Annual Action Plan (AAPs) were approved accordingly (Table-4.3).

(Table-4.3): Identified production related constraints and their interventions

States	Production / constraints	Crop	Loss percentage	Measures adopted / interventions made
UP, MP, PB, Haryana	Mid-season cold waves and terminal heat during Rabi	Gram, Lentil Pigeonpea	10-40%	Tolerant Varieties, MIS Intercropping
MP, MS, Guj, AP, TN	Inundation of water in black cotton soils during heavy rains sub-optimal nutrient uptake	Pigeonpea, Urd,Mung	10-50%	Planting under BBF Planting under Furrow Irrigated Raised Bed (FIRB) Inter-cropping RCT provisions
All states	Micronutrient deficiency (Zn, Fe, B, and Mo) - unbalanced use/seldom soil test; Quality issues	All Pulse crops	-	INM provided @ Rs.500/ha
MP, MS, Guj, AP ,Karnataka, UP	Sulphur deficiency ; inadequate availability of Gypsum or pyrites	All Pulse Crops	-	@ Rs.750 per/ha provision
UP, MP, Bihar, JH., Punjab, Haryana	Podfly and maruca	Pigeonpea	10-50%	IPM provision made
MP, UP, Bihar, Jharkhand	Fusarium wilt	Chickpea Tur & Lentil	20-25% 10-15%	IPM seed treatment
All States including MP	YMV & Powdery mildew	Urdbean& Mungbean	10-50%	Rest. Varieties method of planting - IPM
UP, Bihar, MP, Jharkhand, RJ, CG, Haryana	Stray cattle/ Blue bull meanace	All Pulse Crops		Solar fencing under RKVY Local initiative
All states	Region specific technologies-Pigeonpea on bunds transplanting/ intercropping etc.	All Pulse Crops		Minikit provided, awareness and popularize these technologies through NFSM-Pulses

Source-Annual Report -2017-18, GoI, DPD, Bhopal

Constraints related to inputs

- Quality and timely availability of critical inputs seeds, varieties, bio-fertilizers, micro-nutrient and critical irrigation were identified across the states and felt necessary to be addressed as one of the major strategies under this category.

Constraints related to marketing

- Distress sale, lower minimum support prices compared to cost of production, unfavorable exim policy, non-accessibility to market, post harvest losses etc., were identified as major market related constraints, especially in major pulse producing state. The policies to provide remunerative prices to the farmers including the procurement facilities were felt vital by the government.

Constraints related to extension and their interventions

- Lack of guidance in respect of certified seed production/variety identification, insect-pest/diseases identification and management phases, importance and procedure of seed treatment/rhizobium inoculation, lack of information/knowledge on current advances in production, management technology, and also poor or no knowledge about organizing seed production and its protection for succeeding crop.
- Poor knowledge base on nutrient use efficiency (NUE), IPM, method of preparation of spray solutions and multiplicity of extension system on IPM, esp., pesticide dealers etc., identified as technology transfer or extension related constraints.

Chapter-5
ROAD MAP FOR SUCCESS

To achieve self sufficiency in the pulses, the DAC&FW formulated a Five year Roadmap and initiated a multi-pronged strategy since 2015-16.

Committee for monitoring actions on increasing pulse production and policy initiatives of the government

In 2015-16, the Government constituted a Committee for Monitoring of Actions for "Increasing Pulse Production" under the Chairmanship of Additional Secretary, comprising ICAR, ESA and Joint Secretaries (Crops/ C&C/ PMKSY/ PP/ Seed/ Marketing) of DAC&FW.

- The Monitoring Committee meets quarterly to regularly review the pulses programme implementation progress for over all monitoring at the level of Secretary, DAC&FW.
- The Committee has been mandated to design long-term strategy and annual action plans, monitoring of implementation of initiatives, including production incentives, price support and MSP related issues, critical irrigation for pulses under PMKSY, seed production through ICAR institutes and KVKs.
- A Note for "Committee of Secretaries (CoS)"on the long term strategy for increasing production and productivity of pulses, for Inter-Ministerial consultations, involving Secretaries/ CEO of Deptt. of Consumer Affairs, Deptt. of Food and PD, Deptt. of Commerce, Deptt of Expenditure, Deptt. of Revenue, DEA, Secretary, DARE and CEO, NITI AYOG, was adopted and put for consideration.
- The Policy Initiatives to increase production of pulses emanated through wider consultations include the various critical interventions are given as under (Table -5.1).

(Table-5.1): Recent policy initiatives/interventions taken (2015-16 to 2017-18)

S. No.	Road Map (Interventions/ Initiatives)	Year/ Inception	Allocation (Rs. in Cr)	Remark
1.	Enhanced allocation-NFSM Pulses	2015-16	640.16	>50% of Total NFSM Allocation
2.	Additional Allocation (Spring/Summer Pulses)	2015-16 2016-17 2017-18	440.00 346.00 577.67	In addition to regular Rabi Programme
3.	Modification in BGREI- Pulses area expansion in Rice Fallows	2015-16	With BGREI allocation	To include cluster demonstration under Cropping System approach (CSBD) in Rice fallows involving pulses.
4.	CFLDs through ICAR/ATARI/KVK	2015-16 2016-17 2017-18	12.00 25.29 26.11	Promotion/adoption of new varieties ICAR-IIPR : 0.98 Cr. Since 2016-17
5.	MSP enhanced substantially	2015-16		(Gram, Lentil) -Marketing season 2016-17

S. No.	Road Map (Interventions/ Initiatives)	Year/ Inception	Allocation (Rs. in Cr)	Remark
6.	**Seed availability (Strengthening of works/ SPU and farm implements)**			
a)	Enhancing Breeder Seed Production (EBSP) (8 states/ 12 locations)	2016-17to 2018-19	20.39	To increase BSP from 10000 qtls. to 14000 qtls. (2016-17), 15000 qtls. (2017-18) and 16000 qtls. (2018-19)
b)	Seed Production Incentives (To increase SRR/ VRR)	2016-17 2017-18	200.00 111.50	@Rs. 2500 per qtls. on <10 yrs old varieties
c)	Pulse Seed Hubs (24 states/ 150 centres)	2016-17to 2018-19	225.00	150 Nos. @ 1000 qtls. per seed hub annum seed production target.
d)	Pulse Seed Minikits distribution (To ensure varietal Replacement)	2016-17	100.00	For 0.4 ha demonstration (Urd, Mung, Arhar-@ 4 kg Gram -@ 16 kg; Lentil-@ 8 kg)
e)	Seed Village Programme	2017-18		(29 states, 638 districts) 60,000 village, 19.55 lakh farmers
7.	**Technology demonstration**			
a)	Increased Cluster demonstration (States'AAP)	2015-16 2016-17	Within NFSM Pulse AAP	2015-16 - 5.10 lakh ha 2016-17 - 5.50 lakh ha *(for bridging the yield gaps)*
b)	Promotion of minor pulses (Rajmash, Cowpea, Fieldpea, Horsegram etc.)	2016-17	From within EBSP/ Seed Hub and CFLDs	ICAR to Strengthen BSP and identification of varieties *(for exploiting minor pulses)* *(for bridging the yield gaps)*
c)	CDP (Tur on Rice bunds) (Target- 02 Lha)	2016-17	From within NFSM/ BGREI	Area Expansion
d)	CDP (demonstrations on Ridge and Furrow cultivation, summer mung, Tur transplanting & intercropping)	2016-17	From within NFSM/ BGREI	Popularization of Good Agricultural practices (GAP)
e)	Critical Irrigation (Provision of irrigation under PMKSY, 50% allocation reserved for pulses)	2016-17	Within total allocation of PMKSY	Sprinkler sets and water carrying pipes (to Improve Water use efficiency (WUE)
8.	**Remunerative Prices to pulse growers**			
a)	Loan against warehouse receipts (Pledge Loan)	2016-17	Within Interest Subvention Scheme	Interest free loans against warehouse receipts
b)	MSP and Procurement (Credit guarantee raised from Rs. 9000 Cr to Rs. 19000 Cr)	2016-17	NAFED, SFAC and FCI	45.57 Lakh MT Rs. 10.57 Cr

S. No.	Road Map (Interventions/ Initiatives)	Year/ Inception	Allocation (Rs. in Cr)	Remark
9.	**Extension**			
a)	Advisory on pulses (monthly)	2016-17		DPD, Bhopal – IYOP 2016 celebrated with training pamphlets on all pulses in Hindi/English
b)	Creation of IT based information portal (**http// dpd.gov.in**)			IYOP 2016 round the year trainings/ workshops were organized. Pulse Bulletins/ pamphlets (bilingual) developed and distributed across the country.
10.	Effective monitoring	2015-16 onwards	Within NFSM	· Senior Officers Meeting (SOM) under the chairmanship of Secretary, DAC&FW- weekly. · Committee for monitoring actions of road map - under the chairmanship of CEO, NRAA, Govt. of India - fortnightly & monthly. · Video Conferencing by DAC&FW- weekly. · CDDs Review Meeting under the chairmanship of JS (Crops) - bimonthly. · National Level Monitoring Team visits in the states under the leadership of Director, CDDs - all crop seasons by CDDs. · Monthly f ield visits by CDDs & consultants. · Field visits/ monitoring by Director, ATARI; DES (SAUs), Director, IIPR. · ICAR-AGM on pulses/ interface/ seminar/ workshop/ meetings by Directorate of Pulses Development, Bhopal. · Monitoring of seed minikits distribution and FLD/ CFLD by CDDs. · Monitoring of Seed Hubs, EBSP by CDDs.

S. No.	Road Map (Interventions/ Initiatives)	Year/ Inception	Allocation (Rs. in Cr)	Remark
11.	Soil test based promotion of INM/ IPM	2015-16	Within NFSM-Pulses	2015-16 - 29 Lha 2016-17 - 41 Lha
12.	Targeting Rice Fallow Area (TRFA) (Area Expansion)	2016-17	8.85 (2016-17) 203.64 (2017-18)	06 eastern states of Assam, Jharkhand, WB, CG, Bihar, Odisha
13.	FPOs – Value Addition Chain Development (Marketing/ Value Addition)		52.10	11 States (119 FPOs on pulses)
14.	Enhanced MSP of Pulses	2015-16 to 2017-18	Kharif 2018-19 MSP Arhar-Rs.5675 Urd-Rs.5600 Mung-Rs.6975	The real term exponential growth rates >4% in all five pulses
15.	EXIM policy	2017-18	Import of pulses during 2017-18 declined by 03 MT resulting saving of foreign exchange of Rs. 7698 Cr.	Government has imposed import duties on pulses for the first time in this decade. All varieties of pulses, including organic pulses, have been made 'free' for export.
16.	District Agriculture Contingency Plan (DACPs) involving pulses	2016-17	-	By CRIDA involving 46 SAUs and 8 ICAR institutions. 676 districts.

Catalytic effect of plan expenditure increased with assured benefit -DBT

A. Impact of NFSM-Pulses: Enhanced Allocation

- The NFSM-Pulses became operational with 100% central assistance from 2007-08 to 2014-15. Since, from 2015-16, it is operational at 60:40 (GoI + States) sharing basis for plains/general states and 90:10 (GoI + States) for North Eastern and 3 Himalayan states. Currently the programme is operational in all 29 states/638 districts under Krishonnati Yojana. The Govt. changed the sharing pattern to enlighten an ownership by the states and also to ensure benefits to reach the target group under 100 per cent DBT.
- All India NFSM-Pulses budgetary allocation during 2014-15 was Rs. 1326 crores which increased proportionately between 2015-16 and 2017-18. The expenditure, despite DBT mode implementation, has also increased over time.
- Another success of the NFSM/Pulses Development programme during 2016-17 to 2017-18 is its implementation in DBT modes. The beneficiaries directly received their subsidy/incentives in their accounts.

(Table-5.2): Progress of NFSM-Pulses (2007-08 to 2017-18)

(Rs. in Crore)

Year		NFSM States		Agencies		Total	
		Rel.	Exp.	Rel.	Exp.	Rel.	Exp.
2007-08	XIthPlan	103.65	36.50	1.94		105.59	36.50
2008-09		270.16	242.69	17.13	12.69	287.29	255.38
2009-10		373.98	399.77	13.7	19.03	387.68	418.80
2010-11		621.16	607.65	106.6	93.35	727.76	701.00
2011-12		614.3	620.66	44.15	36.33	658.45	656.99
2012-13		951.03	872.67	24.72	5.95	975.75	878.62
2013-14		1242.82	1107.47	24.72	23.00	1267.54	1130.47
2014-15	**XIIth Plan**	**818.66**	**1068.16**	**12.05**	**12.88**	**830.71**	**1081.04**
2015-16		**619.29**	**508.81**	**23.88**	**22.63**	**643.17**	**531.44**
2016-17		**705.51**	**613.2**	**193.70**	**178.97**	**899.21**	**792.17**
2017-18		**866.81**	**853.79**	**170.39**	**88.51**	**1037.20**	**942.30**

Source:- NFSM Cell –DAC&FW, Ministry of Agriculture

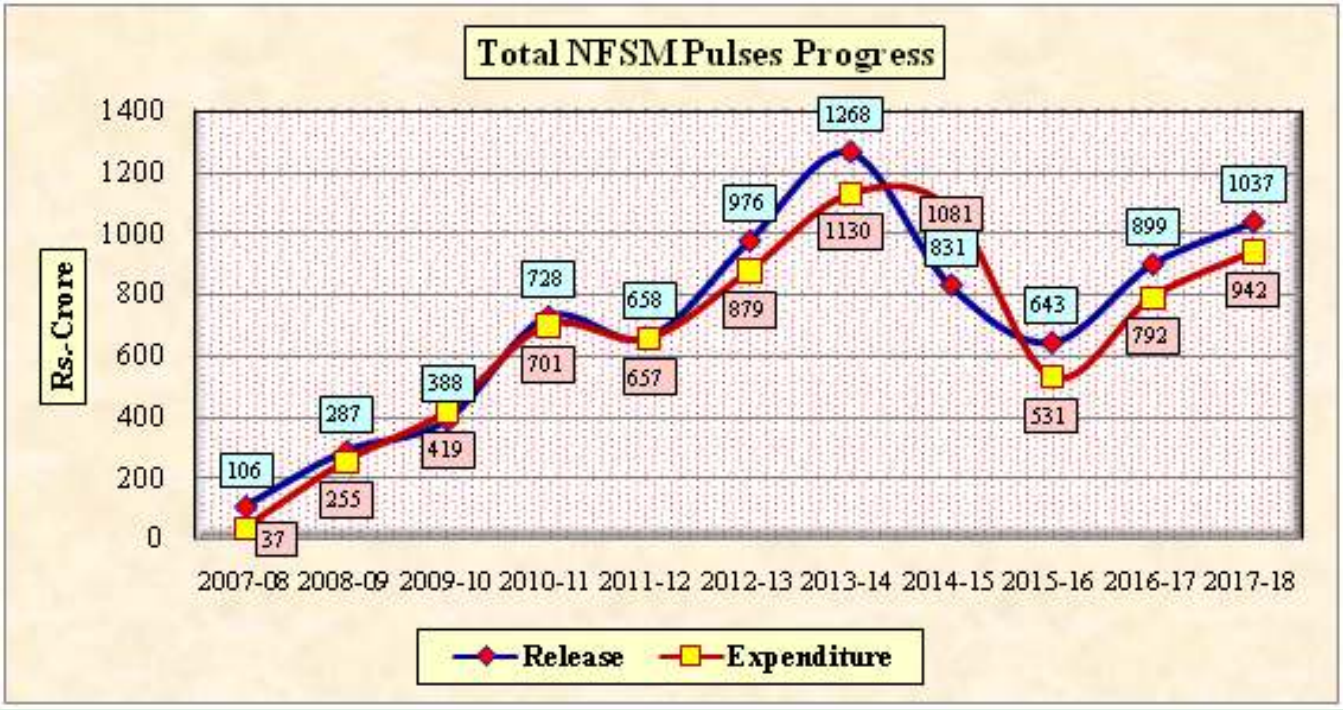


Fig.-5.1: Total NFSM Pulses Progress

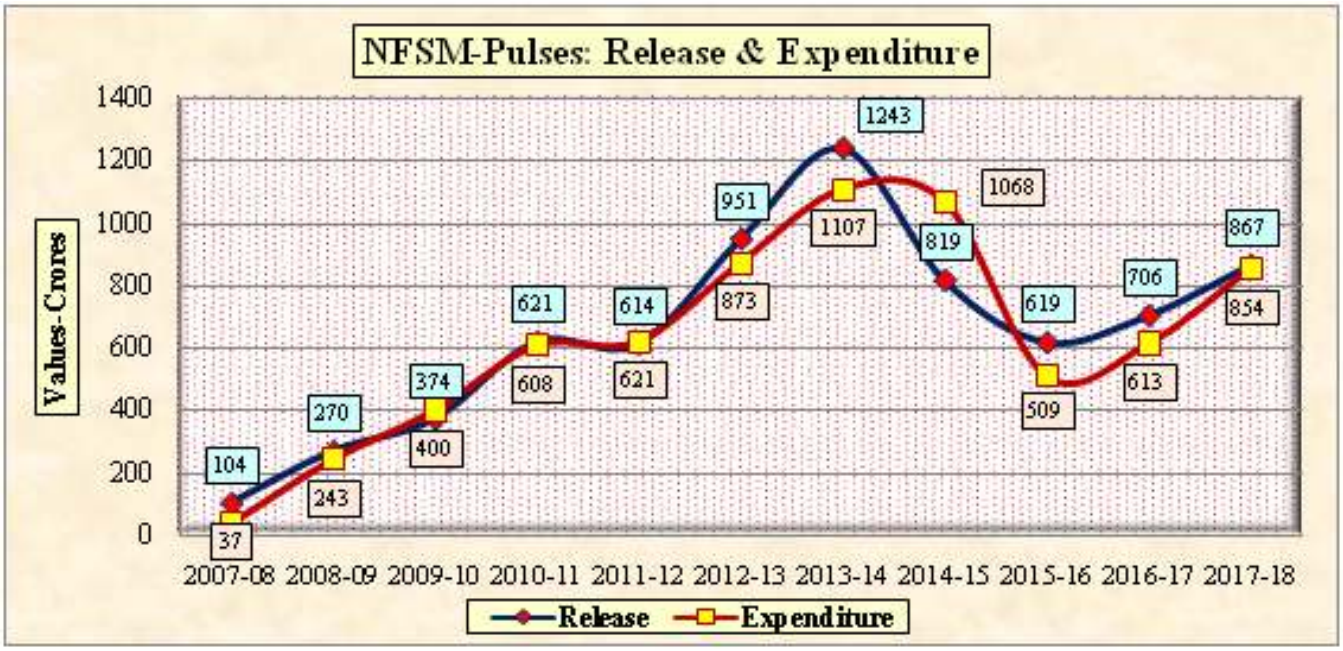


Fig.-5.2: NFSM-Pulses: Release & Expenditure

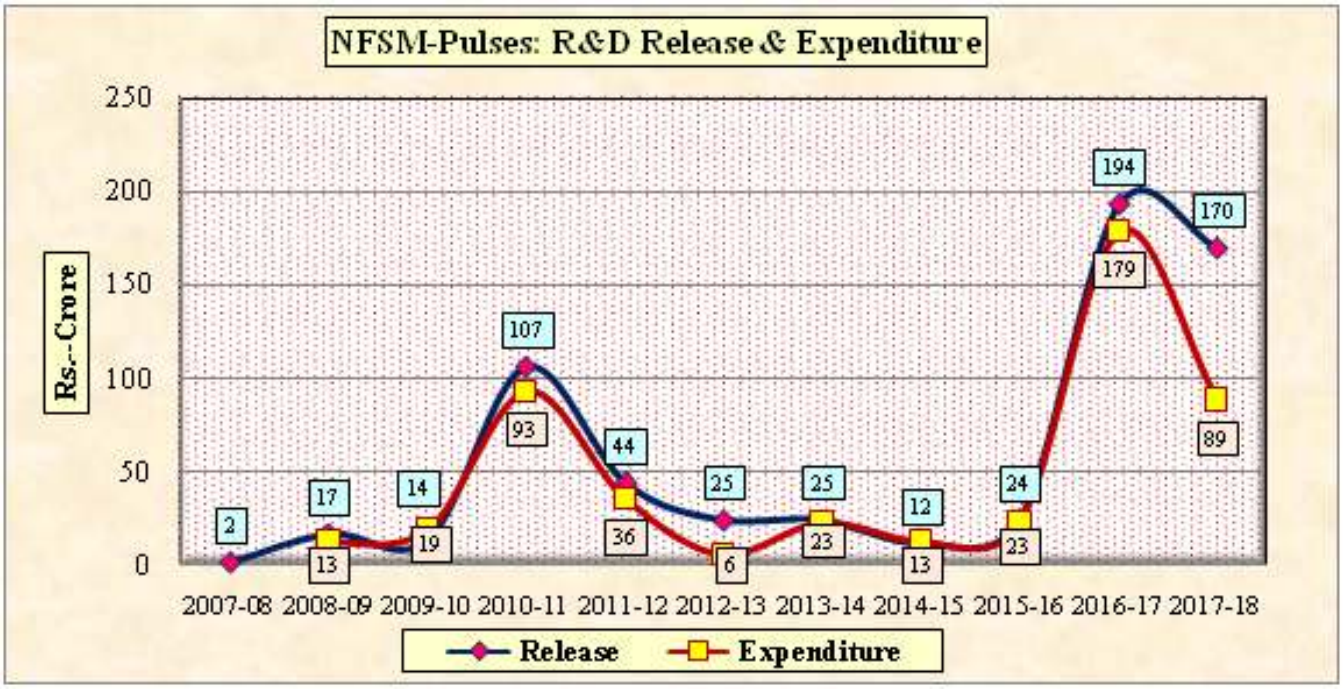


Fig.-5.3: NFSM-Pulses: R&D Release & Expenditure

B. Intervention-Wise Achievements

Substantially increased distribution & production of HYVs seeds *(Unit-Lakh Qtls)*

Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Distribution of Certified seed of pulses						
Target	6.05	10.94	7.50	8.32	10.24	9.52
Achievement	5.44	5.47	1.74	6.89	3.69	4.15
Production of HYVs Seeds						
Target					10.09	9.13
Achievement					2.37	5.40

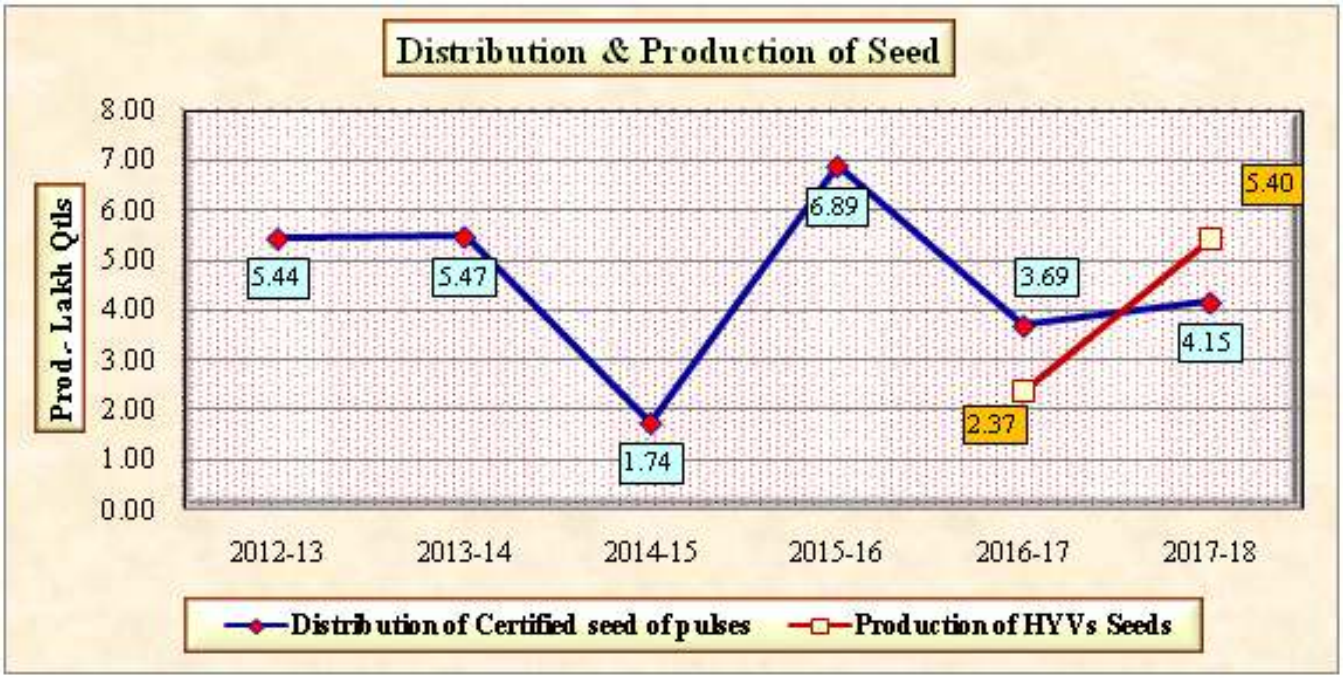


Fig.-5.4: Substantially Distribution & Production of HYVs Seeds

Cluster demonstration on improved technologies

(Demo.-ha)

Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Cluster demo. on improved package of practices						
Target	449798	446608	1312954	778919	725612	621372
Achievement	428141	509980	625558	684100	639949	631743

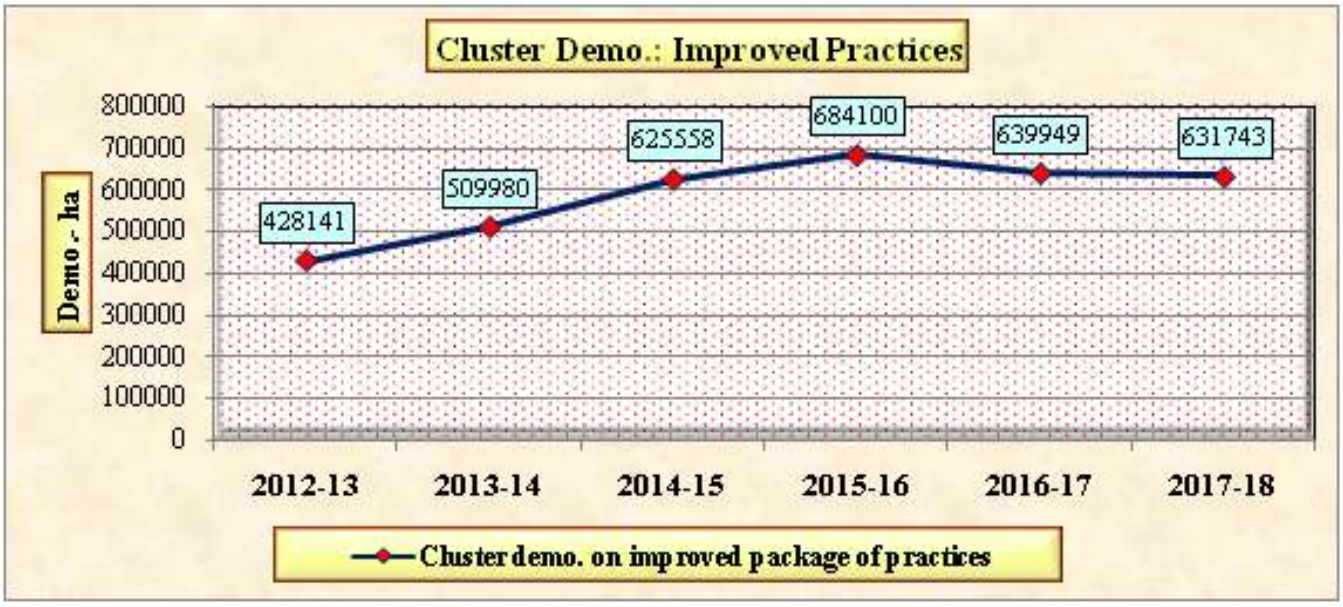


Fig.-5.5: Cluster Demonstration on Improved Technologies

Enhanced coverage under INM & IPM *(Area- ha)*

Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Integrated Nutrient Management (INM)						
Target	1083626	1958778	1848195	2242993	2506271	2255100
Achievement	1047503	1440714	904339	988081	1563461	944154
Integrated Pest Management (IPM)						
Target	795255	1246714	735399	1467929	2437148	2234325
Achievement	701636	914119	448497	830311	2007475	1046296

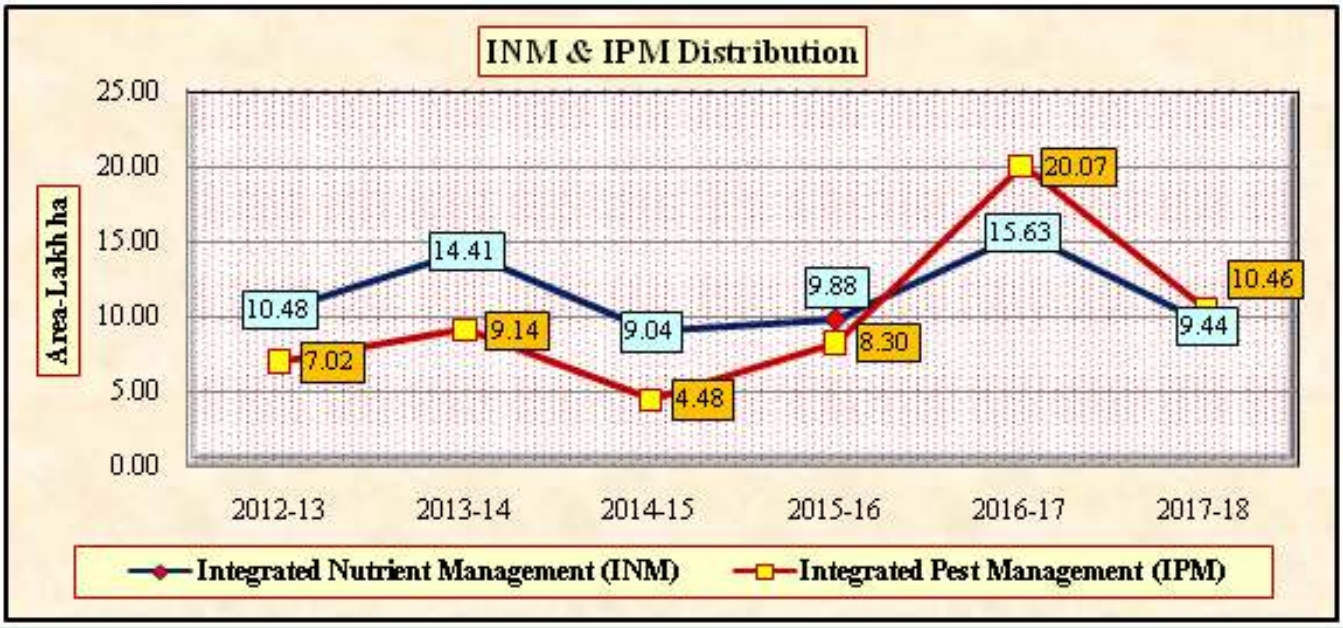


Fig.-5.6: Enhanced Coverage under Integrated Nutrient Management (INM)

Resource conservation technologies/tools *(Quantity-Numbers)*

Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Distribution of Zero till seed drills`						
Target	1850	4450	1793	2161	1034	948
Achievement	1582	3265	708	1081	498	571
Distribution of multi crop planters						
Target	250	52	613	69	815	746
Achievement	25	342	147	1	498	540
Distribution of seed drills`						
Target	14433	20694	8328	9954	3599	3056
Achievement	13033	16145	4902	3754	3631	3408
Distribution of Zero till multi crop planter						
Target	98	852	43	35	558	460
Achievement	7	55	0	13	457	305
Distribution of Ridge Furrow Planter						
Target	445	1928	1383	579	1072	505
Achievement	12	680	164	8	97	314
Distribution of Rotavators						
Target	12446	16244	7469	9635	18630	7658
Achievement	11974	13401	2720	3606	9090	5763
Laser Land levelers						
Target			197	307	646	391
Achievement			25	88	302	270
Tractor Mounted Sprayers						
Target			1173	429	884	998
Achievement			959	50	502	322
Multi Crop Threshers						
Target			2343	2419	3156	2649
Achievement			1241	923	1731	2164
Raised Bed Planter						
Target				2091	2600	79
Achievement				19	96	14
Power tiller						
Target				138	606	2096
Achievement				79	35	1629

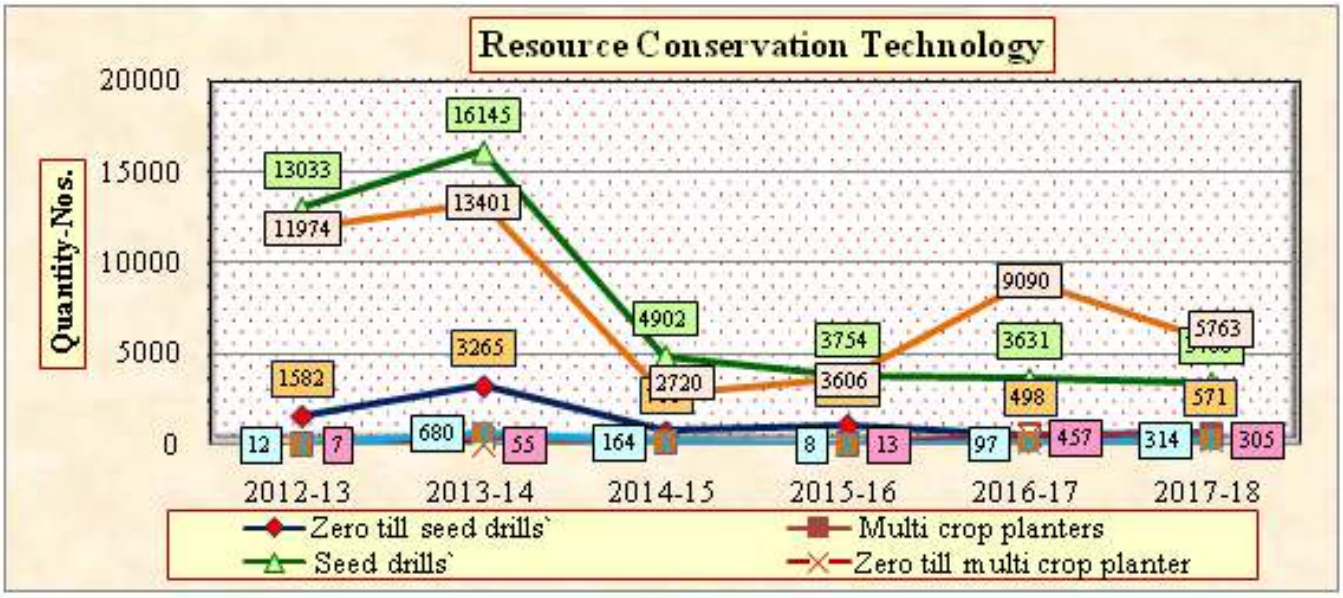


Fig.- 5.7: Resource Conservation Technologies/Tool

Efficient water application tools - Sprinkler sets *(Quantity-Numbers/000 Meter)*

Particulars/Year	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**
Distribution of sprinklers sets						
Target	15953	36454	22720	17208	21265	34164
Achievement	16269	23132	6829	7197	14853	15784
Distribution of Rainguns						
Target	3976	3128	2525	240	1187	308
Achievement	1440	1403	113	56	371	51
Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Distribution of Pump sets						
Target	30470	36632	20952	19072	30498	30805
Achievement	34179	28932	12166	8586	19177	20703
Pipe for carrying water from source to the field (000'Meters)						
Target	-	-	27793	16301	14542	12555
Achievement	-	-	5674	2833	4195	18725

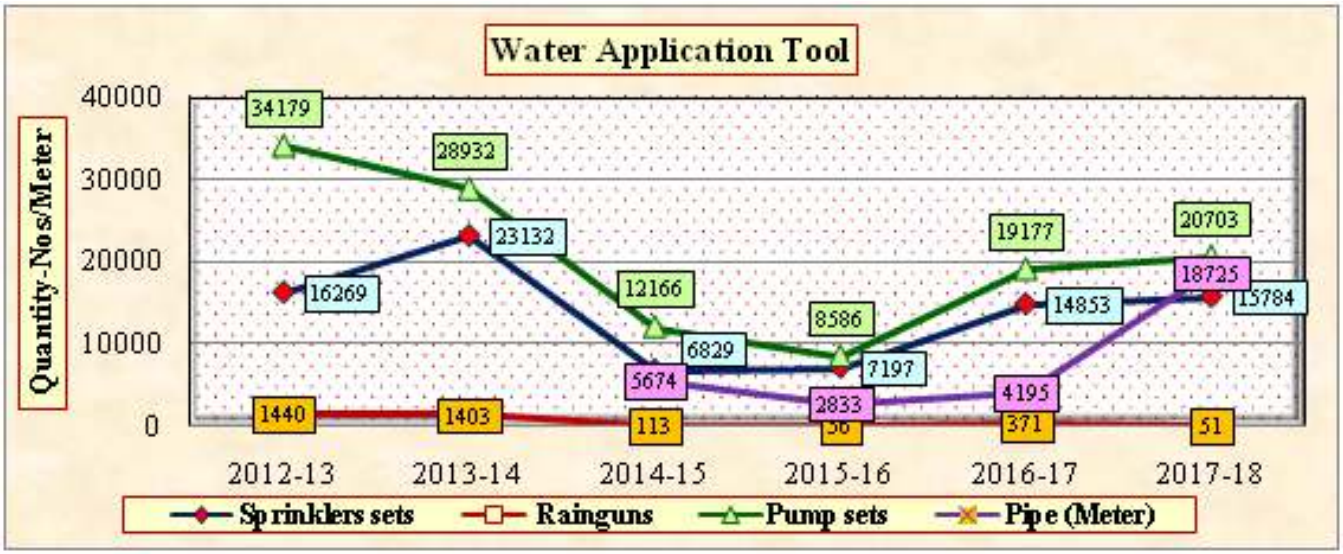


Fig.-5.8: Efficient Water Application Tools - Sprinkler Sets

Enhanced cropping system based trainings

(Training.-Numbers)

Particulars/Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Cropping system based trainings (CSBT)						
Target	6291	7997	3631	6798	11087	10419
Achievement	4839	7224	1712	4299	7370	7242

Fig.-5.9: Enhanced Cropping System Based Trainings

Strategies adopted

Area expansion

- Rabi pulses to bring additional production from additional area coverage in rice fallows, crop-wise strategies were adopted viz., Gram - CG, West Bengal, Bihar, Jharkhand, Odisha, Assam, Andhra Pradesh, Tamil Nadu; Lentil - Chhattisgarh, West Bengal, Bihar, Jharkhand, Assam and Mung/Urd in rice fallow costal region; Intercropping - Gram with barley, Mustard and Linseed in Rajasthan, UP, Bihar, Vidarbha (Maharashtra); Intercropping -Gram/Lentil with autumn planted ratoon sugarcane in UP, Maharashtra, Bihar.

- Kharif pulses - additional production from additional area coverage (diversion to other crops like cotton, oilseeds, coarse cereals), cultivation of kharif pulses as intercrop, planting of red gram on rice bunds, cultivation of minor pulses in niche areas.
- Spring/Summer pulses Punjab, Haryana, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Gujarat, Jharkhand, TN and AP were chosen.
- During 2017-18 total allocation under additional pulses production programme of Rs. 577.67 Crores (350 Crore GoI + 227.67 State Share) is operational in 17 states.

(Table-5.3): Area coverage under spring/summer pulses

(Area-Lakh ha)

States	2014	2015	2016	2017	2018
Tamil Nadu	1.83	1.73	2.38	2.31	2.39
Bihar	0.00	2.58	0.73	2.95	1.47
Uttar Pradesh	1.16	2.04	1.56	1.36	1.40
Andhra Pradesh	1.53	0.44	0.26	0.74	0.15
Gujarat	0.56	0.51	0.43	0.40	0.38
Haryana	0.44	0.17	0.06	0.06	0.06
Karnataka	0.13	0.15	0.19	0.09	0.09
Madhya Pradesh	2.24	1.69	1.67	1.51	0.92
Punjab	0.43	0.65	0.32	0.14	0.15
West Bengal	0.40	0.39	0.52	0.61	0.86
Others	0.16	0.32	0.21	2.35	1.08
Total	**8.88**	**10.67**	**8.33**	**12.52**	**8.95**

Source: WWWR Report, DPD, Bhopal

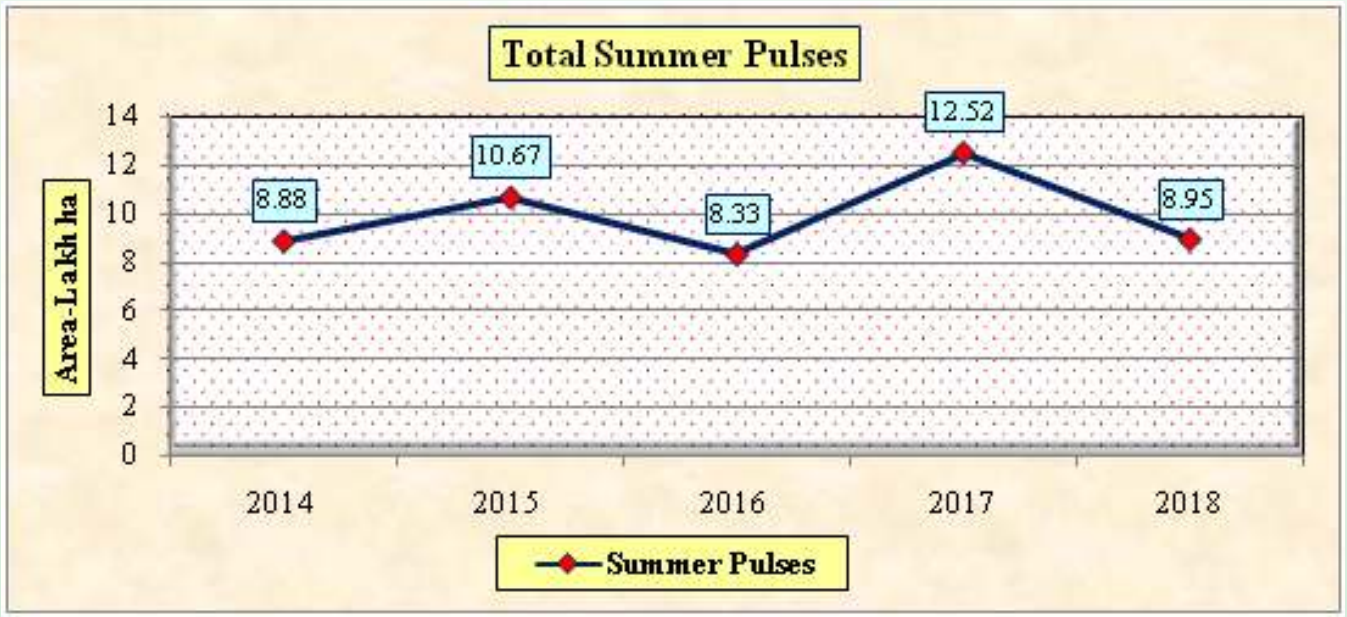


Fig.-5.10: Area Coverage under Total Summer Pulses

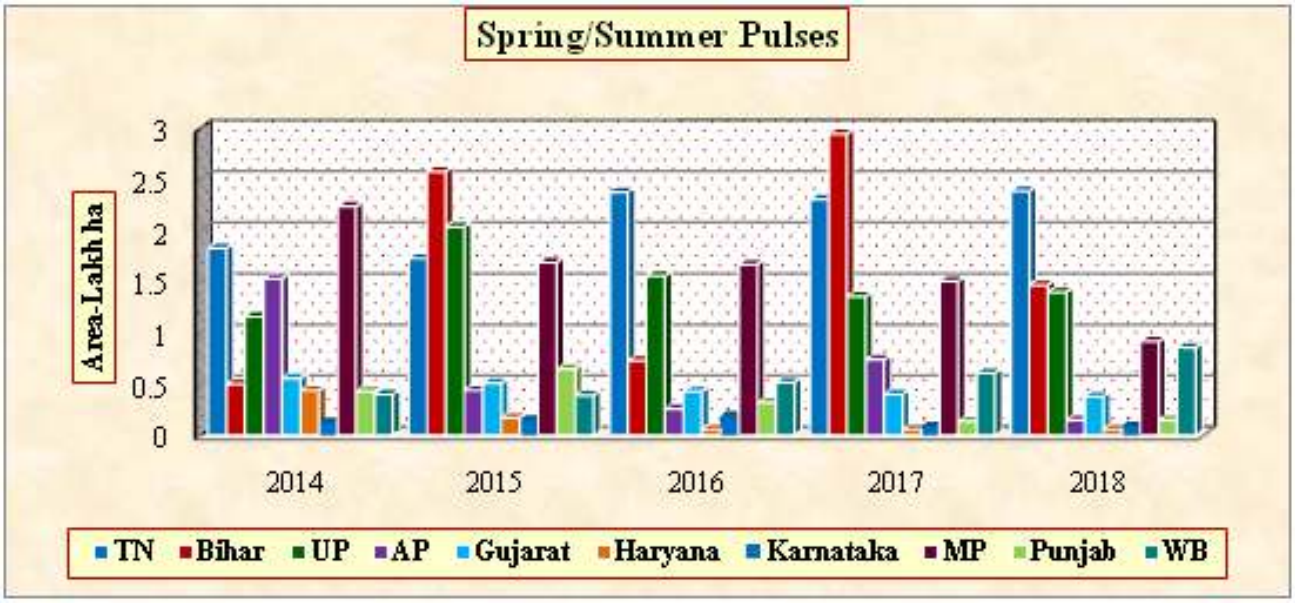


Fig.5.11: Major state-wise Area Coverage under Spring/Summer Pulses

Targeted rice fallow area (TRFA)

- Under area expansion of rabi pulses in rice fallows, TRFA programme has been initiated since 2016-17 in 06 Eastern States of Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and West Bengal. Against a target of 4.5 Mha rice fallow under pulses, an area of > 2.6 Mha has so far been achieved uptill 2017-18.
- During 2016-17 the TRFA was implemented in 15 districts of 6 states to cover 19.14 lakh ha (pulses-15.31 lakh ha + oilseed-3.83 lakh ha). During 2017-18 the scheme has been extended to 40 districts and 4000 villages with a view to cover 15.00 lakh ha (pulses-12.00 lakh ha + oilseeds-3.0 lakh ha) with support for cluster demonstrations, minikit distribution and training to the farmers etc. According to the report an area of 10.72 lakh ha were covered (pulses-9.13 lakh ha + oilseeds-1.60 lakh ha) in rice fallows covering 43 districts and 3739 villages. The additional area coverage resulted a production of 9.04 lakh tonnes of pulses and oilseeds as against the production target of 10.00 lakh tonnes. Most of the rice fallows were covered under pulses viz. pea, lentil, black gram, green gram, chickpea, arhar and lathyrus.
- The total allocation under TRFA-Pulses for the year 2017-18 was Rs. 98.27 crores which was fully released to the states. However the expenditure reported so far is Rs. 62.33 crores which is 63% of the release.
- During 2018-19 the total allocation 220.80 Crore out of this Rs. 148.28 Crores of Central share comprising 133.48 Crore for demo. & Rs. 14.80 Crore for Minikit.

(Table-5.4): Progress of TRFA

(Area- Lha, Allo Amount- Crores)

State	Area under Rice Fallow	Pulses Coverage No. of Districts/ Villages (2017-18)		2018-19 (Target)	Area Covered			Allocation (CS)		Interventions
					2017-18		2018-19 (Target)	2017-18	2018-19	
		Target	Ach.		Target	Ach.				
Assam	10.42	8/800	8/800	8/800	1.84	0.92	2.10	21.48	28.80	Cluster Demo. Minikit Distribution, and Farmers Training
Bihar	3.00	5/380	5/380	7/700	0.24	0.75	0.35	12.23	16.80	
Chhattisgarh	28.56	5/427	5/427	9/900	2.80	4.49	3.95	12.23	21.60	
Jharkhand	4.75	4/378	4/378	5/500	0.24	0.18	0.35	8.37	12.00	
Odisha	29.61	9/854	9/854	11/1100	3.44	2.05	4.20	21.98	26.40	
West Bengal	12.00	12/900	12/900	10/1000	3.44	0.75	3.85	21.96	24.00	
Total	**88.34**	**43/3739**	**43/3739**	**50/5000**	**12.00**	**9.14**	**14.80**	**98.25**	**129.60**	

(Table-5.5):State-wise production of pulses under TRFA during 2017-18

(Production in lakh tonnes and Yield kg/ha)

States	Area	Production	Yield
Assam	0.92	0.82	897
Bihar	0.75	0.71	940
Chhattisgarh	4.49	4.48	997
Jharkhand	0.18	0.19	1079
Odisha	2.05	1.07	524
West Bengal	0.75	0.65	867
Total	**9.14**	**7.92**	**867**

- Short duration high yielding rice varieties with its earlier planting as dry seeding/ DSR and early transplanting were introduced under NFSM to bring pulses under Rice fallow.
- Rice fallow covered under additional pulse programme by Relay sowing (uttera cropping) of lentil, khesari, small seeded chickpea and pea also solved the problem of late sowing.

Recommendations for improving pulses productivity under rice fallow

- Under mentioned recommendations and policy issues indicated in the NAAS Policy Paper (64) on "improving productivity of rice fallows", 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.

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 photo synthetically 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 5.6 (a) and (b).

(Table – 5.6-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 *Quizalophop 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 farmer's participatory approach	SDA/SAUs/KVKs

(Table –5.6- 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 ofDec) 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

TRFA –Field pea Cultivation Jagdalpur, CG

TRFA – Bund Cultivation Tur, Kondagaon, CG

Coriander + Gram under TRFA, Dantewada, CG

Tur Production under TRFA Programme, CG

Cluster Demo.: Summer Mung (TJM-3) District- Guna, (M.P.)

Area Expansion: Tur on Rice Bunds- CG

Productivity enhancement

Promotion of Sulphur & Zinc

- Wide spread deficiency of sulphur and zinc noticed in pulse growing regions constraints the productivity of pulses. In major pulse growing areas, 44 districts have shown 40-60% sulphur deficiency and 82 districts with 50-60% zinc deficiency. In view of encouraging response to application of S and Zn with cost benefit ratio of 10-21%, their application was vigorously pursued after 2014-15.

Promotion of Rhizobium & PSB

- About 40% pulse growing regions have low to medium population of native Rhizobium. Seed inoculation with bio-fertilizer (Rhizobium and PSB); low cost inputs; are known to increase pulse productivity by 10-12%. Rhizobium + PSB provided under NFSM.

Technology demonstration conducted

- The frontline demonstrations were conducted in different agro-climatic regions on important pulse crops with a view to demonstrate and assess the benefits of new varieties and technologies under diverse cropping systems have revealed the existing potential of productivity to be exploited through technological interventions.
- A package technology like improved cultivar, Rhizobium inoculation, use of Sulphur, INM, application of weedicide, foliar spray of urea, IPM etc were vigorously pursued.
- For good crop establishment, seed priming (soaking the seeds over night in water surface, drying and sowing next day), seed treatment with effective Rhizobium strain, sowing of seed into deeper moist soil (in case of chickpea), lime pelleting for acidic soil and gypsum in saline areas was encouraged under NFSM pulses/CFLDs.
- Government focused on key areas like seeds of improved varieties, irrigation tailored to pulses (especially micro-irrigation), bringing new niche areas under pulse cultivation, attractive minimum support price (MSP) and market that allow farmers to increase their profitability aligned to improved farmer welfare.
- The Government of India released amount of Rs. 97.50 lakh for 1300 no. of demonstration during 2017-18 and Rs. 117.00 Lakh for same nos. of demonstration during 2018-19.

(Table – 5.7) Promotion of improved varieties

States	Crop	Leading varieties
Andhra Pradesh	Tur	LRG-41
	Gram	JG-11-KAK-2
	Mung	LGG-460, Urd – PU-31, LBG-752
Bihar	Mung	HUM-16 , IPM-02-03, Panth Mung – 5
	Kulthi	DV-7
Jharkhand	Tur	NDA-2, MAL-13, ICPH-2671,
	Gram	Kabulichana – 2, JAKI-9218
	Mung	TM-99-21, HUM -12 (MalviyaJanchetna), HUM -16, HUM -668, IPM-02-03
	Urd	PU-31, Sujata, WBU-109, Sekhar-3,
	Kulthi	Birsa-Kulthi-1, Madhu,
	Lentil	WBL-77, HUL-57

States	Crop	Leading varieties
Karnataka	Tur	BRG-2, TS-3R, BSMR-736
	Gram	JG-11, JAKI-9218
	Mung	BGS-9, SML-668
	Urd	T-9, TAU-1
Maharashtra	Tur	PKV-Tara,BDN-711,BDN-708, BSMR -853, ICPL -8863 (Maruti), ICPL-87119 (Asha), ICPL-87 (Pragati
	Gram	Akash, Digvijay, JAKI-9218, Virat, ICCC-37,KAK-2,Vishal, vijay
	Mung	BM-2002-1, PKV-AKM-4, BM-2003-2, Utkarsh, Kopargaon
	Urd	AKU-15, TAU-1
Odisha	Tur	Asha, Lakshmi, UPAS-120, LRG-41
	Mung	PDM-139 (Samrat), HUM-12 (MalviyaJanchetna), SML-668, IPM-02-3, IPM-2-14
	Urd	PU-30,31, Shekhar-2, IPU-02-43, Azad Urd
Rajasthan	Gram	RSG-44, GNG-1581 (Gangaur), GNG -1958 (Marudhar), CSJ -515, GNG-2144 (Teej), RSG-974
	Mung	SML-668, GM-4, MH-421, IPM-02-3,IPM 2-14, HUM-16, HUM-12 (Malviya Jan Chetna), PDM-139, MH-2-15 (Satya), MH 2-14
	Urd	PU-30,31, IPU-94-1, TAU-1,2, KU-300, KPU-07-08, KPU-405, K-96-3
	Moth	RMO-40,225,423, CAZRI-2, RMB-2
Tamil nadu	Arhar	LRG-41, CO (Rg)-7, BRG-1,2; Urd- VBN-5,6, ADT-3
	Mung	CO (GG) 912/CO-7, CO-8
	Kulthi	Paiyur-2
Telangana	Arhar	LRG-41, PRG-176, ICPL-87119 (Asha)
	Gram	JG-11, JAKI-9218
	Mung	LGG-460, MGG-295, IPM-2-14
	Urd	LBG-752, T-9, IPU-2-43, PU-31
Uttar Pradesh	Arhar	UPAS-120,PUSA-992,Narendra Arhar-1,PUSA-9,PDA-11, Bahar
	Gram	JAKI-9218, Shubhra, Ujjawala, DCP-92-3, Avrodhi, Uday
	Mung	IPM-2-3, Narendra Mung -1, MalviyaJyoti (HUM -1), MalviyaJanchetna (HUM-12), PDM-139 (Samrat).
	Urd	IPU 91-1 (Uttara), IPU-2-14, PU-31, PU-35, Shekhar-3, IPU-2-43, T-9
	Lentil	PL-4,5, DPL-62, Narendra Masoor-1, K-75, L-4076

Source: SDAs of Agriculture.

NFSM-CFLD
Arhar (TJT-501), District- Seoni (M.P.)

Local Initiative: Mechanical Nipping of
Pigeonpea (Var-TS3R) Vijayapur (Karnataka)

CFLD: Demo./Training Seed treatment
(Rhizobium + PSB) , District-Sehore, (M.P.)

Local initiative- Dal Mill, Kanpur (U.P.)

Technology transfer through CFLDs.

- Government has initiated National Level Cluster Frontline Demonstrations on pulses, through Krishi Vigyan Kendra under 11 Agriculture Technology Application Research Institute (ATARIs) to demonstrate the production potential of new varieties and the related technologies; increasing production through area expansion and productivity enhancement in a sustainable manner in the identified districts of the country; restoring soil fertility and productivity at the individual farm level; and enhancing farm level economy (i.e. farm profits) to restore confidence amongst the farmers.
- The CFLD programme has been started from 2015-16. The total targets during 2015-16 in 15382 hectares have been increased at 126% during 2018-19.
- The transfer of technology through CFLDs have increased yield levels shown upto 42% and 54% over local check and normal yield. Crop-wise details of CFLDs conducted, yield gaps and varieties demonstrated during 2016-17 is given below (Table-5.8, to 5.11).

(Table-5.8): All India CFLDs targets and achievement (2015-16 to 2018-19) *(Area: ha)*

Year	Target	Achievement
2015-16	15382	13528
2016-17	31000 (By 534 KVKs)	29008
2017-18	31366 (By 549 KVKs)	30366
2018-19*	34750 (By 578 KVKs)	-

Source: ICAR-ATARI

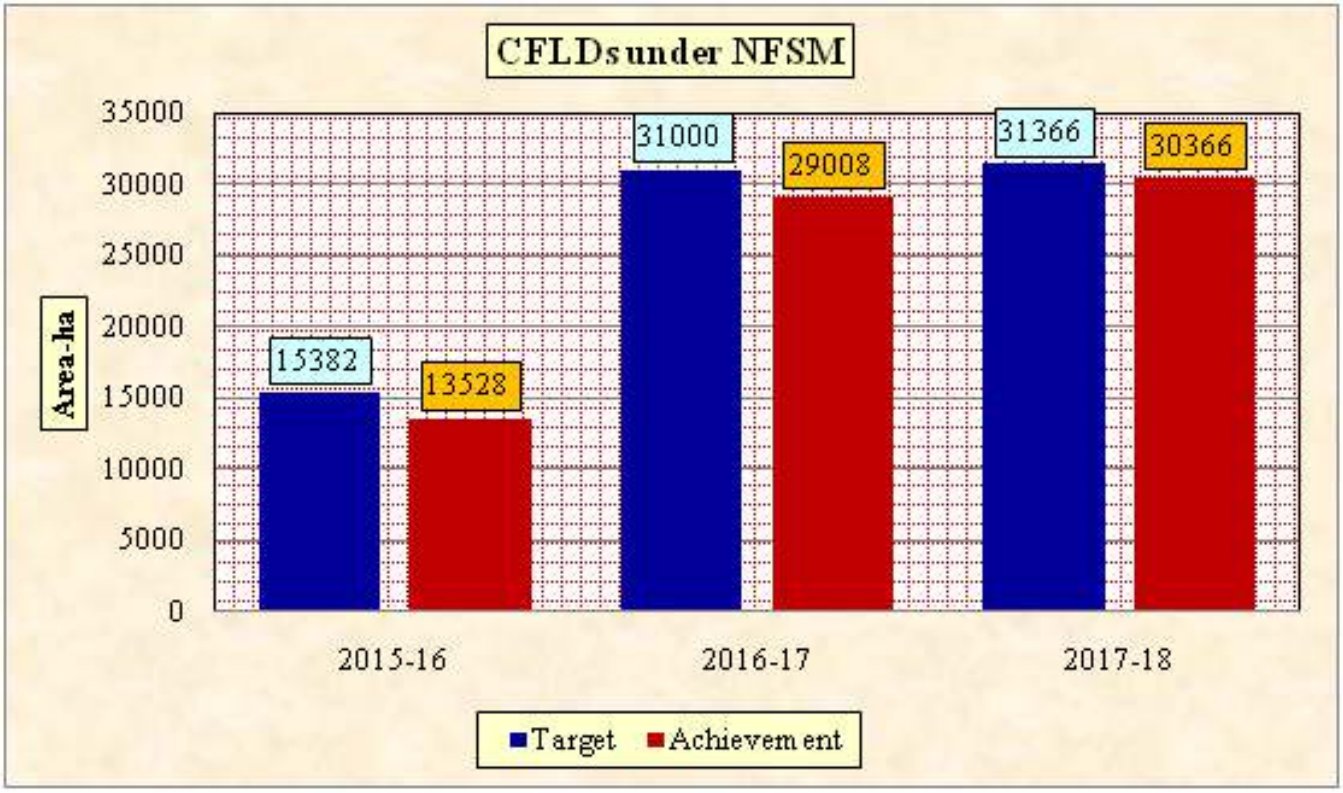


Fig.-5.12: All India CFLDs Targets and Achievement (2015-16 to 2018-19)

(Table-5.9): All India: CFLDs yield gaps exhibited: Total Pulses (2016-17) *(Yield: qtls/ha)*

Crop	Area (ha)	Yield			Actual Yield Gap		% Yield Gap	
		Demo.	Local Check	NY	Local Check	NY	Local Check	NY
Pigeonpea	4824.80	14.50	9.92	7.25	4.58	7.25	46	100
Black gram	4469	8.67	6.39	6.32	2.28	2.35	36	37
Green gram	7491.20	8.30	5.90	5.00	2.40	3.3	41	66
Horse gram	228.00	8.15	6.05	4.83	2.10	3.32	35	69
Chick Pea	6054.46	15.07	11.02	9.32	4.05	5.75	37	62
Field Pea	1819.09	15.89	11.11	9.40	4.78	6.49	43	69

Crop	Area (ha)	Yield			Actual Yield Gap		% Yield Gap	
		Demo.	Local Check	NY	Local Check	NY	Local Check	NY
Lentil	3689.70	10.66	7.58	7.38	3.08	3.28	41	44
Rajmash	203.65	13.67	8.07	8.07	5.60	5.60	69	69
Moth bean	112.00	6.23	4.82	4.82	1.41	1.41	29	29
Lathyrus	116.00	7.16	5.53	7.76	1.63	-0.6	29	-8
Total	**29007.90**	**10.83**	**7.64**	**7.02**	**3.19**	**3.82**	**42**	**54**

NY: Normal Yield: (Ave. 2011-12 to 2015-16) Yield of Local Check considered as NY.

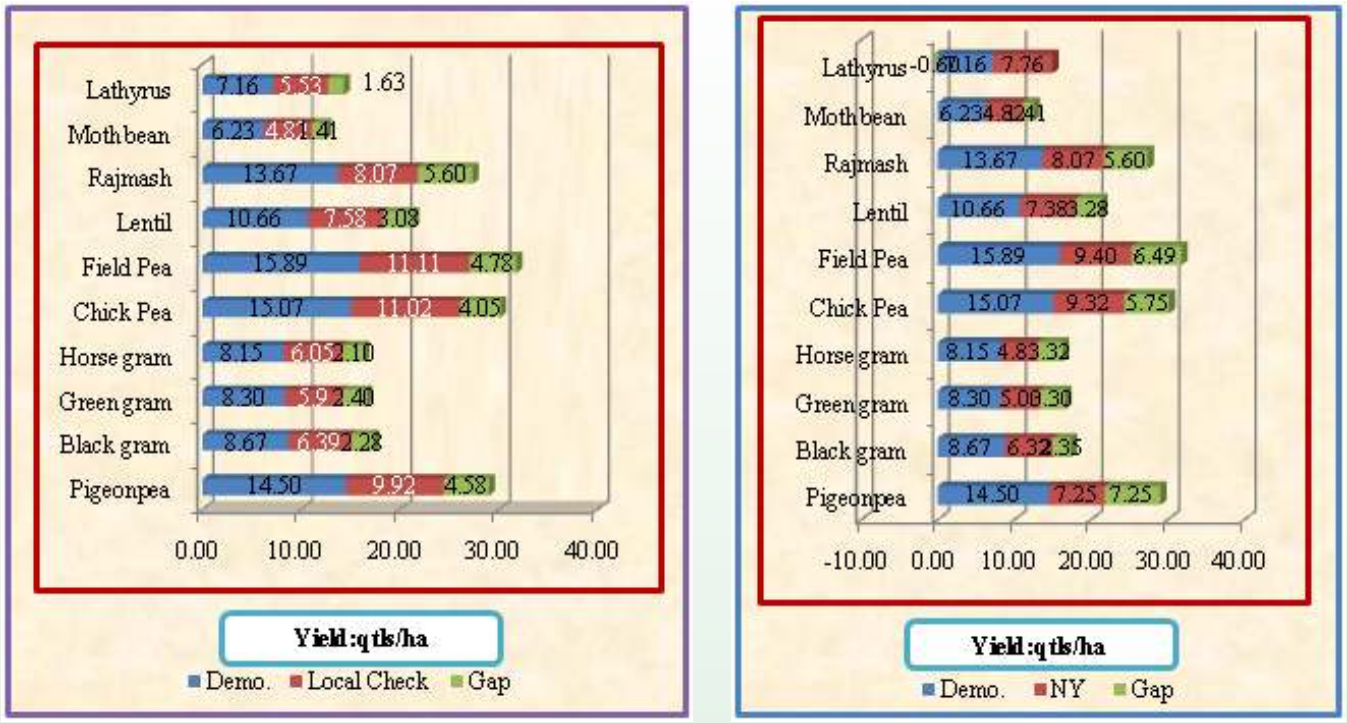


Fig.-5.13: All India Crop-wise: CFLDs Yield Gaps Exhibited: Total Pulses

(Table-5.10): All India: CFLDs yield gaps : Kharif Pulses (2016-17)

(Yield:qtls/ha)

Crop	Area (ha)	Yield			Actual Yield Gap		% Yield Gap over	
		Demo.	Local check	NY	Local Check	NY	Local Check	NY
Pigeon pea	4741.8	12.22	8.51	7.25	3.71	4.97	44	69
Black gram	2734.6	8.39	5.85	5.19	2.54	3.2	43	62
Green gram	2103.8	8.66	6.34	4.14	2.32	4.52	37	109
Horse gram	228	8.15	6.05	4.57	2.1	3.58	35	78
Rajmash	19.2	13.31	6.2	6.2	7.11	7.11	115	115
Moth bean	112	6.23	4.82	4.82	1.41	1.41	29	29
Total	**9939.40**	**9.49**	**6.30**	**5.36**	**3.20**	**4.13**	**51**	**77**

NY:Normal Yield: (Ave. 2011-12 to 2015-16) Yield of Local Check considered as NY of Rajmash&Mothbean

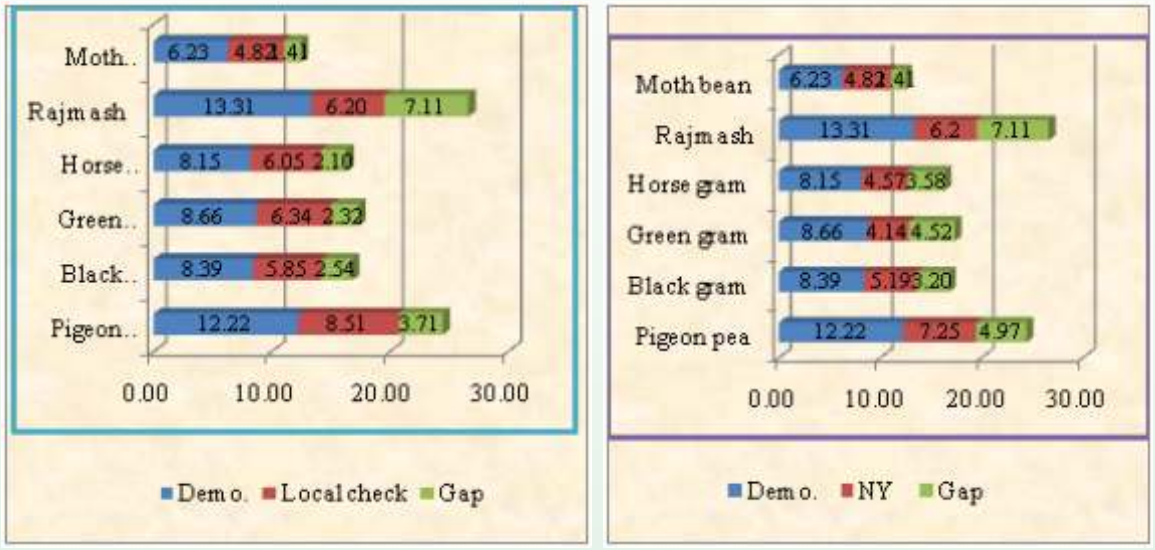
(Table-5.11): All India: CFLDs yield gaps: Rabi Pulses (2016-17)

(Yield:qtls/ha)

Crop	Area (ha)	Yield (q/ha)			Actual Yield Gape over		% Yield Gap over	
		Demo.	Local Check	NY	Local Check	NY	Local Check	NY
Chick Pea	6054.46	15.07	11.02	9.32	4.05	5.75	37	62
Lentil	3689.7	10.66	7.58	7.38	3.08	3.28	41	44
Field Pea	1819.09	15.89	11.11	9.40	4.78	6.49	43	69
Green gram	1449.4	7.99	5.24	5.77	2.75	2.22	52	38
Black gram	1020.2	9.33	6.88	7.45	2.45	1.88	36	25
Pigeon pea	83	16.82	11.33	11.33	5.49	5.49	48	48
Rajmash	180	19.60	11.88	11.88	7.72	7.72	65	65
Lathyrus	116	7.16	5.53	7.76	1.63	-0.6	29	-8
Total	**14411.85**	**12.82**	**8.82**	**8.79**	**3.99**	**4.03**	**45**	**46**

NY: Normal Yield: (Ave. 2011-12 to 2015-16) Yield of Local Check considered as NY of Rajmash&Mothbean

Kharif season



Rabi season

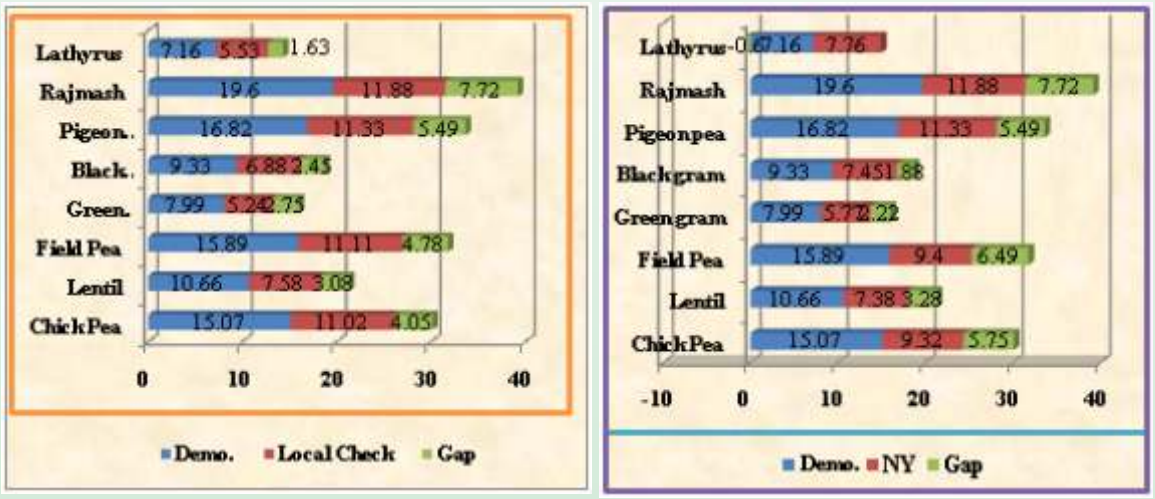


Fig.-5.14: All India Kharif& Rabi: CFLDs Yield Gaps Exhibited

NFSM- CFLD-Summer-Pulse Mung (Var. IPM 02-3), Jabalpur (MP)

(Table-5.12): All India: Varieties Demonstrated under CFLDs

Crop	Variety
Pigeonpea	TJT-501, AL-201, Malviya Arhar-13, Asha, UPAS -120, NA-2, BSM3-736, GRG-811,
Blackgram	Mash 114, UG 218, Shekhar, PU-31, AKU-15, IPU-94-1,Shekar,PU-19
Greengram	MH421, Pant Moong 5, IPM 2-3,Tripura Moong-1, MGG-347, Uttara,GM-4,KKM-3, SML-668, SML-832, HUM-16, Samrat
Horsegram	BirsaKulthi, Pavur-2, Indrakulthi.
Rajmash	WazejRajmash, Tripura Rajmash Sel-1.
Mothbean	RMO-257, CZM-2
lentil	HUL 57, DPL 62, L 4594.
Field pea-	Prakash, Rachna, Anupam, Shalimar pea;
Chickpea	JG 16, HC1, GNG 1581, HC 1, HC 5, JAKI 9218, Vijay, Vishal, Digvijay , NBEG-3, BDNG-797,GG-2, GJG-3, GG-5, JGG-1, GG-5;
Black gram,	LBG 752, LBG-787, GBG-1, PU-31;
Green gram,	LGG460, WGG-42, TM96-2, MGG-295,GG- 2, Co-4,CO-4, IPM-99-125

Interventions related to marketing

Phenomenal Increase in MSP of Pulses

- To address Price security, distress sale, access/connectivity to mandies, farmers' exploitation and heavy storage loss (20-30%) etc., Initiatives to link all APMCs under E-NAM and procurement of pulses under PSS and PSF on MSP by National Agricultural Marketing Federations Ltd. (NAFED) / FCI, SFAC etc, also paid dividends (Table-5.13).

(Table-5.13): Minimum support price (MSP) of pulses of last 10 years

(Rs./quintal)

Years	Arhar	Urd	Moong	Gram	Lentil
2007-08	1590	1740	1740	1600	1700
2008-09	2000	2520	2520	1730	1870
2009-10	2300	2520	2760	1760	1870
2010-11	3500	3400	3670	2100	2250
2011-12	3700	3800	4000	2800	2800
2012-13	3850	4300	4400	3000	2900
2013-14	4300	4300	4500	3100	2950
2014-15	4350	4350	4600	3175	3075
2015-16	4625	4625	4850	3500	3400
2016-17	5050	5000	5225	4000	3950
2017-18	5450	5400	5575	4400	4250
2018-19	5675	5600	6975	-	-
*Growth rate (%)	11.34	9.40	9.24	10.86	9.43

Source: Directorate of Economics & Statistics, Govt. of India, M/A, New Delhi
** Nominal exponential growth rate (%) (2008-09 to 2017-18), in real terms, it was more than 4% in all five pulses.*

Fig.-5.15: Trend of Minimum Support Price (MSP)

Interventions related to seeds

A. Enhancing Breeder Seed Production (EBSP)

- As a major initiative to address SRR/VRR constraints with budgetary allocation of Rs. 20.39 crore EBSP programme has been started in projectile mode for a period of 03 years (2016-17 to 2018-19) in 08 states with 12 centers at Rajasthan (ARS, Kota/RARI-Durgapur), Bihar (BAU, Sabour), Maharashtra (ARS-Badnapur/MPKVV-Rahuri), Madhya Pradesh (JNKVV, Jabalapur/RVSKVV, Gwalior & IIPR-RS Phanda), Odisha (ARS, Berhampur), Uttar Pradesh (ICAR, IIPR, Kanpur), Andhra Pradesh (ARS-Lam), Karnataka (UAS, Dharwad).
- Crop-wise/Centre-wise targets for quality seed production and infrastructure created at each location is given below (Table 5.14 & 5.15).

(Table-5.14): All India-Crop-wise additional breeder seed production targ. & achiev.

(Qty.: qtl)

Crops	2016-17		2017-18		2018-19	Total		
	Target	Ach.	Target	Ach.	Target	Target	Ach.	% Ach.
Tur	425	978	157	548	168	750	1526	203
Urd	317	720	183	304	212	712	1024	144
Mung	490	790	195	374	244	929	1164	125
Gram	2140	2917	235	3241	277	2652	6158	232
Lentil	165	250	140	205	132	437	455	104
Pea	180	350	68	190	73	321	540	168
Total Pulses	**3717**	**6005**	**978**	**4862**	**1106**	**5801**	**10867**	**187**

Source: ICAR-IIPR, Kanpur

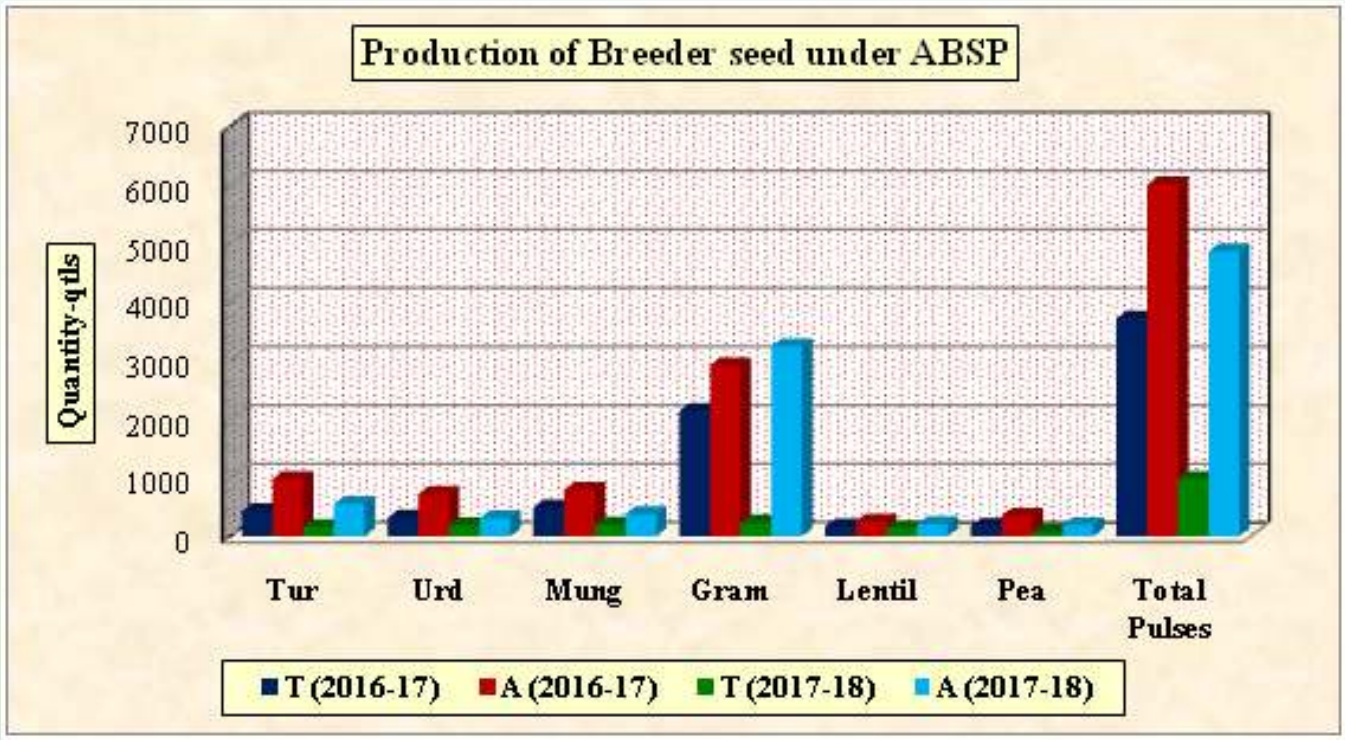


Fig.5.16: Production of Breeder seed under ABSP

B. Infrastructure created under EBSP: Breeder seed infrastructure strengthening comprises of several need based items at different centres such as works (threshing floors), Seed Processing Plants (SPP), Farm implements (tractors, sprinkler systems, power sprayers, Rotavator, BBF Planter, Ridge Planter, Storage godown, irrigation channel, fencing, bore-well, power thresher, seed-cum ferti-drill, pick-up van, irrigation pipes, hydraulic trolley, gravity separator, weighing machines, combine harvester).

(Table-5.15): Infrastructure: Strengthening of seed production farms

Allocation (Rs. Crore)

States	Institutes		Infrastructural Activities			
		Alloc.	CW	SPU	FI	Total
Madhya Pradesh	ICAR-IIPR, RS-Phanda, Bhopal	2.75	02	01	02	05
	JNKVV, Jabalpur	1.90	06	-	02	08
	RVSKVV, Gwalior	0.92	02	-	17	19
Bihar	Agril. University, Sabour (Bihar)	1.95	03	01	02	06
Rajasthan	ARS, Kota Agri. University, Kota	1.80	05	02	08	15
	RARI, Durgapur, Shri Karan Narendra Agri. University, Jobner	1.47	02	02	04	08
Maharashtra	Agril. Research Station, Badnapur, VNM Krishi vidyapeeth Parbhani	1.45	05	01	01	07
	MPKVV, Rahuri	1.58	04	-	05	09
Uttar Pradesh	ICAR-IIPR, Kanpur	1.65	04	01	-	05
Andhra Pradesh	Agril. Research Station, LAM, ANGRAU	1.75	03	02	-	04
Karnataka	UAS, Dharwad	1.77	-	-	03	03
Odisha	Agril. Research Station, Berhampur, OUAT, KrishiBhubneshwar	1.40	03	01	01	05
Total- 08	**12**	**20.39**	**39**	**11**	**45**	**94**

SPU-Seed Processing Unit; FI-Farm Implements; CW-Civil Work; Alloc.-Allocation

NFSM EBSP : INFRASTRUCTURE CREATED

ICAR- IIPR Research Station -Phanda, Madhya Pradesh

JNKVV, Jabalpur, Madhya Pradesh

JNKVV, Jabalpur, Madhya Pradesh

Karnataka

EBSP : INFRASTRUCTURE AND SEED PRODUCTION

NFSM-EBSP : Seed Godwon, ZARS- Pawarkheda (M.P.)

NFSM-EBSP : Implements- Cultivator ZARS- Pawarkheda (M.P.)

EBSP-Moong- Breeder Seed Production, Var. Shikha, JNKVV, Jabalpur, (M.P.)

EBSP- Threshing Floor, Tikamgarh, (Bundelkhand), M.P.

C. Breeder seed production under new varieties

Breeder Seed

- During 2014-15 Breeder seed production and indent was 10,910qtls. and 9702 qtls respectively. During 2016-17 both the production and indent increased by 40%and 37% (15242 qtls/13236 qtls) over the base year 2014-15. New varieties of pulses put to seed chain. The crop-wise production and indent of breeder seed is given as under (Table-5.16).

(Table- 5.16): Breeder seed production and indent

(Quantity-qtls)

Crop	2014-15		2015-16		2016-17		2017-18	
	Indent	Prod.	Indent	Prod.	Indent	Prod.	Indent	Prod.
Pigeonpea	390	653	226	734	308	653	351	735
Chickpea	6742	7464	7184	7630	10119	11174		
Mungbean	932	857	702	686	811	890	970	912
Urdbean	424	485	424	296	454	513	457	364
Lentil	259	312	449	474	467	535		
Fieldpea	464	637	1215	759	611	777		
Horsegram	8	4	10	2	17	21	25	41
Mothbean	95	36	59	23	62	66	25	42
Rajmash	4	88	2	7	3	14		
Lathyrus	4	88	9	14	115	166		
Clusterbean	341	272	269	257	227	289	231	306
Cowpea	39	14	168	26	42	144	19	31
Total	**9702**	**10910**	**10717**	**10908**	**13236**	**15242**	**2078**	**2431**

Source: ICAR-IIPR, Kanpur, U.P.

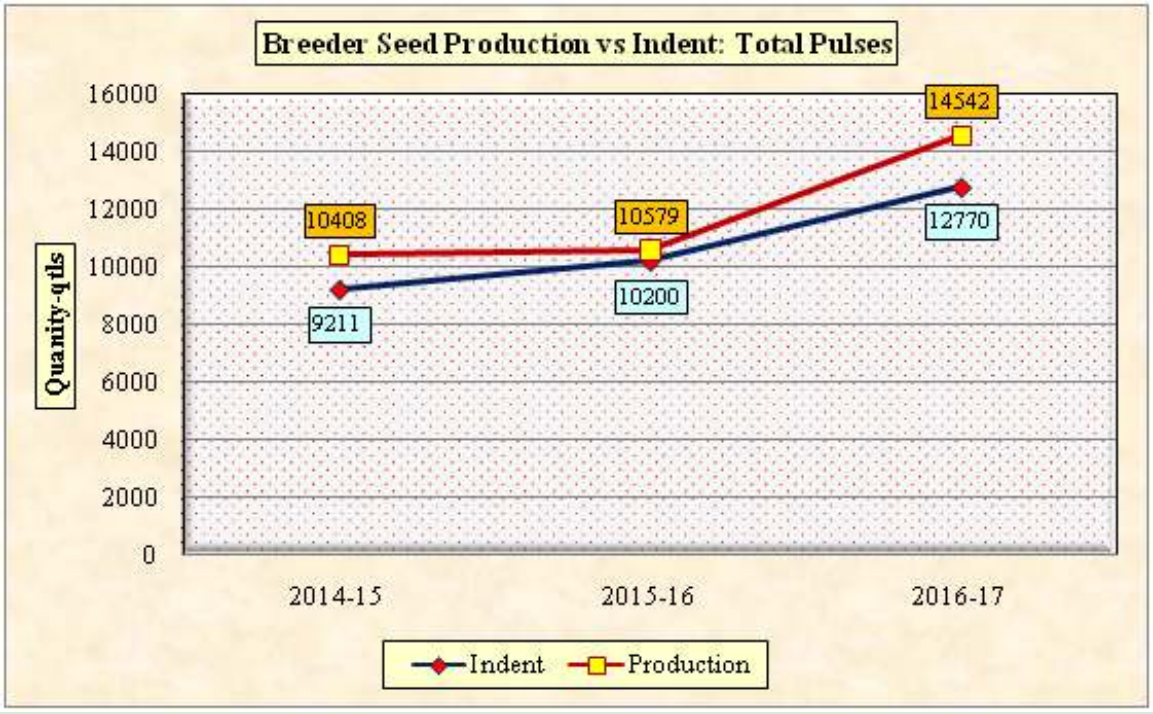


Fig.-5.17: Breeder Seed Production vs Indent: Total Pulses

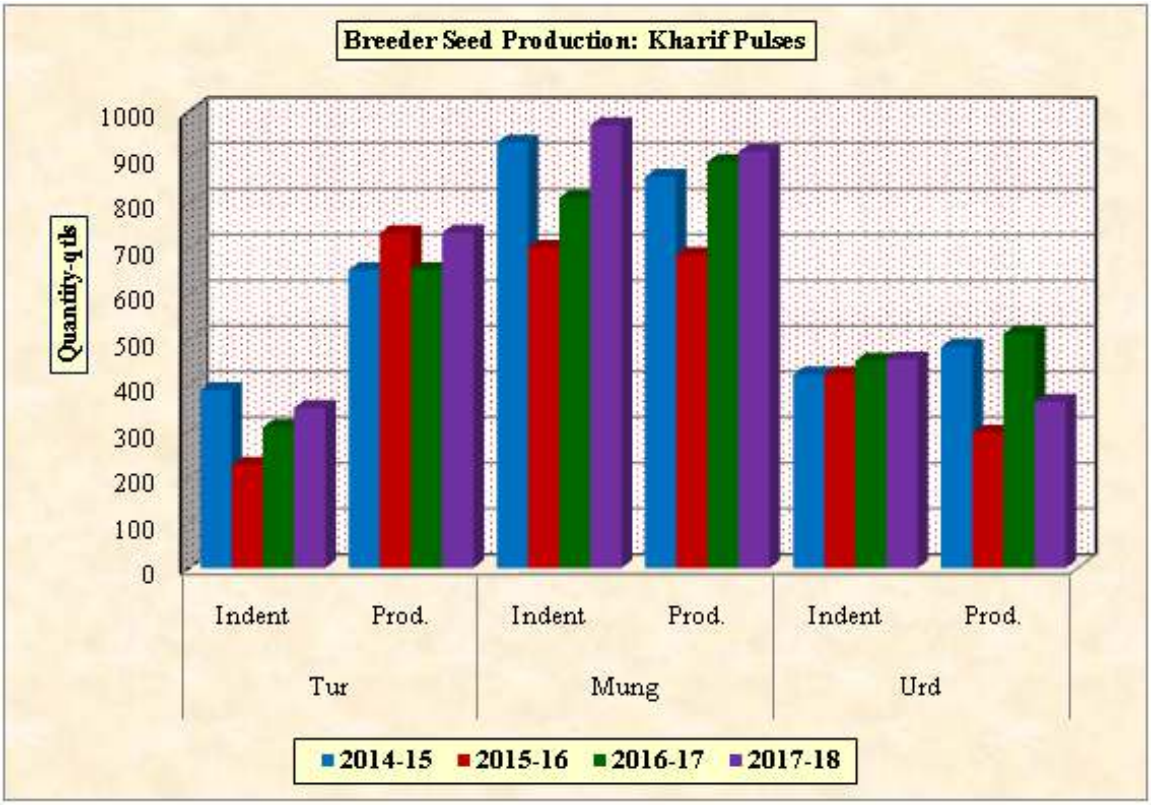


Fig.-5.18: Breeder Seed Production: Kharif Pulses

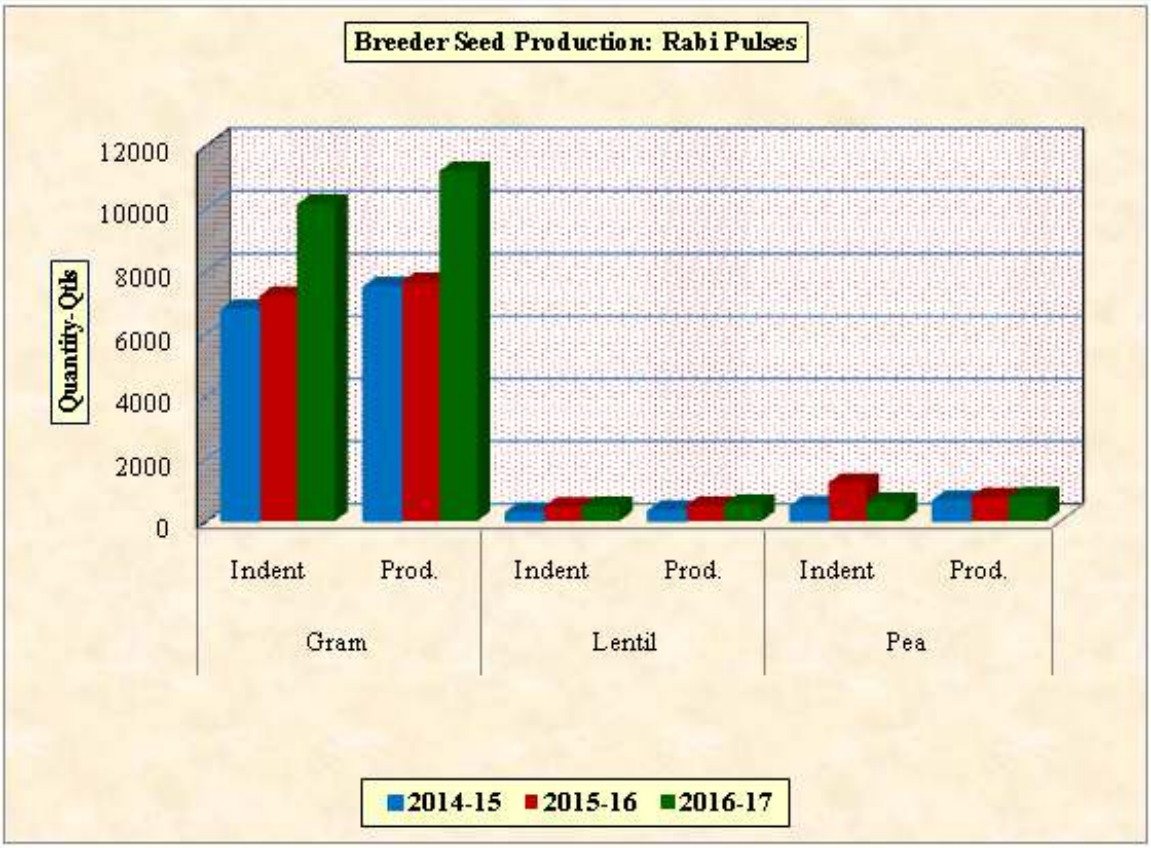


Fig.-5.19: Breeder Seed Production: Rabi Pulses

- The seed production subsidy was one of the major initiatives during 2016-17. The quality pulse seed produced by various public sector/central agencies has been about 2.65 lakh qtls during 2016-17 and>6.00 lakhqtls in 2017-18. The new/promising varieties were made available to the farmers. The agency-wise quality seed is given below (Table-5.17).

(Table-5.17): Certified seed production programme under NFSM-Pulses

(Quantity-qtls)

Agency	2016-17			2017-18			
	Kharif	Rabi	Total	Kharif	Rabi	Summer	Total
NSC	35413	196720	232133	65000	269000	47000	381000
HIL	2681	23016	25697	22000	69000	3000	94000
KRIBHCO		7140	7140	1650	6060		7710
NAFED				48400	58900		107300
IFFDC				3400	16600		20000
TOTAL	**38095**	**226876**	**264971**	**140450**	**419560**	**50000**	**610010**

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

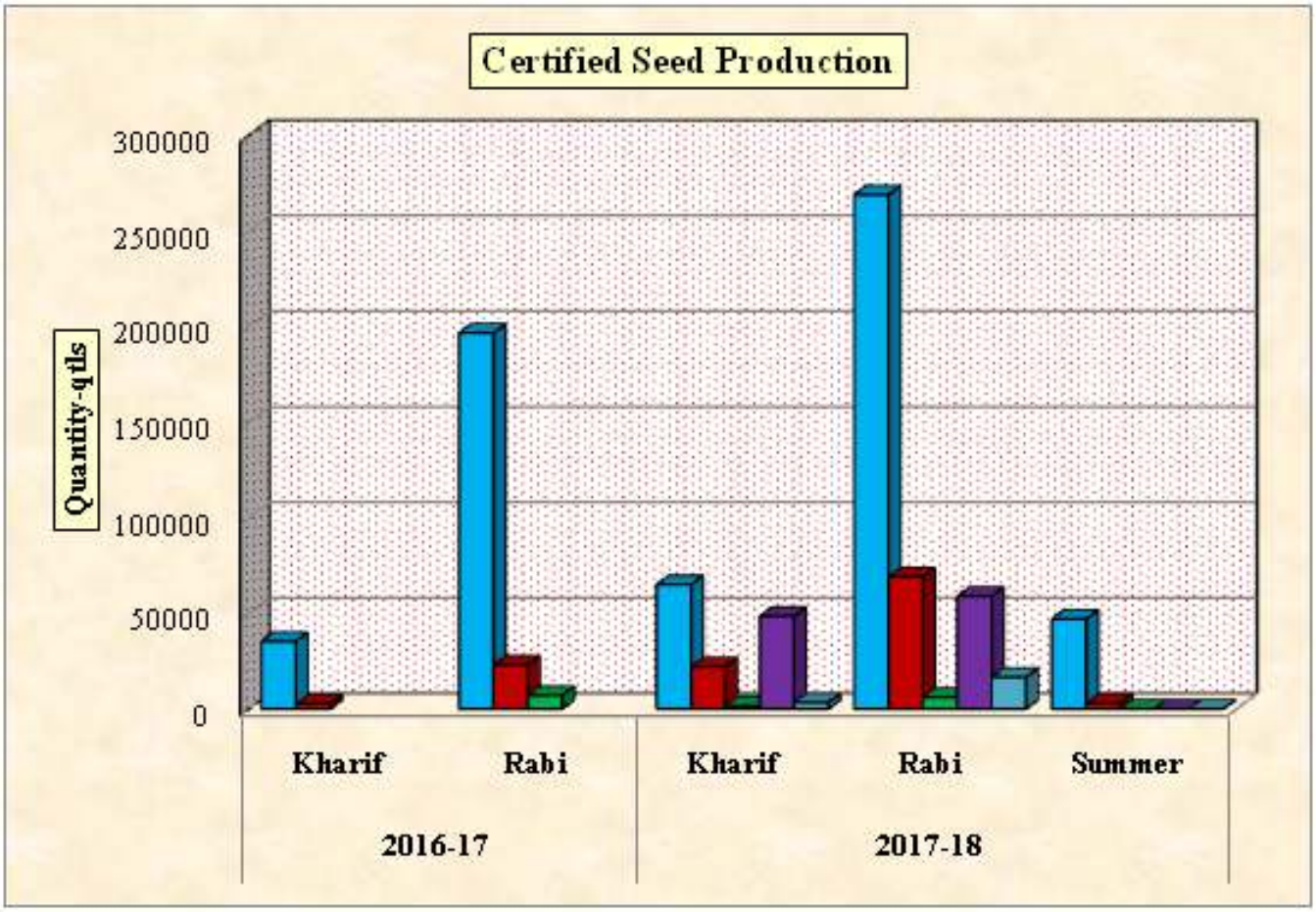


Fig.- 5.20:Availability of Certified Seeds of Pulses Enhanced

- As a result during 2017-18, enhanced availability of > 35.00 lakh qtls certified seeds of improved varieties which is >6.75 lakh qtls(23%) higher the availability over the base year 2014-15.Certifiedseed availability in gram was >2.00 lakh qtls, over it's requirement during 2017-18, followed by urd and mung.
- During 2018-19 the targeted certified seed production is 31.22 lakh quintals.

(Table-5.18): All India: Crop-wise requirement and availability of certified seed

(Quantity- lakh qtls.)

Crop	2014-15 (Base Year)		2015-16		2016-17		2017-18		Change Over
	R	A	R	A	R	A	R	A	(+/-) 2017-18
Gram	16.11	15.72	18.14	14.86	17.65	16.01	17.16	19.27	2.11
Lentil	1.79	1.38	1.30	1.06	1.47	1.15	1.37	1.36	-0.01
Peas	1.96	1.57	2.12	1.83	2.67	2.91	2.39	2.36	-0.03
Urd	2.68	3.31	2.62	2.71	2.67	2.9	2.74	3.74	1.00
Moong	2.79	3.31	2.87	3.23	2.68	3.27	2.41	3.14	0.73
Arhar	2.64	2.78	2.51	2.72	2.71	2.97	3.31	3.81	0.50
Others	0.92	0.81	0.92	0.84	1.81	2.07	1.88	1.96	0.08
Pulses Total	**28.88**	**28.87**	**30.49**	**27.24**	**31.66**	**31.28**	**31.26**	**35.64**	**4.38**

Source: Seed Division, Min. of Agri. & FW (DAC&FW), R- Requirement, A – Availability

Fig.-5.21: Availability of Certified Seed

D. Seed Village Programme

- To address critical input, the seed village programme has been operationalised to improve the quality and stock of farm saved seeds of pulses enhancing crop production/productivity. To upgrade the quality and varieties of farm-saved seeds which is about 80-85% of the total seed used, of cluster of 50 farmers @ 1 acre is provided with 60% financial assistance towards foundation/certified seed of pulses for production of certified/quality seeds. The farmers are also imparted training on seed production technology.
- During 2017-18 the seed production programme was conducted in > 9 lakh ha area by distribution of 7 lakh qtls of seed. In all about 28 lakh farmers were benefitted in > 1 lakh villages of the country. The state-wise detail is as under (Table-5.19).

(Table- 5.19): Seed distribution under Seed Village Programme (2017-18)

S. No.	State Agency name	Area (in ha)	F/C seed distribution (qtls.)	Qty. of Seeds Produced (qtl.)	No. of Seed Villages Organized	Total (M+F)
1	Tamilnadu		102771	228240	3258	450919
2	KOF,Karnatka	551.2	618	0	269	1378
3	ASC-Khrif	44400	16299	774600	1414	212100
4	ASC-Rabi	51450	7980	71100	1715	256290
5	ASC-Summer	19185	6171.6	369718	897	90526
6	ASSCA	6440	2576	80500	161	7793
7	Uttar Pradesh (K)	27350	8997	668189	15971	68376
8	Uttar Pradesh (R)	46564.8	46127	904794	25095	116412
9	IISS, Mau Uttar Pradesh	2699	2645	47678	317	6887
10	Chhattisgarh	173093	49805	1069901	4045	158841
11	Telangana	37650	26562	791495	3765	94125
12	Madhya Pradesh	196838	137612	1308655	7945	415506
13	Bihar (K-17)	18383	5430.1	425355	638	41294
14	Bihar(R-2017-18)	16325	15459	397720	719	52502
15	Uttarakhand K-17	4183	1274	19380	2850	15625
16	Uttarakhand R-17	9057	8467	132898	4256	23957
17	MSSC (R)	6772	88968	1514631	16697	286277
18	MSSC(K)		1768	23576	1433	5894
19	Andhra Pradesh	19370	12201	539040	1937	48425
20	RSSC-K	33167	8065	283548	1415	141456
21	RSSC-R	46581	42291	1319117	1165	116452
22	RSSC-zaid/ summer	2915	583	16300	72	7286
23	Himachal Pradesh	32664	32664	580721	1868	137647
24	Jammu & Kashmir K-17	28208	12491	727253	804	70913
25	Jammu & Kashmir R-18	45960	41112	0	938	124645
26	NSC		0	22022	189	3344
27	IARI, Karnal	52.8	6.6	2376	8	115
28	Odisha	9604	1921	104750	137	9604
29	Meghalya	32815	5913	237980	275	39625
30	Nagaland K-17			3246	27	1350
Total		**912278**	**686777**	**12664783**	**100280**	**3005564**

Source: Seed Division, DAC&FW, N. Delhi

(Table-5.20): State-wise Physical and Financial Progress under Seed Village Programme

(Amount Rs. in lakhs; Qty. in qtl.)

S. No	Name of State	2015-16				2016-17				2017-18			
		Amount Released	Seed Village	Seed produced	farmers Covered/ Benefited	Amount Released	Seed Village	Seed produced	farmers Covered/ Benefited	Amount Released	Seed Village	Seed produced	farmers Covered/ Benefited
1	AP	650	6475	1135919	161850	37	1610	590315	40250	352	1937	539040	48425
2	Assam	1060	2771	1944810	415655	1000				1313	4186	1275918	566709
3	Arunachal Pradesh		36	10900	1800					52			
4	Bihar	600	885	648505	86321	635	376	238916	36210	324	1357	823075	93796
5	CG	245	1243	625093	89986	281	1150	684799	57538	518	4045	1069901	158841
6	Gujarat		58	9025	1223					24			
7	HP	248	1754	638868	172682	375	1498	505268	130480	386	1868	580721	137647
8	Haryana	1	18	1830	191	1	11	3186	154	1	8	2376	115
9	J&K	391	1178	415467	178531	691	1379	898826	208703	899	1742	727253	195558
10	Karnataka	20	380	91730	6372	25	163	51950	2338	83	269		1378
11	Kerala	4	9	18000	404	27							
12	MP	587	2441	1287398	239858	1395	1202	627440	75482	2056	7945	1308655	415506
13	MH		1320	110322	30260	600	729	177460	64318	2431	18130	1538207	292171
14	Meghalaya	98	305	69426	20755	11				142	275	237980	39625
15	Mizoram					25							
16	Manipur	4				55							
17	Nagaland	118					62	3969	2850	47	27	3246	1350
18	Orissa		213	298177	21295		105				137	104750	9604
19	Punjab	318	630	543570	63076				10300				
20	Rajasthan	122	312	296570	19266	101	1621	945361	99898	1511	2653	1625985	265194
21	Sikkim												
22	TN	970	1918	159079	447501	702	2484		707979	1330	3258	228240	450919
23	Tripura												
24	UP	900	2632	426050	62390	124	5149	390280	91511	1436	41383	1620661	191675
25	Uttrakhand	303	2888	75707	49475	88	4468	158819	32435	229	7106	152278	39582
26	Pondi.	0					4		29				
27	Telangana	300	1783	375724	44575	550	2187	423385	54675	936	3765	791495	94125
28	NSC					980					189	22022	3344
29	West Bengal												
Total		**6939**	**29249**	**9182170**	**2113466**	**7701**	**24198**	**5699974**	**1615150**	**14070**	**100280**	**12651803**	**3005564**

Source: Seed Division, Ministry of Agri. & FW, (DAC&FW), N. Delhi

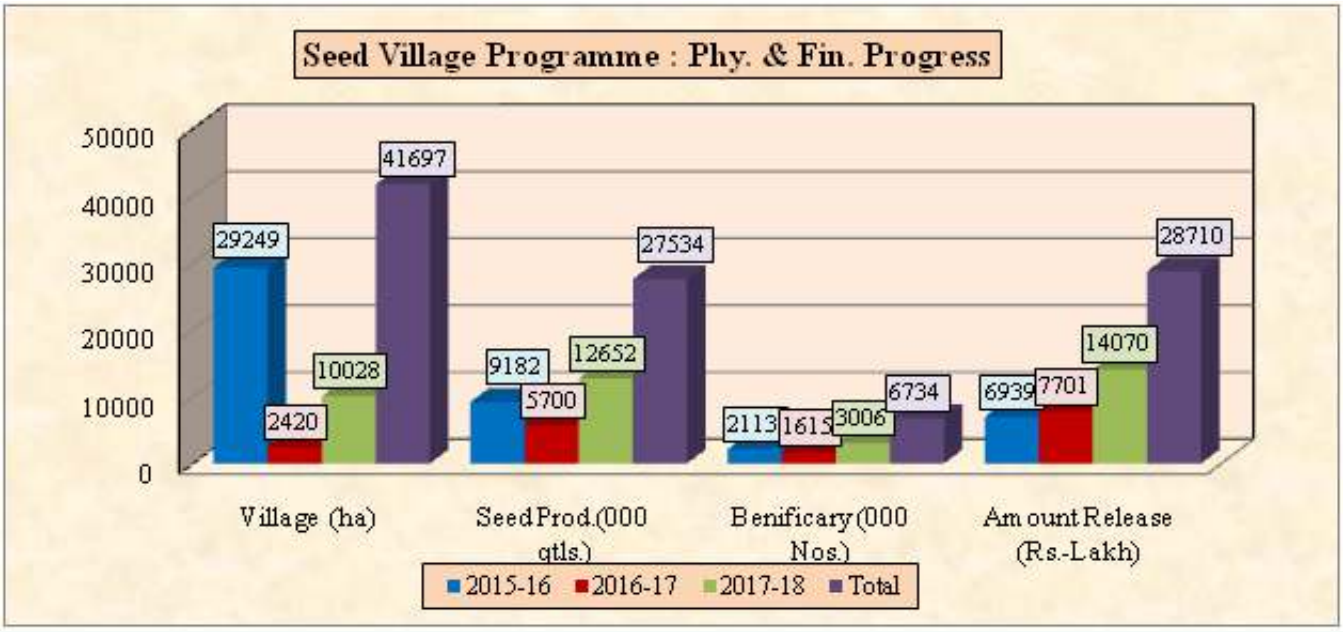


Fig.-5.22: Seed Village Programme - Phy. & Fin. Progress

(Table-5.21): Crop-wise Seeds distributed and produced under Seed Village Programme during 2017-18

(Quantity- 000 Qtls)

Crop	Production	Distribution	% Distributed
Lentil	19.94	1.37	6.89
Gram	925.40	83.33	9.01
Peas	6.78	1.07	15.74
Arhar	76.61	1.96	2.56
Moong	245.91	9.09	3.70
Urd	65.14	17.40	26.72
Moth	58.92	1.47	2.50
Rajmash	3.26	0.37	11.31
Lathyrus	0.84	0.06	7.61
Lobia	7.51	0.46	6.10
Total	**1410.32**	**116.59**	**8.27**

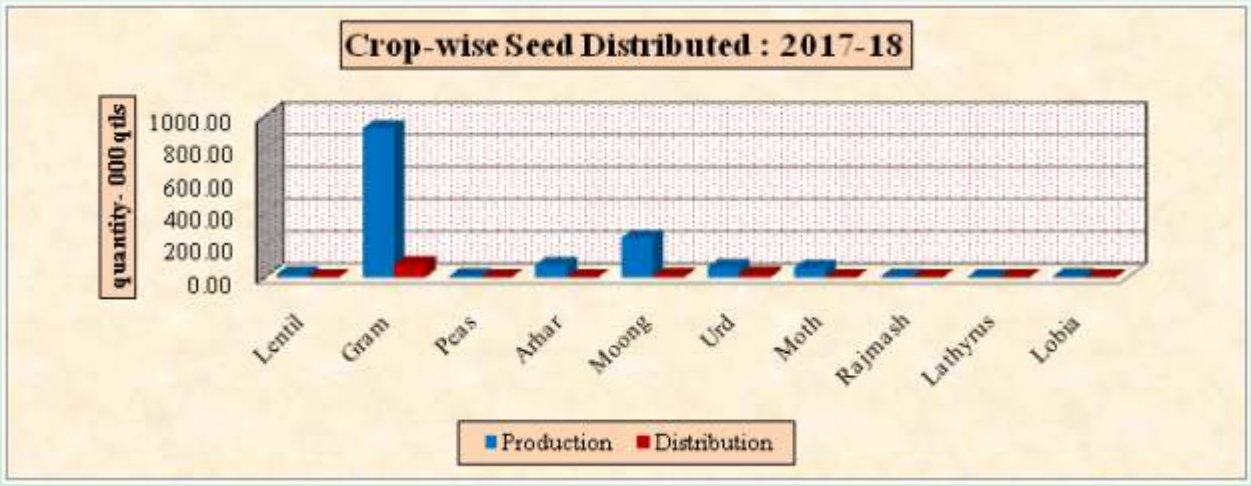


Fig.-5.23: Crop-wise Seed Distributed - 2017-18

E. Seed Replacement Rate (SRR)

- The proactive efforts and various seed related programmes after 2014-15 has resulted to increase in the SRR in most of the pulses. The targeted SRR of 33% for self-pollinated crops was not only achieved, but also increased with a number of HYVs in the seed-chain. The details SRR is given below (Table-5.22).

(Table-5.22): Crop-wise & Year-wise SRR

(SRR-Per cent)

Crop	2014-15	2015-16	2016-17
Urd	30	34	38
Moong	24	31	34
Arhar	41	45	48
Pea	34	30	30
Gram	25	28	32
Lentil	31	27	35

Source: Seed Division, Min. of Agri. & FW (DAC&FW)

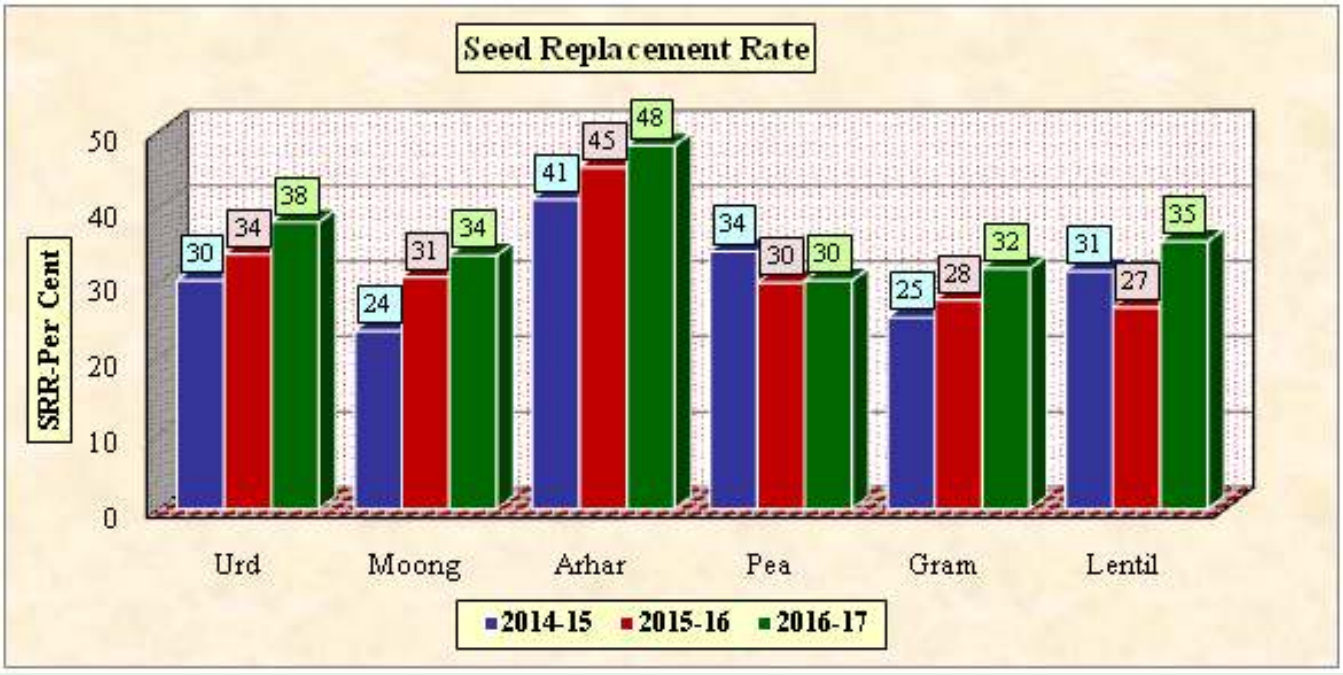


Fig.-5.24: Seed Replacement Rate

F. Creation of Seed-Hub

- To enhance the quality and quantity of pulses seed in the country, a project on creation of seed-hubs (2016-17 to 2018-19) has been initiated under (NFSM) with the mandated objectives and targeted seed production of latest varieties (150 locations in 24 states, at ICAR Institutes 07, ICAR-AICRPs centers - 46, KVKs-97) across 24 states in the country. Each seed hub has to produce 1000 qtls of seed per year.
- With Budgetary allocation of Rs. 225.31 crores, each Seed-Hub has a financial assistance of Rs. 1.50 crore (infrastructure- Rs. 50 lakh for Storage of seeds/processing + Rs. 100 lakh revolving fund towards production, procurement, processing, of seeds during 2016-17 and 2017-18).Almost 90% of infrastructure has been completed and production has already started from 2016-17.
- Crop-wise/Centre-wise targets for quality seed production and state-wise permanent structure/Seed Processing Units (SPU) created are given below (Table-5.23)

(Table-5.23): All India-Crop-wise seed prod. target and achievement under seed-hub

(Qty.: in qtl)

Crops	2016-17		2017-18		2018-19	Total		
	Target	Ach.	Target	Ach.	Target	Target	Ach.	% Ach.
Pigeonpea	15750	6865	25540	17927	31100	72390	24792	34
Urd	8675	4553	15850	15520	18600	43125	20073	47
Moong	16225	5857	28900	21050	34100	79225	26907	34
Chickpea	20510	11921	28700	39058	34150	83360	50979	61
Lentil	7325	4642	11550	9821	13700	32575	14463	44
Fieldpea	9550	1754	12530	4826	14500	36580	6580	18
Lathyrus	150	55	250	532	350	750	587	78
Rajmash	350		450	851	550	1350	851	63
Cowpea	900	222	2150	1316	2050	5100	1538	30
Mothbean	150	46	550	475	700	1400	521	37
Horsegram	400	64	600	425	650	1650	489	30
Total Pulses	**79985**	**35979**	**127070**	**111801**	**150450**	**357505**	**147780**	**41**

Source: ICAR-IIPR, Kanpur

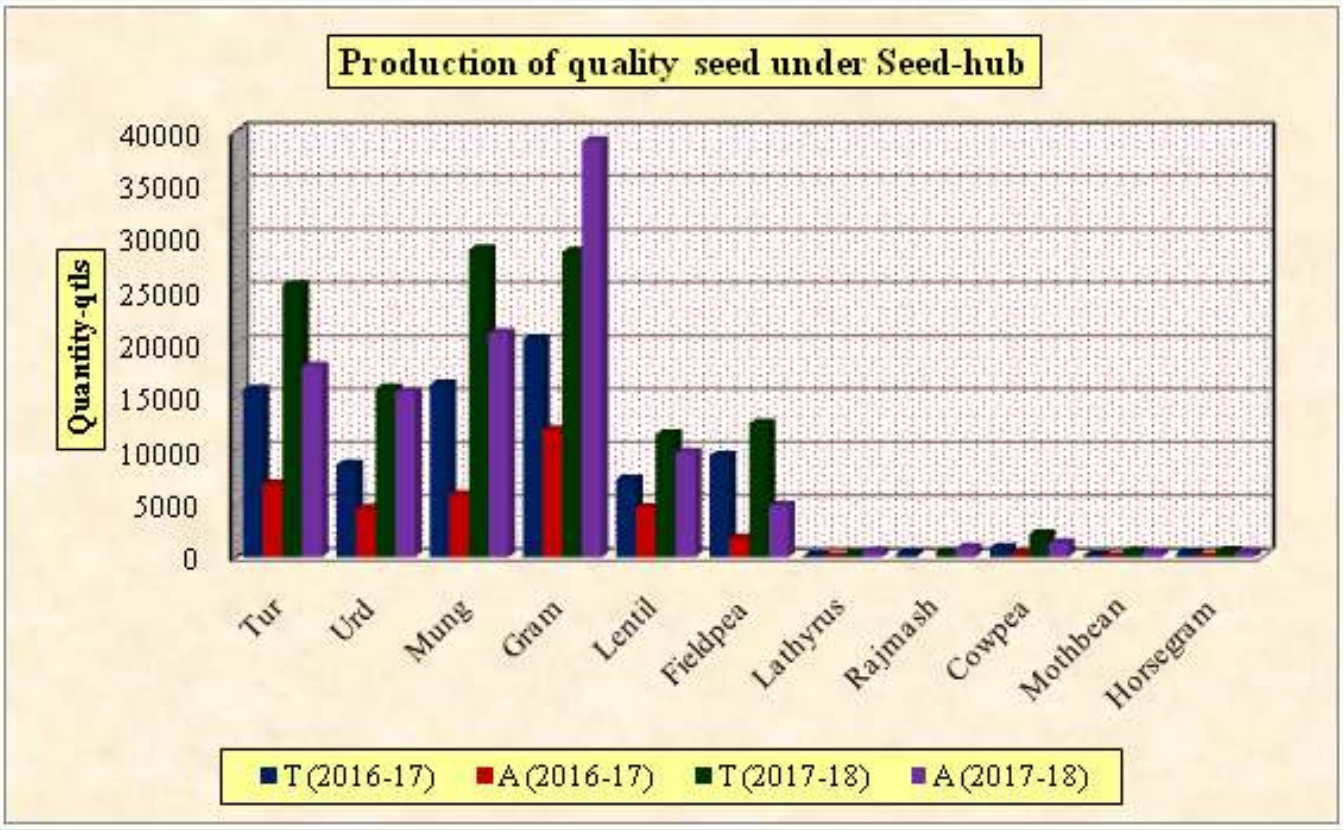


Fig.-5.25: Production of quality seed under Seed-hub

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Andhra Pradesh

Andhra Pradesh

Assam

Chhattisgarh

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Bihar

Bihar

Gujarat

Haryana

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Himachal Pradesh

Jharkhand

J&K

Kerela

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Karnataka

Karnataka

Madhya Pradesh

Maharashtra

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Maharashtra

Odisha

Rajasthan

Rajasthan

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

Telangana

Uttar Pradesh

Tamilnadu

Tamilnadu

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB

West Bengal

West Bengal

STATE-WISE INFRASTRUCTURE CREATED UNDER SEED HUB NORTH-EAST STATES

Nalbari

Kamrup

Jorhat

CAU, Imphal

Lakhimpur

RARA, Nagaon

G. Distribution of Pulses Seed Minikits

- For introduction and popularization of latest released/ pre-released HYVs of pulse crop within 10 years of release, seed minikits distribution programme has been initiated since 2016-17, including those belonging to below poverty line, to encourage farmers for seed multiplication of various crops at grass root level.
- A total of 7.85 lakh minikits of different sizes of pulse crop have been distributed during kharif, rabi and spring/summer of 20. Agencies involved in supply of seed minikits are NSC, NAFED, IFFDC, HIL, KRIBHCO. Looking to the success of this intervention, >15% increase of seed minikits >09 lakh nos.(8,31,484 nos. have been distributed against the allocation of 9,15,900 numbers) are to be distributed during 2017-18 at a total budget outlay of Rs.76.71 crore.
- The crop-wise, season-wise, state-wise details of seed minikit/varieties are given below (Table-5.24 to 5.30).

(Table-5.24): Crop-wise Distribution of Seed-Minikits (2016-17 to 2018-19)

(Qty: qtl./Rs. in Cr)

Season / Crop	Seed Minikit Distribution					
	2016-17		2017-18		2018-19*	
	No.	Qty.	No.	Qty.	No.	Qty.
Kharif						
Arhar	56900	2276	50750	2030	120175	4807
Urad	93750	3750	165000	6600	93281	3731
Moong	132550	5302	131875	5275	188188	7528
Kharif Total	283200	11328	347625	13905	401644	16066
Rabi						
Gram	168151	26904	222250	35560	209731	33557
Moong	39000	1560			30000	1200
Urad	85000	3400				
Lentil	69938	5595	48125	3850	152875	12230
Rabi Total	362089	37459	270375	39410	392606	46987
Summer						
Urad	35000	1400	117500	4700	11900	476
Moong	105000	4200	74000	2960	93850	3754
Summer Total	140000	5600	191500	7660	105750	4230
Grand Total	**785289**	**54387**	**809500**	**60975**	**900000**	**67283**
Total Budget Allocation	**61.74**		**75.01**		**76.71**	

Note: Kit size- Arhar, Urd, Mung @ 4kg; Gram @ 16 kg; Lentil @ 8kg each 2018-19 - Target*

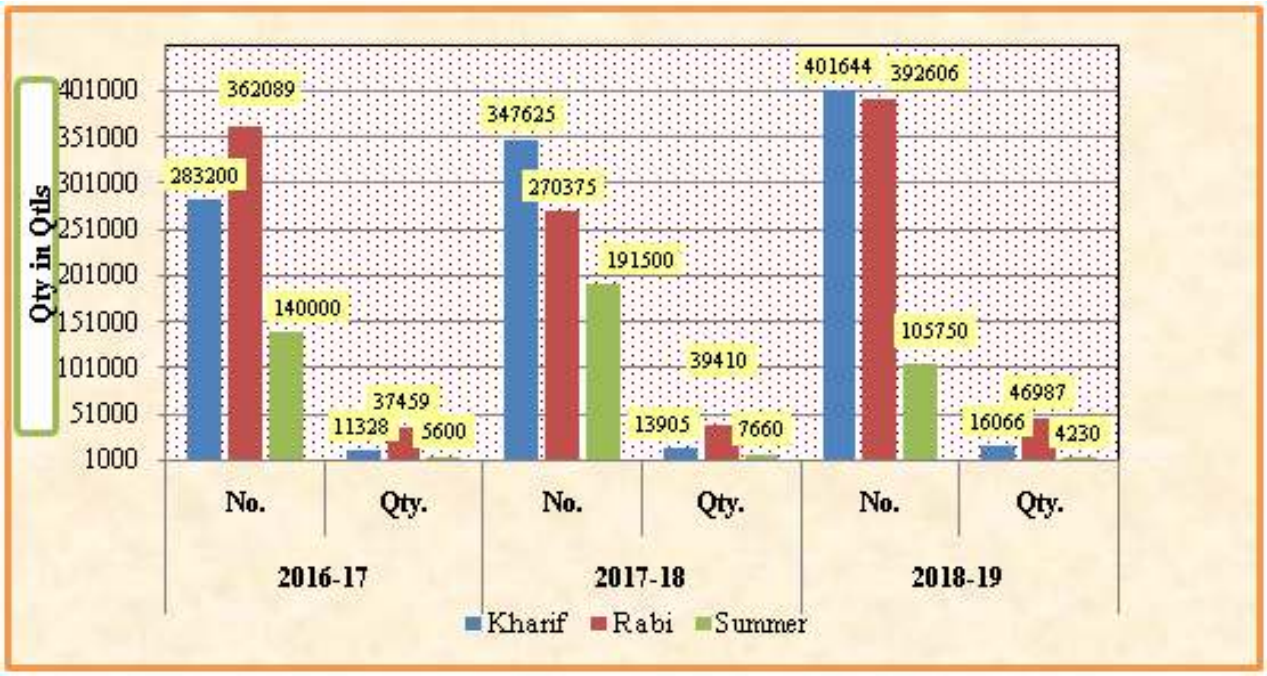


Fig.-5.26:Crop-wise Distribution of Seed-Minikits

(Table-5.25): State-wise distribution of seed minikit (2016-17 to 2017-18)

(Minikits-Numbers)

S. No	States	2016-17				2017-18			
		Kharif	Rabi	Summer	Total	Kharif	Rabi	Summer	Total
1	Andhra Pradesh		19500		19500	6249	37500	41000	84749
2	Arunachal Pradesh	500			500				
3	Assam	900	2700		3600	3166			3166
4	Bihar	3000	500	10000	13500	24999	10000	25000	59999
5	Chhattisgarh	7000	29000	4825	40825	13875	31874	2500	48249
6	Gujarat	5778	2202		7980	12500	4358		16858
7	Haryana		1347		1347	12500	11185		23685
8	Himachal Pradesh	485			485				
9	Jammu & Kashmir	500			500		625	4980	5605
10	Jharkhand	10285	5223		15508	12460	15625		28085
11	Karnataka	2550	7800		10350	25850	6250	600	32700
12	Kerela	500			500	5000			5000
13	Madhya Pradesh	9200	12915	25000	47115	21580	34373		55953
14	Maharashtra	28373	13692		42065	10792	31784		42576
15	Manipur	500			500				
16	Meghalaya	500			500				
17	Mizoram	500			500				
18	Odisha	8000	20668		28668	14000	37500		51500
19	Punjab		565		565	13375	9063	12500	34938
20	Rajasthan	29724	18950		48674	74400	48750	30000	153150
21	Tamilnadu		13500		13500	17700		13500	31200
22	Telangana	2600	9938		12538	2718			2718
23	Tripura	500	500		1000	1000		2500	3500
24	Uttar Pradesh	14751	55566	50870	121007	49998	69211	16900	136109
25	Uttarakhand	1500			1500	4244	6250		10494
26	West Bengal		11000	6750	17750	1250			1250
	Total	**127646**	**225566**	**97445**	**450477**	**327656**	**354348**	**149480**	**831484**

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

(Table-5.26): Agency–Wise distribution of seed minikit (2016-17)

(Minikits-Numbers)

S. No	Agency	Kharif		Rabi		Summer	
		Target	Achievement	Target	Achievement	Target	Achievement
1	NSC	182200	101266	252470	142857	15000	-
2	NAFED	12000	11200	20000	20000	25000	25000
3	HIL	89000	15180	61250	42610	100000	72445
4	KRIBHCO	-	-	12500	4230	-	-
5	IFFDC	-	-	15869	15869	-	-
	Total	**283200**	**127646**	**362089**	**225566**	**140000**	**97445**

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

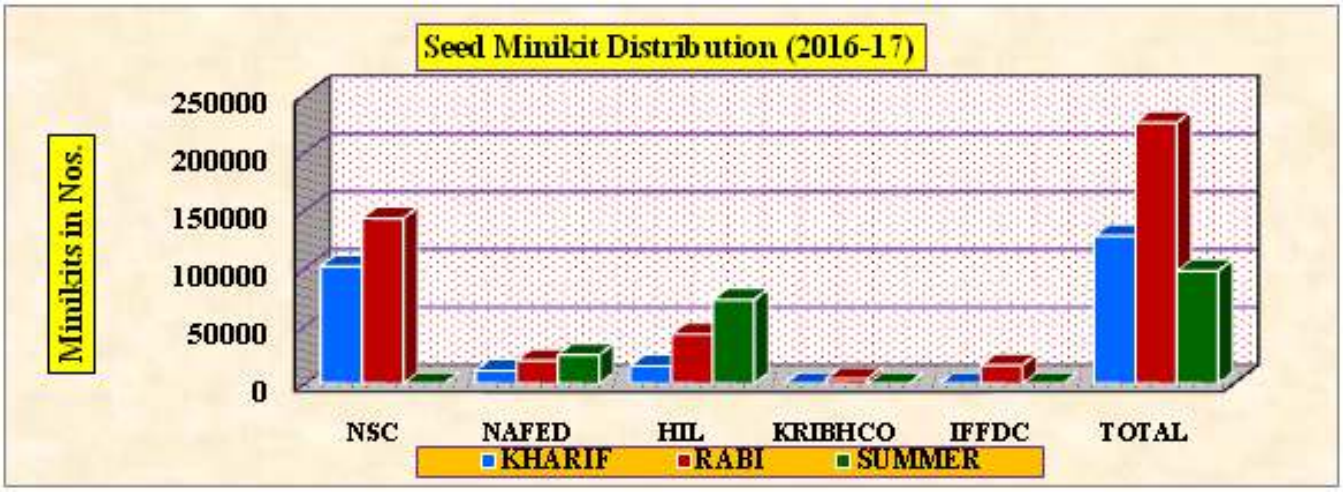


Fig.-5.27: Agency –Wise Seed Minikit Distribution (2016-17)

(Table-5.27): Agency-wise distribution of seed minikit (2017-18)

(Minikits-Numbers)

S. No	Agency	Kharif		Rabi		Summer	
		Target	Achievement	Target	Achievement	Target	Achievement
1	NSC	131225	113168	200400	190398	111500	85080
2	NAFED	112500	111590	82250	82248	-	-
3	HIL	61500	60498	41875	30183	80000	64400
4	KRIBHCO	17400	17400	16000	16000	-	-
5	IFFDC	25000	25000	36250	35519	-	-
	Total	**347625**	**327656**	**376775**	**354348**	**191500**	**149480**

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

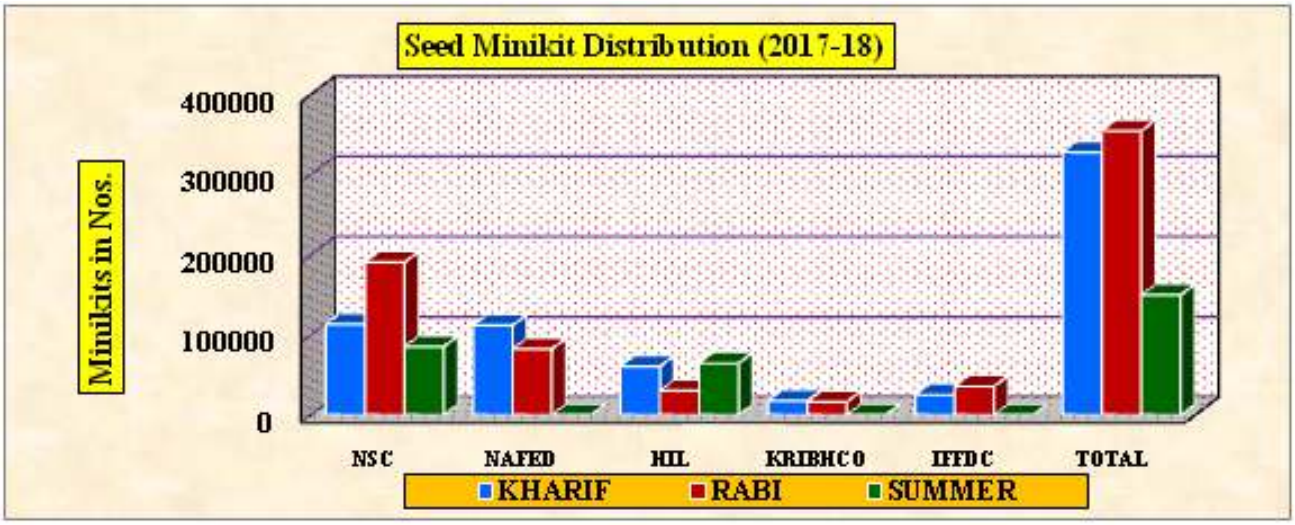


Fig.-5.28: Agency –Wise Seed Minikit Distribution (2017-18)

(Table-5.28): Minikits distribution during kharif 2018-19

S. No.	Agency	Target		Distribution (as on 15.06.2018)	
		Phy (Nos.)	Fin. (Nos.)	Nos.	%
1	NSC	276856	13.00	249724	90.2
2	NAFED	35000	1.68	34860	99
3	HIL	20000	0.90	20000	100
4	IFFDC	47250	2.13	46174	98
5	KRIBHCO	23538	1.05	23538	100
	TOTAL	**402644**	**18.76**	**374296**	**92.96**

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

(Table-5.29): Pulses minikits distri. in aspirational districts during kharif 2018-19

S. No.	Agency	Target		Distribution (as on 15.06.2018)	
		Phy (Nos.)	Fin. (Nos.)	Nos.	%
1	NSC	124100	5.59	Not reported	-
2	NAFED	60000	2.69	60000	100
3	HIL	20000	0.89	NR	-
4	IFFDC	1000	0.045	1000	100
5	KRIBHCO	4000	0.17	4000	100
	TOTAL	**209100**	**9.39**	**65000**	-

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

(Table-5.30): Varieties distributed under seed-minikit

Season/Crop	Varieties distributed
Kharif	
Arhar	LRG-41 (LAM-41), Narendra Arhar-2 (NDA-98-1), TJT-501, BDN-711, BRG-2, BRG-2, BRG-4, BRG-5, ICPH-2740, VL Arhar-1 (ICPL-88039), Pant Arhar-291, TS3R, BDN-711, PKV Tara.
Urdbean	Pant Urd-31, Azad Urd-2, Azad Urd-3, Pant Urd-40, IPU-02-43, Mash-479, Pratap Urd-1, Mash-479 (KUG-479)
Mungbean	IPM-02-14, IPM-02-03, MH-421, HUM-16, TJM-3, Sattya (MH-2-15), PUsa-672, BM-2003-2
Rabi	
Gram	JAKI-9218, Pusa-547 (BGM-547), GJG-3, GNG-1958 (Marudhar), JG-14, JG-6, JG-63, CSJ-515, RSG-974 (Abhilasha), RSG-896 (Arpan), RSG-902, RSG-911 (Aparna), GNG-1581 (Gangaur), RVG-203, NBeG-3, RVG-202, JG-12
Urdbean	IPU-2-43, PU-31
Mungbean	IPM-02-14
Lentil	Moitree (WBL-77), Pant Lentil-8, VL-126, IPL-316 (Shekhar Masoor-3), KLB-320,
Spring/Summer	
Urdbean	PU-31, Mash-479 (KUG-479)
Mungbean	IPM-02-03, MH-421, TJM-3, SML-832, IPM-02-14, Pant Mung-5, IPM-205-07 (Virat), Sikha (IPM-410-03).

Source: NFSM Cell, Min. of Agri. & FW (DAC&FW)

Technology demonstrations : Tur on rice bund

(Area-hectare)

Particulars/Year	2014-15	2015-16	2016-17	2017-18
Redgram on rice bunds				
Target	33355	34830	30629	310000
Achievement	15579	63590	30392	298536

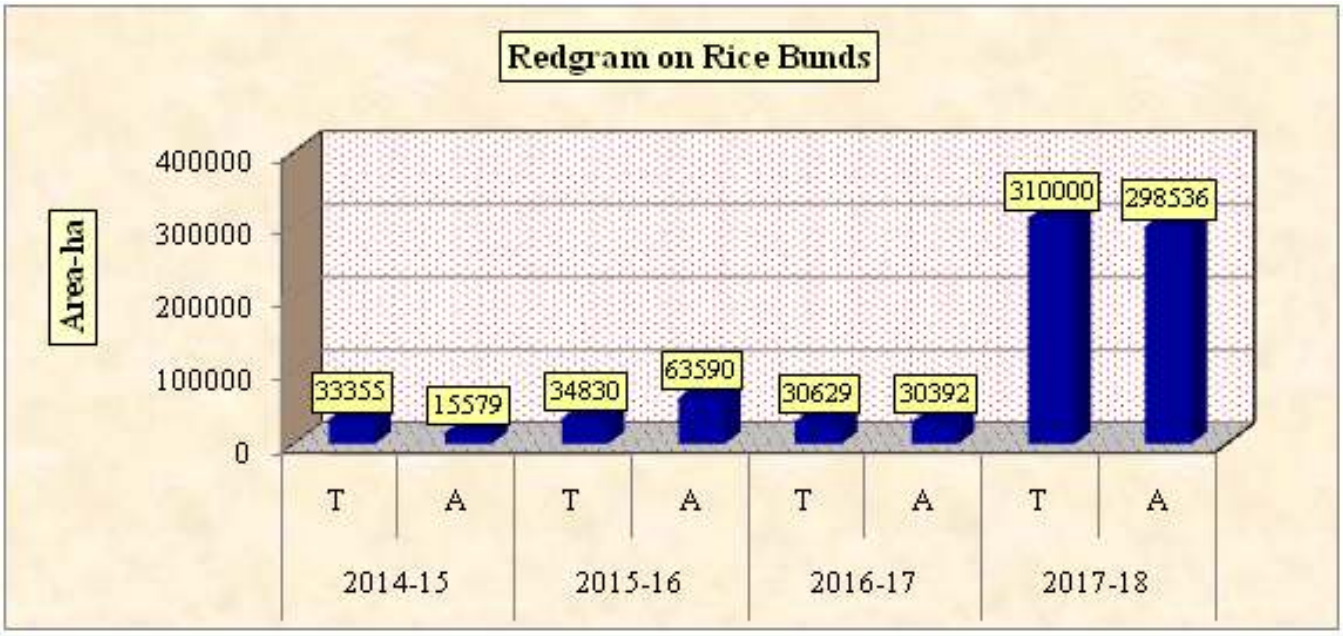


Fig.-5.29: Technology Demonstrations- Tur on bunds

5.1.1Value addition: dhal mill/processor

(Dal Mill-Numbers)

Particulars/Year	2016-17	2017-18
Target	767	1879
Achievement	118	301

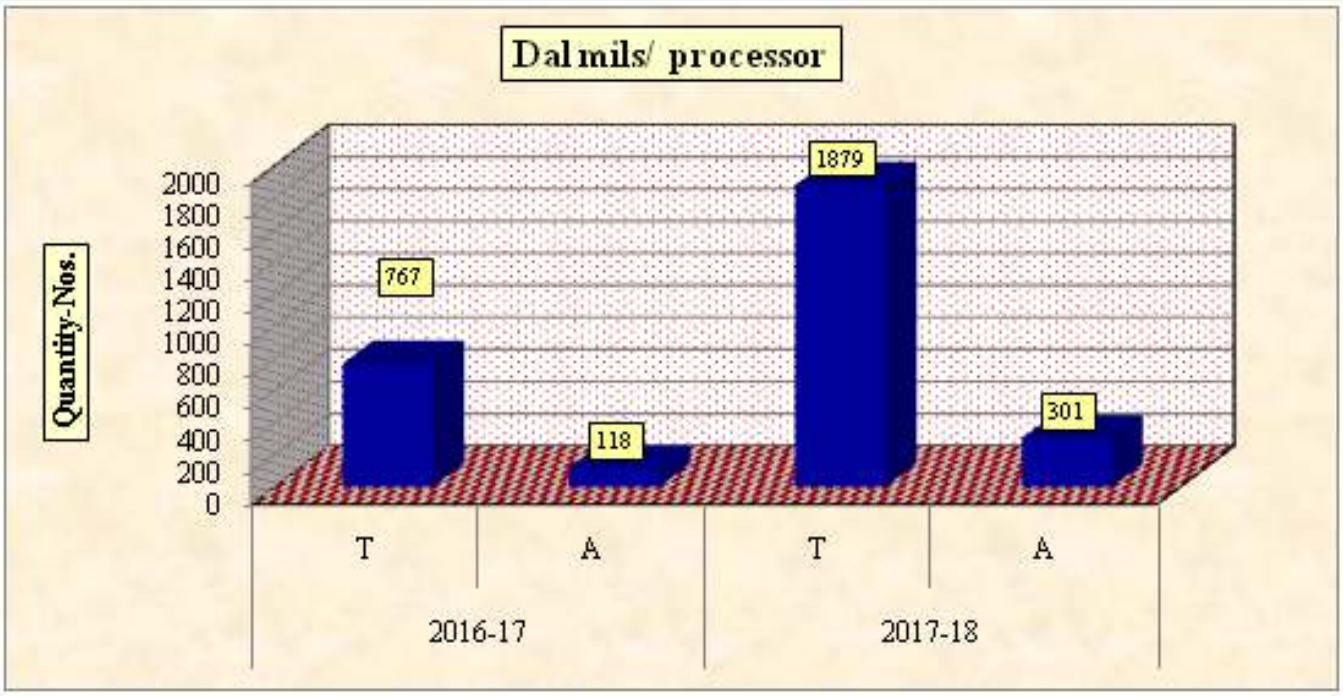


Fig.-5.30: Value Addition: Dhal Mill Processor

Remunerative price to pulse grower

Enhanced procurement of pulses: (2014-15 to 2017-18)

- NAFED has done record procurement of pulses jointly with SFAC and FCI during the year 2017-18 under Price Support Scheme (PSS) and Price Stabilization Funds (PSF), funded by Ministry of Agri. & FW. It procured more than 2008.52 thousand MT of Pulses (Gram 188.59 thousand MT, Masoor 27.07 thousand MT, Moong 407.74 thousand MT, Urd 290.62 thousand MT and Tur 1094.49 thousand MT).
- NAFED has been involved in creating buffer stocks and stabilizing the prices of Pulses. A substantial quantity from buffer stock has been proposed to be supplied to Para-military and Defense forces. Also the supplies will be made to state governments as per their requirements under PDS and other such schemes. Consequently, the procurement agency has positioned itself as the 'Pulse Arm' of the government.
- The total monetary investment towards procurement of total pulses during 2017-18 is Rs. 10.57 Cr by alone NAFED. Crop-wise and state-wise procurement of total pulses is given in (Table 5.31 to 5.33).

(Table-5.31): Crop-wise procurement of pulses enhanced

(Qty. in 000 MT, Rs. in Crore)

Crop	2014-15		2015-16		2016-17		2017-18	
	Qty.	Amt.	Qty.	Amt.	Qty.	Amt.	Qty.	Amt.
Arhar/Tur	6.30		92.85	0.40	1567.37	4.68	1094.49	5.79
Urd			33.07	0.05	183.19	0.56	290.62	1.56
Mung					430.41	1.08	407.74	2.23
Gram	775.13	1.12			287.67	0.36	188.59	0.88
Lentil					80.02	0.35	27.07	0.11
Total	**781.43**	**1.12**	**125.92**	**0.45**	**2548.66**	**7.03**	**2008.52**	**10.57**

Source: NAFED, New Delhi.

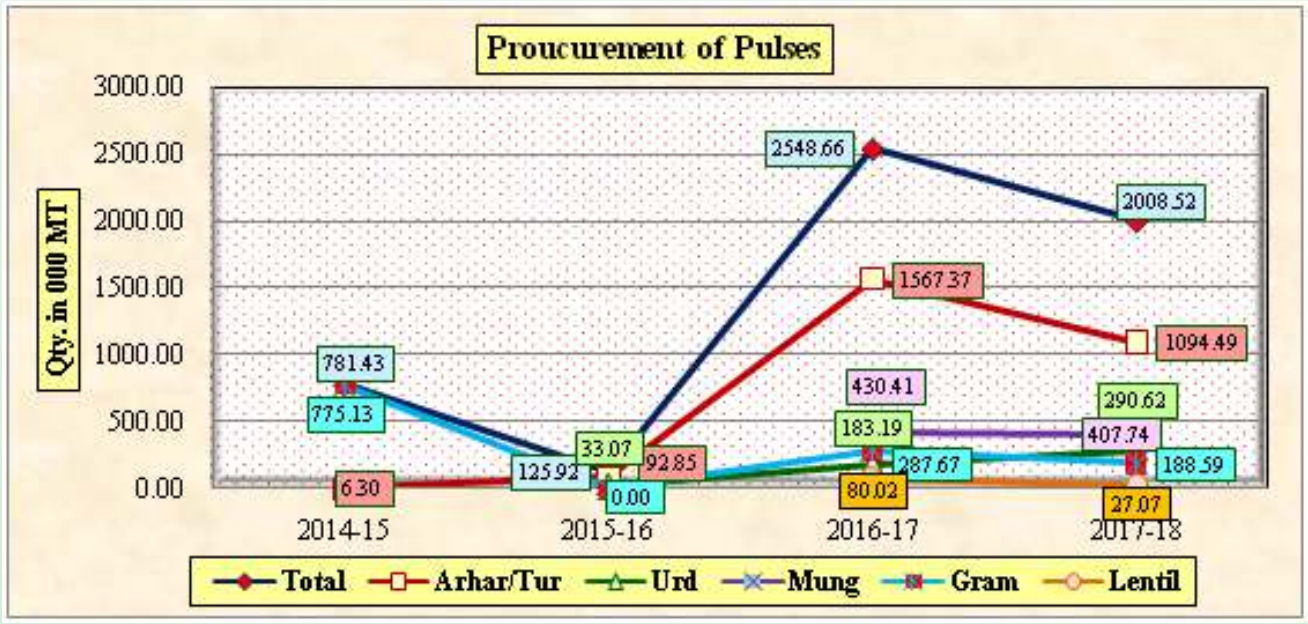


Fig.-5.31: Quantity Procured under MSP

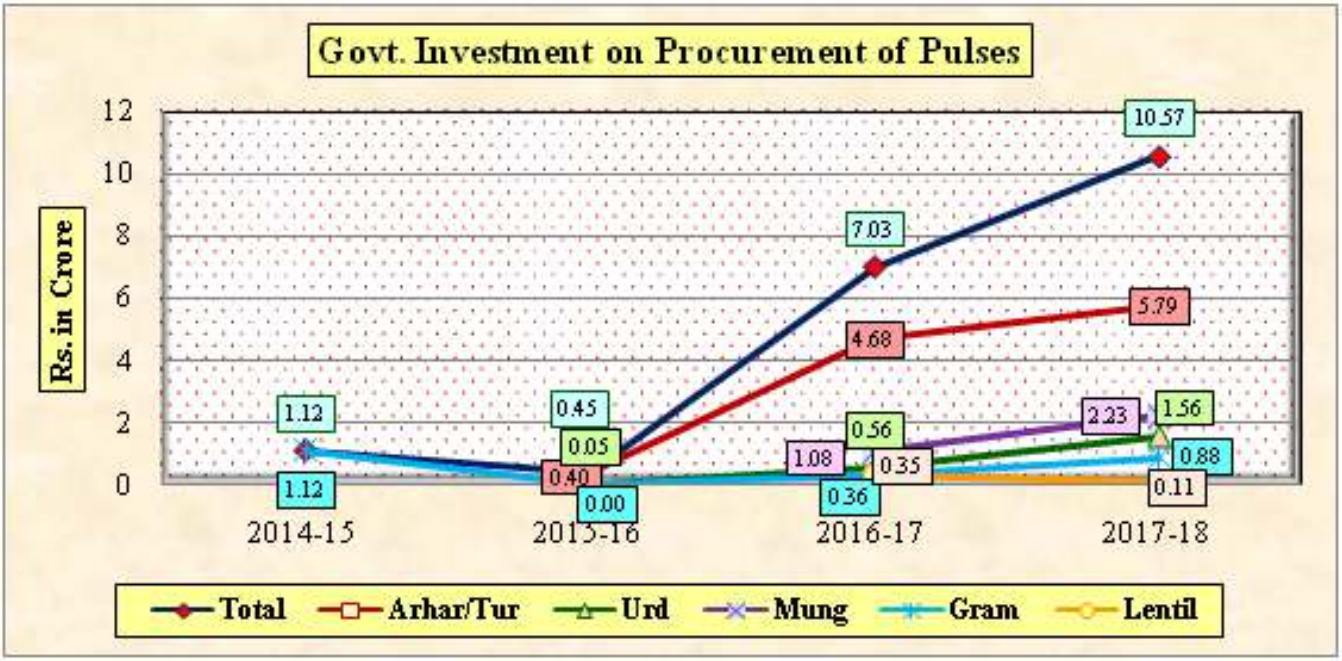


Fig.-5.32: Values of Procured Pulses under MSP

(Table-5.32): State-wise procurement of pulses under MSP (PSS)

State	Qty. Procured (000 Million tonnes)		Value (Rs. Crore)	
	2001-02 to 2013-14	2014-15 to 2018-19	2001-02 to 2013-14	2014-15 to 2018-19
Andhra Pradesh	49.05	213.00	172.22	970.29
Gujarat	29.70	270.95	41.99	1385.71
Karnataka	28.77	791.15	68.48	4043.19
Madhya Pradesh	260.63	953.26	377.38	4322.05
Maharashtra	104.68	956.72	334.25	4962.82
Rajasthan	92.87	967.48	153.48	4648.05
Telangana	0.00	303.35	0.00	1549.79
Uttar Pradesh	71.49	55.10	148.06	294.13
West Bengal	7.66	6.79	16.94	36.67
All India	**5057.86**	**3236.57**	**1171.75**	**16360.42**

Source: NAFED, New Delhi.

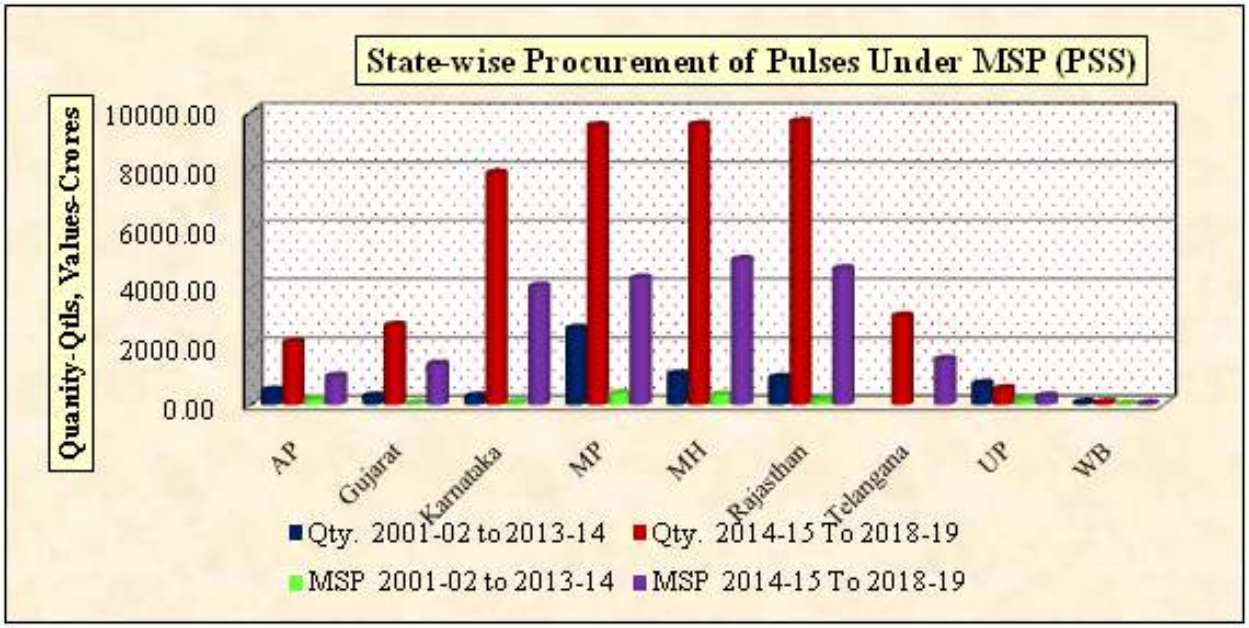


Fig.-5.33: State-wise Procurement of Pulses under MSP (PSS)

(Table-5.33): Crop-wise procurement of pulses under MSP (PSF)

(Quantity- 000 Million tonnes)

Crop	2015-16	2016-17	2017-18	Total
Arhar/Tur	45.53	1165.90	0.00	1211.43
Urd	4.89	88.49	0.00	93.38
Mung	0.00	209.93	0.00	209.93
Gram	0.00	0.00	60.25	60.25
Lentil	0.00	0.00	27.07	27.07
Total	**50.42**	**1464.33**	**87.33**	**1602.08**

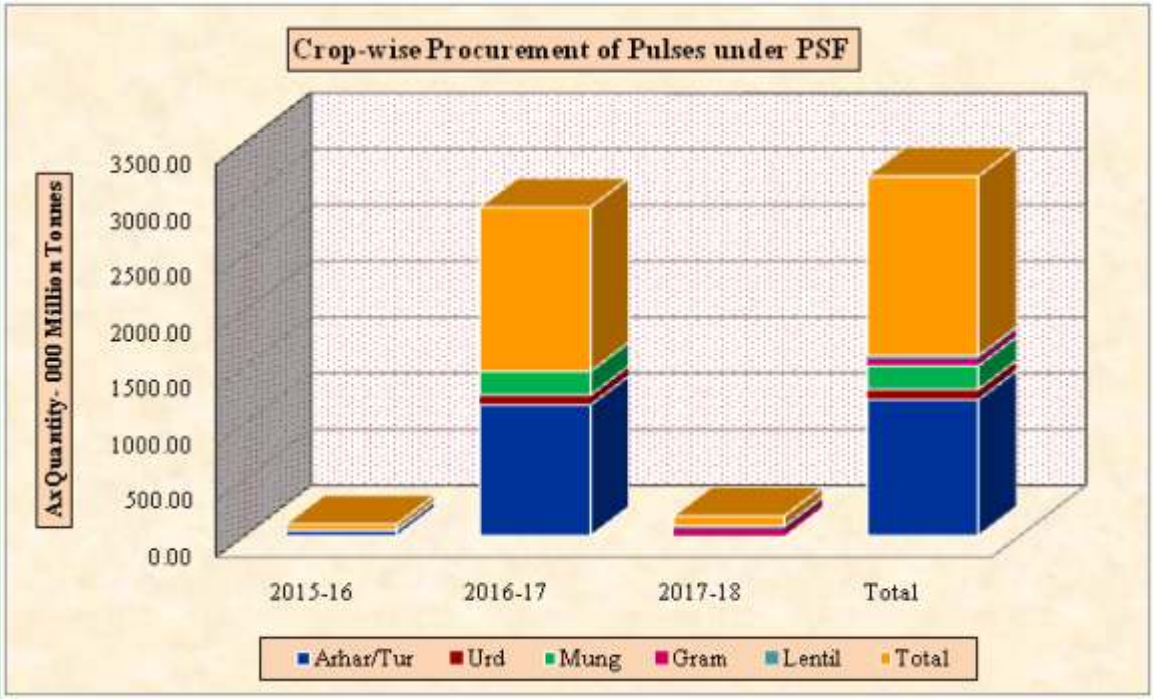


Fig.-5.34: Crop-wise procurement of pulses under MSP (PSF)

Farmer Producer Organization: Empowerment Through Group

- In its resolve to provident to end to end solution to the various issues relating to pulse sector, the govt. has provisioned to formulate farmer interest groups (FIGs) and FPOs. As of now against the total 847 FPOs, 119 in major 07 pulse producing states (Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Telangana, and Uttar Pradesh) are exclusively involved in the pulses sector.
- The total registered FPOs in India about 847. Out of 190 FPOs under taken activities of pulse, total targeted farmers are > 8.0 lakh. About 90% farmers are mobilized. The state-wise detail is as under:

(Table-5.34): State-wise progress of FPO promotion (As on 30.06.2018)

S. No.	State	No. of Farmers			No. of FPOs			No. of FPOs on Pulses
		Mobilized	Under Mobilization	Total Targeted Farmer	Registered	Under the Progress of registration	Total	
1	Andhra Pradesh	6792	208	7000	7	0	7	-
2	Arunachal Pradesh	1750	1000	2750	2	2	4	-
3	Assam	5647	1853	7500	12	3	15	-
4	Bihar	25685	8315	34000	24	11	35	-
5	Chhattisgarh	29135	0	29000	26	2	28	-
6	Delhi	3535	0	3500	4	0	4	-
7	Goa	1810	0	1750	2	0	2	-
8	Gujarat	19166	834	20000	20	1	21	**7**
9	Haryana	13240	510	13750	23	4	27	-
10	Himachal Pradesh	4887	0	4850	5	0	5	-
11	**Jammu & Kashmir**							
	Jammu (Division)	3694	287	3981	1	2	3	-
	Srinagar (Division)	3120	960	4080	1	3	4	-
12	Jharkhand	10009	0	12000	8	2	10	-
13	Karnataka	118218	4282	122500	118	2	120	**14**
14	Madhya Pradesh	126584	18416	145000	135	9	144	**28**
15	Maharashtra	88348	13152	101500	85	17	102	**24**
16	Manipur	5671	1279	6950	4	4	8	-
17	Meghalaya	2990	760	3750	3	1	4	-
18	Mizorun	1700	1000	2700	1	2	3	-
19	Nagaland	1750	0	1750	2	0	2	-
20	Odisha	39463	0	38900	41	0	41	-
21	Punjab	6288	0	6000	7	0	7	-
22	Rajasthan	49617	883	50500	40	2	42	**16**
23	Sikkim	16279	0	15750	29	1	30	-
24	Tamilnadu	10945	55	11000	11	0	11	-
25	Telangana	24548	0	23998	20	0	20	**10**
26	Tripura	2874	0	2750	4	0	4	-
27	Uttarakhand	6004	0	6000	7	0	7	-
28	Uttar Pradesh	35746	0	49000	34	16	50	**20**
29	West Bengal	72266	0	88500	68	19	87	-
	Total	**737761**	**53794**	**820709**	**744**	**103**	**847**	**119**

Chapter-6
VISION 2030

- The current population (2018) of the country is 1.36 billion which is expected to be 1.51billon by 2030. As per the Indian Council of Medical Research (ICMR), the recommended dietary allowance (RDA), the protein requirement for a working male and female is 60 g and 55 g per capita per day respectively. In vegetarian population, the protein requirement is primarily contributed by pulses with supplementary sharing by other food ingredients. The domestic demand of pulses is 23 million tons ie.52 g/capita/day, which has increased to almost 53 g / capita / day.
- To feed 1.51 billion population, the projected demand of pulses by 2030 is likely to be 35 million tons as per the behaviouristic approach (consumption – 28.70 Mt + seed post harvest losses-5.72 Mt). This necessitates an annual growth rate of 3.57 per cent.
- To meet the projected requirement and sustain the balanced production in pulses, the existing actual yield gaps of 439 kg/ha or 65 per cent under total pulses shall have to be a bridged besides bringing an additional area of 5-6 Mha under pulses.
- Eradicating hunger and malnutrition is one of the great challenges of our time. One in three- suffer from some form of malnutrition. Of the 17 global goals of the world Food Programme 2015 adopted by global community for sustainable development to improve people lives by 2030, Goal-2-Zero Hunger- pledges to end hunger, achieve food security, improve nutrition and promote sustainable agriculture.
- India is self sufficient in cereals and has achieved quite balanced, almost self-sufficient, pulse production during 2017-18. However, by 2030 for meeting out the 35 Mt requirement of pulses the existing (2017-18) productivity of 835 kg/ ha shall have to be raised to 1030 kg/ha in addition to bring additional coverage of pulses in a area of 5-6 Mha over the existing normal area. The per annum average growth in area and productivity shall have to be ensured at 1.7 per cent and 1.95 per cent respectively.
- Besides WTO and Intellectual Property Regime (IPR) implications, pulses have a greater significance in the economy of rainfed regions i.e. 73 Mha area of the country and the prosperity of the youth, small and marginal farmers, which would mean better nutritional security, improvement in the production base through conservation of natural resources, livelihood generation high net returns to farmers though value addition and lowering the cost of production with an eye on export.
- The rainfed eco system with more than 40 per cent of total population and 2/3rd or 66 per cent of livestock of the country is a targeted group for the government. The DAC&FW, in its resolve to double the farmers' income by 2022, envisions to sustain self sufficiency in pulse production, improve competitiveness through knowledge based technological interventions for improving nutritional security and sustainability of the production system.

Road Map-2030

In order to sustain the growth of pulses at various levels i.e. among the states, districts, within districts and to bridge the yield gap between FLDs and farmers' practice, DAC&FW has envisioned a road map with two pronged strategy:

I- **Horizontal Expansion** through bringing additional area under pulses, and diversification of rice-wheat system in Indo-gangetic plains

(IGP) through popularization of short duration varieties of pigeonpea, kabuli chickpea, field pea and summer mungbean; Bringing additional area under pulses through promoting urdbean/mungbean cultivation in rice fallow in peninsular India and chickpea lentil in NEPZ and Chhattisgarh; promotion of pulses in intercropping viz., short duration thermo-insensitive varieties of mungbean/ urdbean with spring sugarcane; pre-rabi chickpea with mustard/linseed; pigeonpea with groundnut/ soybean/millets, etc.; development and popularization of urdbean/mungbean for late planting (mid Aug-early Sept in north India).

(Table-6.1): Potential of additional area under pulses

S. No.	Potential Crops/Cropping System/Niches	Specific areas	Potential Area	Target Area (2030)
			(Million ha)	
1.	**Intercropping**			
	Mungbean with Sugarcane (Irrigated) and with cotton and millets (Rainfed uplands)	Western, central and eastern UP, Bihar, MH, AP and Tamilnadu	0.70	0.50
	Pigeonpea with soybean, sorghum, cotton, millet and G. Nut (Rainfed upland)	A.P., Malwa Plateu of MP, Vidarbha of MH, North Karnataka, Tamilnadu	0.50	0.50
	Chickpea with barley, mustard, linseed and safflower (rainfed)	South –east Rajasthan, Punjab, Haryana, UP, Bihar, Vidarbha of MH	0.50	0.30
	Chickpea/Lentil with Autumn planted/ ratoon sugarcane	MH, UP, Bihar	1.00	0.60
2.	**Catch Crops**			
	Mungbean : Spring/Summer	Western & Central UP, Haryana, Punjab, Bihar, WB	3.00	2.00
3	**Rice fallow**			
	Chickpea	Eastern UP, Bihar, Jharkhand, Odisha, CG, WB	0.40	0.40
	Urdbean/Mungbean	AP, Tamilnadu, Odisha, Karnataka	0.50	0.40
	Lentil	Eastern UP, Bihar, WB, Assam, Jharkhand	0.30	0.30
	Lentil/Fieldpea	North east	0.10	0.10
4	**Kharif Fallow**			
	Urdbean/Mungbean	UP, Bundelkhad MP	1.20	1.00
	Total		**8.20**	**6.10**

II-Vertical Expansion through increasing productivity and bridging the yield gaps; development of high yielding short duration varieties having multiple and multiracial resistance to diseases; development of new and efficient plant types; development of input use efficient genotypes; exploitation of hybrid vigour in pigeonpea; popularization of improved crop management practices and bridging yield gaps.

⊙ Improving yield stability

Development of transgenic against drought and gram pod borer; efficient water management in rainfed areas; rainwater harvesting and recycling through farm ponds and community reservoirs; promoting short duration varieties in drought prone areas; promoting micro irrigation system; adoption of moisture conservation practices; development of location specific suitable varieties and ensure availability of quality seeds.

⊙ Development of resilient pulse crops to climate adversaries

Development of resilient pulse crop varieties to mitigate the impacts of climate change; critical monitoring of diseases and pest dynamics with reference to climate change; production and supply of quality seeds through seed hub and ensuring seed production accountability to SAUs/ ICAR to organise location specific recommended latest varieties of pulses in their jurisdiction; active involvement of private sector, NGOs, & farmers' help groups in production of quality seeds; mandatory target to public sector seed corporations; popularization of seed village concept with buyback system; more incentive on production of seeds of new varieties; promotion of farmer to farmer exchange of seeds and seed village programme.

⊙ Reducing post harvest losses

Refinement and popularization of harvesters, threshers and graders; development of stored grain pest resistant varieties; popularisation of storage bins and mini dal mills; strengthening of FPOs and establishment of processing units; development and popularization of low cost safe storage structures.

⊙ Ensuring attractive price to producers

Announcement of MSP well in advance; assured procurement and creation of procurement centres in production zones; development of organized markets for pulses; linking farmers with FPOs, aggregations and E-NAM (markets); promotion of export of pulses like lentil and kabuli chickpea and arid legumes; production of value added products and use of by-products; branding of produce and promotion of organic pulse production.

⊙ Ensuring timely availability of critical inputs and advisory

Promotion of IPM technologies against Helicoverpa; ensuring timely availability of quality bio-pesticides- HaNPV, Trichoderma & herbicides e.g. Pendimethalin etc.; seed dressing of fungicides for controlling seed borne diseases; providing safe storage structures like Pusa Bin and warehouse facility; creation and maintain/ sustain of production units of quality bio-fertilizers and bio-pesticides; fortification of fertilizers with specific nutrients like S, Fe, Zn, B etc., in specific regions; popularization of sprinklers and micro irrigation techniques in rainfed areas; establishment of single window input supply centres for cluster of villages; advanced forewarning and forecasting systems for pest and disease outbreaks.

⊙ Efficient transfer of technology

Organizing farmers training and exposure visits; popularization of improved technology through mass media; close interaction of research

organizations, state departments of agriculture and private agencies; market led initiatives for organized village level seed production to exploit the high demand for improved varieties of pulse crops as well as branding of local germplasm ex. Baigani Arhar in tribal belts of MP; exploiting the led commercial pulse processing units at village level; promotion of pulse production as cash crops in unconventional areas like hills, coastal and tribal belts of country; promotion of farmer information and communication technologies based pulse knowledge management to increase production and productivity of smallholder farmers.

⊙ Advance Seed Plan

The DAC&FW has made advance planning for Quality Seed Production of Pulses for three years (2018-19 to 2020-21) in order to ensure sustainability growth of pulses production in the country .

(Table – 6.2): Seed Plan-Total Pulses (2018-19 to 2020-21)

(Qty. in qtls.)

Crops	2018-19			2019-20			2020-21		
	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total
Andhra Pradesh	52890	0	52890	54490	200	54690	58490	200	58690
Assam	13938	2789	16727	0	0	0	0	0	0
Bihar	5680	0	5680	6532	0	6532	7384	0	7384
Chhattisgarh	29553	299	29852	30417	251	30668	31249	316	31565
Goa	3.00	1.80	4.80	3.90	2.00	5.90	4.80	2.10	6.90
Haryana	42875	1550	44425	61375	2725	64100	42875	1925	44800
Gujarat	42480	4248	46728	57224	5722	62946	62640	6264	68904
Karnataka	94700	4735	99435	94700	4735	99435	95200	4760	99960
Maharashtra	100870	8200	109070	100669	11350	112019	102704	13950	116654
Madhya Pradesh	95580	2215	97795	105630	2530	108160	112400	2650	115050
Odisha	2100	0	2100	2150	0	2150	2200	0	2200
Rajasthan	219808	4263	224071	282828	4336	287164	306366	5362	311728
Tamil Nadu	13827	0	13827	14355	0	14355	15081	0	15081
Telanagana	77928	2200	80128	79487	3950	83437	81077	0	81077
Tripura	1881	0	1881	1944	0	1944	2074	0	2074
Uttar Pradesh	55992	0	55992	58270	0	58270	60805	0	60805
Uttarakhand	1355	62	1417	1400	62	1462	1450	62	1512
West Bengal	5950	160	6110	6210	160	6370	6415	160	6575
Total	**857410**	**30722**	**888133**	**957685**	**36023**	**993709**	**988415**	**35651**	**1024065**

Source: Seed Division, DAC&FW, N. Delhi

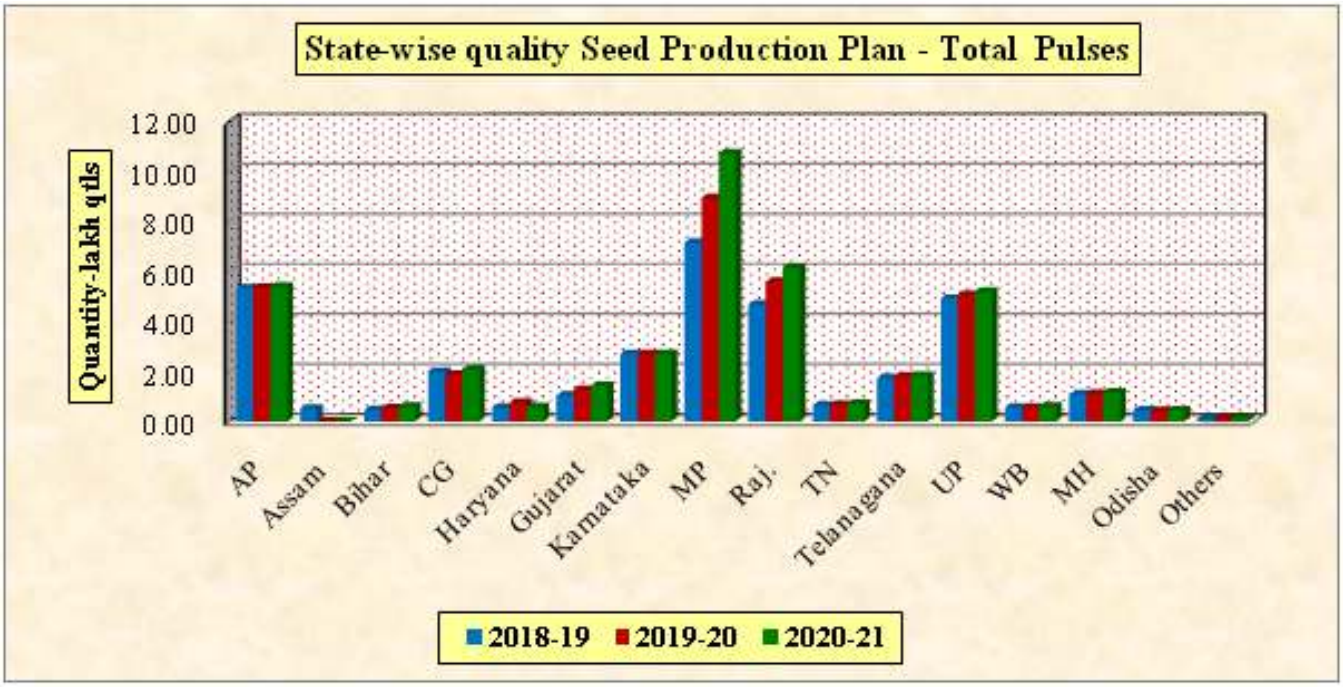


Fig.-6.1: State-wise seed plan total pulses

(Table – 6.3) Seed Plan: Kharif Pulses (2018-19 to 2020-21)

(Qty. in qtls.)

Crops	2018-19			2019-20			2020-21		
	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total
Andhra Pradesh	480936	0	480936	480936	0.00	480936	480936	0	480936
Assam	28829	5765	34594						
Bihar	41200	0	41200	47380	0	47380	53560	0	53560
Chhattisgarh	167450	1691	169142	156214	1578	157792	174430	1762	176192
Haryana	8349	2350	10699	9016	2450	11466	9916	2650	12566
Gujarat	52250	5225	57475	59400	5940	65340	67100	6710	73810
Karnataka	161950	8098	170048	162160	8108	170268	162500	8125	170625
Madhya Pradesh	612600	5675	618275	780460	6125	786585	949500	7311	956811
Odisha	42400	2000	44400	40900	2000	42900	42100	2000	44100
Rajasthan	230850	12438	243288	260000	12516	272516	289960	13073	303033
Tamil Nadu	50688	0	50688	53378	0	53378	55704	0	55704
Telanagana	85681	8000	93681	89964	8400	98364	94462	8400	102862
Tripura	2797	0	2797	2935	0	2935	3085	0	3085
Uttar Pradesh	435724	0	435724	448953	0	448953	459537	0	459537
Uttarakhand	1558	0	1558	2779.6	0	2779.6	3442.56	0	3443
West Bengal	47767	910	48677	49430	910	50340	52805	910	53715
Total	**2451029**	**52152**	**2503181**	**2643906**	**48027**	**2691933**	**2899037**	**50941**	**2949978**

Source: Seed Division, DAC&FW, N. Delhi

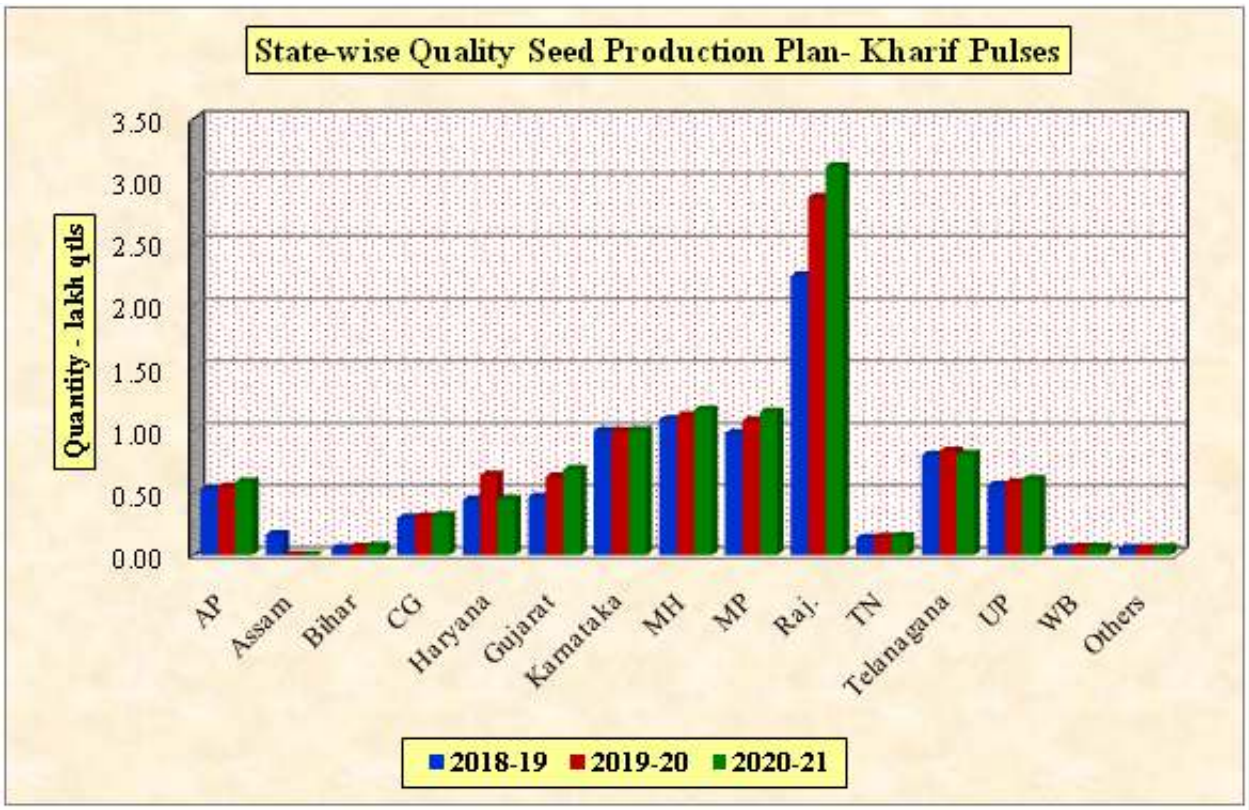


Fig.-6.2: State-wise seed plan kharif pulses

(Table – 6.4) Seed Plan: Rabi Pulses (2018-19 to 2020-21)

(Qty. in qtls.)

Crops	2018-19			2019-20			2020-21		
	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total	Normal Req.	Seed Bank	Total
Kharif Pulses									
Redgram	293480	11311	304791	298460	13214	311674	306206	13387	319593
Greengram	217514	9498	227012	220814	8806	229620	249921	11961	261882
Blackgram	204355	7270	211624	205104	8681	213785	215252	7123	222375
Horsegram	4142	35	4178	4295	37	4332	4451	38	4490
Cowpea	16402	555	16957	16432	565	16997	16727	565	17292
Mothbean	30798	913	31711	40825	927	41752	45858	1029	46887
Guar	91800	1140	92940	153756	2193	155949	150000	1547	151547
Total Kharif	**858490**	**30722**	**889213**	**939685**	**34423**	**974109**	**988415**	**35651**	**1024065**
Rabi Pulses									
Redgram	1173	0	1173	1180	0	1180	1849	0	1849
Greengram	74312	2751	77063	73940	2569	76509	77676	2652	80328
Blackgram	100661	3910	104572	98848	3289	102138	101269	3290	104559
Bengal gram	1712765	113018	1750930	1973159	39655	2012814	2176463	42236	2218700
Lentil	165394	2278	167673	170772	602	171374	183993	750	184744
Fieldpea	243665	3614	247279	252386	471	252857	282267	563	282830
Horsegram	4290	0	4290	4290	0	4290	4290	0	4290
Cowpea	1960	65	2025	2092	65	2157	2620	65	2685
Lathyrus	65101	1368	66469	67415	1376	68791	69732	1385	71117
Rajmash	535	0	535	562	0	562	590	0	590
Total Rabi	**2369321**	**127005**	**2421473**	**2644082**	**48027**	**2692109**	**2900159**	**50941**	**2951100**
Total Pulses	**3227811**	**157727**	**3310686**	**3583767**	**82450**	**3666218**	**3888574**	**86592**	**3975165**

Source: Seed Division, DAC&FW, N. Delhi

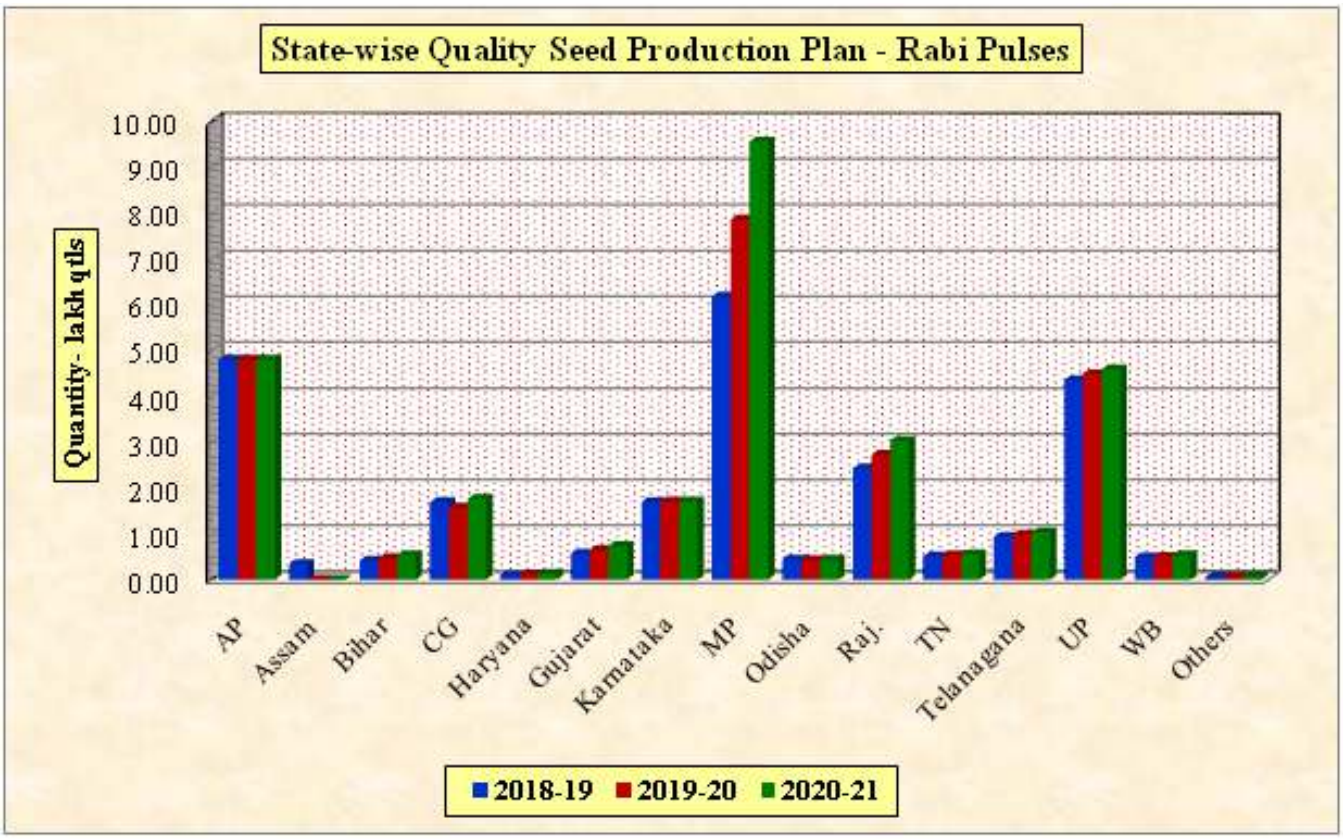


Fig.-6.3: State-wise seed plan rabi pulses

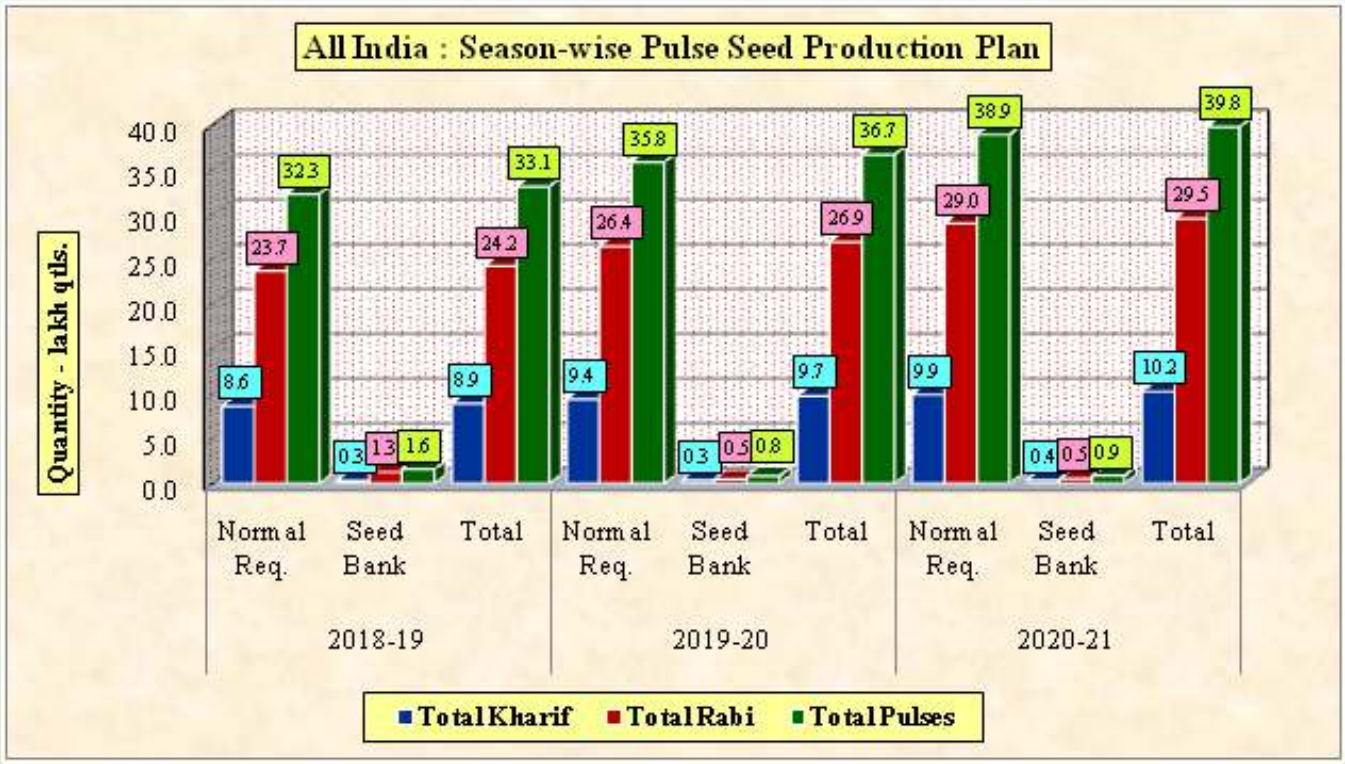


Fig.-6.4: season-wise seed plan of pulses

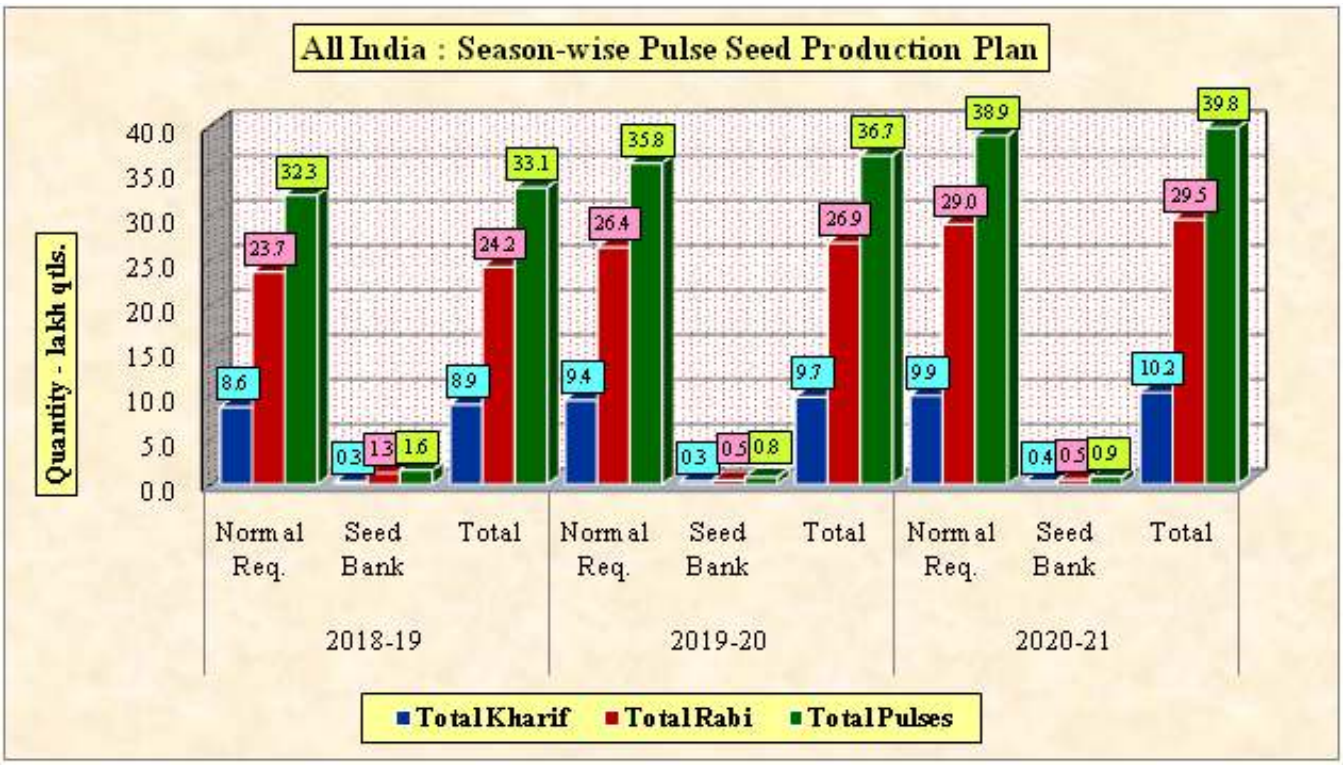


Fig.-6.5: crop-wise seed plan of pulses

Chapter-7
WAY FORWARD-2030

- It is an established fact that a human body requires a daily intake of about 55 to 60 g of protein. The protein malnutrition and other health indicators like maternal and infants mortality rates, anaemia etc, is a matter of concern for the government. Nutritious food has direct bearing on health and affects work performance of the people. Out of the 22 amino acids required in the human diet, the body supplies 14. The remaining eight have to come from food. If all the eight amino acids are present in a single food item, it is called a complete protein food. Since all proteins from animal sources are complete proteins, it is easy to meet the dietary protein requirements of people with non-vegetarian food as the main diet. However, for vegetarian population the main sources of protein are leguminous plants to which the pulses belong. However, in general, pulses have lower concentrations of protein than animal sources. Besides, none of the pulses, except soybeans, are complete proteins. Therefore, combinations of two or more pulses are needed in a vegetarian diet. Dairy products, which are complete proteins, may also be used to supplement pulse proteins in vegetarian diets.
- Keeping in view the production issues and recent pulse scenario in India, it is now established that the domestic supply of pulses is able to meet the growing demand of our consumers. Availability, price and the dietary preference for specific types of pulses in different parts of the country is largely responsible for this. About 29 million hectares of land is under pulses producing about 24 million tons annually. Our population is increasing as well as demand will also increase which we have to resort to increase the production. It is a challenge for us to ensure supply of pulses as pulse crops are primarily taken up for cultivation under rainfed condition in poor soils and are prone to production losses due to moisture stress.
- Two major issues have emerged in respect to pulses production in the country. First, the limited genetic potential for high yields and second their vulnerability to pests and diseases. Compared to other food grains crops, yield potential of the pulses has been rather low. Newer varieties of pulses need to be developed so that the crop cycle fits well into cropping systems that the farmers adopt. Another important issue is limited mechanization potential, especially for planting and harvesting of the crop. Suitable plant types need to be developed for mechanical harvesting with pods above the canopy and sturdier plants.
- Due to the high protein content in pulses, the crop is highly vulnerable to pests and diseases. It is estimated that about 30% of pulses crops are lost on account of pest attacks and diseases every year. Attack by pod borer and pod fly is so severe that the entire standing crop is devastated at several times. Research efforts need to be prioritized in this direction by employing modern biotechnological tools for crops for developing pest resistant varieties of pulses.
- Weed is one of the problematic areas for limiting yield both in kharif and rabi pulses. Manual weeding appears to be difficult in future to manage this weed menace, therefore development of herbicide tolerant pulses as well as varieties suitable for mechanical harvesting is the necessity of the time to minimize the labour-intensive crops.
- Another problem peculiar to the Indo Gangetic plains is the menace of large scale grazing by blue bulls. We need to support the efforts of the

farmers for higher acreage under pulses crops without contravening the legal provisions of the Wild Life Protection Act which prohibits killing of these animals. There is thus a huge possibility and potential of bringing innovative solutions to save the pulses crops and encourage more intensive promotion of production technologies.

- Besides varietal research, we need to address the issues relating to farmers' preference for the competing crops to pulses through development and promotion of crop production and crop protection technologies. Under National Food Security Mission, BGREI and CDP, these aspects have been taken up for more aggressive promotion of available technologies through cluster demonstration to ensure that the farmers are able to harvest better crops. The Government significantly increased the Minimum Support Price of the pulses and strengthened pulses procurement mechanism by designating additional central agencies to support the farmers. In fact, the minimum support price has been doubled in last three year with quantum jump given this year with an increase of more than 150% of cost of production during Kharif 2018. Use of drip irrigation in pigeonpea and agronomic practices like transplantation and nipping of branches are showing very encouraging results. Our import & export policies are linked to our ability for better crop forecasts and the principle of balancing the farmer's interest in a manner that the prices are not distorted and the Indian farmer continues to get a good return for their produce. This will hopefully help in better planning and management of supply chain. With better yields through development of pest and disease resistant varieties, increased MSP support and lessons learnt from exchange of knowledge, the Indian farmer will definitely adopt pulse based cropping systems to produce more pulses with increased acreage. This will significantly ease the supply side constraints in the years to come.
- To meet the challenges faced by the pulses sector, government has given emphasis on research efforts for developing biotic stress resistant and stress tolerant varieties, to be encouraged along with public-private initiatives for better logistics planning and handling of pulses. The crop cycle should be such as to fit into the overall cropping system that the farmer takes during the year.
- Aggressive promotion of available technologies under the cluster front line demonstration has been taken up. The pulse procurement mechanism has been strengthened by designating additional central agencies and the minimum support price (MSP) has been significantly increased to more than 150% of the production cost. Thus, by balancing the farmer's interest in such a way that the domestic prices are not distorted and the Indian farmer continues to get a good return for his produce, the use of new production technologies and agronomic practices, and government support put together could maintain to self sufficiency.
- Given the important role that pulses play in the human diet, their availability needs to be increased indigenously. The possibility of improving pulse productivity two to three times through existing varieties and available package of technologies is well demonstrated in scientific experiments.

Focusing on individual pulse crop group

Enhancing chickpea production

- Chickpea has tremendous scope for expansion in rice fallows of eastern U.P., Bihar, Orissa and West Bengal, Bhal areas of Gujarat and through diversification of rice-wheat system in Indo-gangetic plains. This will not only increase the area of chickpea but also help in sustaining cereal based cropping system in long run. An estimated additional area of 1.0 to 1.5 million ha area can be brought under chickpea cultivation. Under

intercropping of chickpea with barley, mustard, linseed and safflower (south-east Raj., Punjab, Haryana, UP, Bihar, Vidarbh of MS), Autumn-planted/ Ratoon sugarcane (MS, UP, Bihar), chickpea under rice fallow (eastern UP, Bihar, Jharkhand, Odisha, CG, WB), an additional area of 02 Mha may be brought.

- A large number of improved varieties and matching production technologies have been developed in chickpea which showed its impact on increasing the production and productivity but there are some critical gaps which could not be properly addressed so far.
- In the last 4 decades, the area, production and productivity of chickpea have fluctuated widely. Some of the states like Punjab, Haryana, Uttar Pradesh and Bihar have lost considerable area where as the states like Andhra Pradesh, Maharashtra, Karnataka have brought additional area.
- The growing condition is altogether different in southern states from northern states, there is need to develop more varieties and production and protection technologies to address the critical gaps in the region. Still there is lot of scope of increasing production and productivity in these states by developing high yielding varieties with short maturity duration, terminal heat and moisture stress tolerance. There is also scope of refinement in production technologies for better establishment of crop and increasing the productivity.
- The chickpea programs need to be dynamic and efficient in rapidly developing varieties needed for adaptation in existing and evolving cropping systems and have the traits preferred by farmers, industries and consumers. We need to also consider the environment and the efficiency in use of available resources. Traits like phosphorus acquisition efficiency (PAE) and biological nitrogen fixation (BNF) efficiency need due consideration. Though chickpea is a good source of protein, carbohydrates, dietary fibre, minerals (Fe, Zn, Ca and Mg) and other important nutrients that are essential for human health, there is a scope for further improving nutritional quality of chickpea.
- Protein content of present day cultivars is usually in the range of 18–22% whereas, much larger variability (14–32%) exists in the germplasm which could potentially be exploited to develop high protein (≥25%) varieties. Similarly, wide variation has been observed for iron and zinc contents in the germplasm, which can be exploited for developing high iron and zinc varieties. It is important to develop nutritionally enhanced varieties as the consumers would get a higher amount of protein and other nutrients from the same amount of chickpea consumed.
- The applied research and efforts towards short duration varieties for bringing additional area in eastern India, abiotic and stress tolerance, machine harvestable and herbicide tolerant varieties, extra-large kabuli chickpea for premium domestic and international market, diversification of rice-wheat system, efficient cropping systems, varieties with enhanced phosphorus acquisition efficiency, management of pod borer (Helicoverpa armigera), incorporation of multi-racial and multiple disease resistance, nutritionally enhanced varieties, popularization of extra-large seeded kabuli varieties and machine harvestable varieties among farmers etc. shall have to be continued.

Enhancing pigeonpea production

- Pigeonpea or redgram, the second most important crop in total pulses and the top ranking kharif season pulse crop, is a preferential pulse across the country. Owing to its characteristic behaviour as a contingent and risk management crop, the two pronged strategy i.e. area expansion and bridging the yield gaps (61 percent or 530 kg/ha over state average yield) shall be the way forward.
- **Expansion in area (Horizontal expansion):** There is less scope in direct expansion of

pigeonpea area overall in the country. However, a new concept of rabi pigeonpea is developing in Chhattisgarh state parts of eastern UP, Bihar, West Bengal, Odisha, Gujarat and eastern Madhya Pradesh state in those areas where paddy cultivation has a limitation due to irrigation water resources or after early paddy and hood prone areas where field get waterlogged during rainy season, there can be a scope of rabi pigeonpea. There is a great demand of early pigeonpea (120-130 days) by the soybean growing farmers especially of Malwa region where soybean is a dominating kharif crop. Because of its early harvest farmers yet cannot afford to replace soybean as land can be made free for rabi cultivation (double cropping) as soon soybean is harvested. Chickpea and wheat fetches higher income to the farmers of Madhya Pradesh. Therefore, alternate replacement crop for soybean has not yet paved its way in soybean areas in spite of decreasing productivity of soybean crop in the state. The ways to increase the pigeonpea area is intercropping of pigeonpea with soybean in kharif season. Under NFSM Cluster Demonstration and CFLDs, farmers are being demonstrated to include one or two lines of pigeonpea alternated after 6 or 8 lines of soybean. Govt. of India is also promoting intercropping of pigeonpea with soybean in Madhya Pradesh by taking Frontline Demonstrations of AICRP Programmes. The practice is being adopted in some areas like Bhopal and Raisen districts where underground water is scarce.

- **Making availability of early maturing:** Pigeonpea naturally is a perennial crop. However, through intensive research efforts scientists could bring down its maturity upto 120 days and some varieties like UPAS 120, ICP 151, ICPL 87, TT 401, TJT 501 have been developed and released for cultivation. However because of its natural habit, any change in micro climate results drastic change in growth behavior of pigeonpea crop. Varieties maturing in 120 days in South zone, gains 140-150 days in Central zone (especially in Madhya Pradesh). The state has released Mid-early duration variety pigeonpea variety TJT 501 in 2009 and this variety has gained large popularity due to its stability in yield. However some minor changes in maturity cannot be avoided due to inherent nature of the crop. Looking to the immense need of early duration variety (~120-130 days).
- During kharif 2018, early duration varieties Pusa-16 (125 days), ICPL-151 (140 days), ICPL-87 (130 days) and other short maturing varieties of southern region have been taken for seed production and multi-location trials at 06 locations of MP (KVKs/ ZRS- Shajapur, Rajgarh, Dewas, Khargone, Sehore, Ujjain).
- It is proposed to consider re-notification of varieties in central region of MP & Vidharbha of Maharashtra, AP, North Karnataka and Tamil Nadu under intercropping (pigeonpea with soybean, sorghum, cotton, millet and rainfed upland groundnut with 01 row of pigeonpea + 6, 8 or 10 rows of principal crop). Potential area of 0.5 Mha has been envisioned by 2030 in addition to ever highest area coverage of 5.39 Mha during 2016-17 (existing normal area of 4.2 Mha).
- The Bhabha Atomic Research Centre (BARC), in association with RVSKVV, Gwalior (SAU) has been roped in for mutation breeding to bring 120 days variety for MP, the 3rd ranking Tur state in the country.

Adoption of recommended Package of Practices:

- **Row spacing:** Keeping recommended row spacing in sole pigeonpea cropping is an important factor affecting the grain yield. In spite of scientific recommendations of 60 cm for early, 75 cm for Mid-early and 90 cm for medium duration pigeonpea varieties, farmers are adamant to plant pigeonpea in a closer spacing of not more than 45 cm especially in Madhya Pradesh. In addition to it within row minimum spacing of 20 cm is not adopted. This results in very close and high plant population, limits the crop growth with lower productivity.

- **Ridge sowing:** Madhya Pradesh is experiencing high rainfalls during past 2-3 years. Continuous rainfall increases not only atmospheric humidity, but continuous moisture (water stagnation) during early crop growth stages increase incidence of Phytophthora disease in pigeonpea causing heavy toll of seedlings, reducing optimum plant population. Scientific method of ridge planting can save the pigeonpea seedlings, allowing water drainage and reduces the intensity of mortality due to Phytophthora disease.

Development of early duration varieties/hybrids

- Hybrid pigeonpea ICPH-2671 and ICPH-2740, in 2000 on farm trials have exhibited 47% and 42% yield advantage over the best local varieties, would have to be taken forward with effective hybrid seed production training programmes through KVKs/ SAUs.
- Since last 4 years with the collaboration of ICRISAT, efforts are being made to develop early duration pigeonpea hybrids in pigeonpea. One hybrid RVICPH 2431 has reached to the level of AVT 2 and is likely to be released in 2-3 years.
- Collection and identification of early pigeonpea genotypes.
- Although there are many extra early and early genotypes/varieties released and available, these genotypes have found unproductive in Madhya Pradesh condition. The major constraint of low yield is heavy incidence of pod borer complex including Marucca from flowering itself. Some accession of determinate (DT) and non-determinate (NDT) early pigeonpea have been acquired from ICRISAT and tested since 2-3 years. Although someof them flower and pod in south condition, the pod setting of these super-early accessions in Madhya Pradesh condition is yet under adaptation.
- In addition to it early duration CMS lines are also being exploited for development of early maturing pigeonpea hybrids.

Research Projects on Early pigeonpea:

- Research funding to ICRISAT (2017-18 to 2019-20, Rs. 8.90 Cr) for enhancing genetic gains in chickpea & pigeonpea and scaling up and popularization of pigeonpea in Karnataka, MS, Telangana, AP and Odisha (2018-19, Rs. 6.50 Cr), has been done to ensure sustainable growth to these two crops.

Enhancing Mungbean, Urdbean and Lentils Production

- Mungbean, urdbean, lentil, lathyrus, rajmash and fieldpea together accounts for about 37% of total pulses production in India. Therefore, these crops assume greater significance in bringing self sufficiency in pulses in the country. Research and input supports are crucial in further advancing the production and productivity of these crops. It is envisioned that the new initiatives will not only improve the productivity of these crops, but also help in promotion of pulses in different production nitches. These efforts are likely to bring 2-2.5 Mha additional area under pulses which can provide 1-1.5 mt additional production to national pulses basket in next three years.
- In mungbean, low and instable productivity due to severe incidence of MYMV, Jassids and Thrips and poor crop management often noticed in major growing states like Rajasthan, Maharashtra, Madhya Pradesh and Uttar Pradesh. IPM strategies for control of pests use of resistant cultivars, seed dressing with systemic insecticides and timely spray of recommended insecticides and use of bio-fertilizers, sulphur (@20 kg/ha) and zinc (@ 15 kg/ha) and foliar spray of 2% DAP/urea at flowering stage can help improve the crop management.
- Mechanical harvesting in mungbean is prevalent in some parts of MP, Rajasthan, Punjab, Haryana and western Uttar Pradesh. Other states shall have

to be brought under mechanical harvesting in mungbean with the development of suitable genotypes and appropriate machines. There is adequate scope of horizontal expansion under mungbean and urdbean to the tune of >3 Mha by promotion of the crop under intercropping with cotton, pigeonpea and millets in the states like Karnataka, Odisha and UP, Madhya Pradesh; with spring sugarcane in Uttar Pradesh and bringing additional area under rice fallow in rabi season in Tamil Nadu, Andhra Pradesh and Odisha.

- In lentil, inadequate availability of quality seeds of improved varieties in major states like Uttar Pradesh, Madhya Pradesh and Bihar has been the major constraint. Promotion of quality seed production through seed hubs/ formal and informal seed production systems shall have to be promoted. Wilt in Uttar Pradesh and Madhya Pradesh and Rust in Uttar Pradesh and Bihar have been crucial diseases which can be controlled through IPM with the use of resistant varieties and seed dressing with bio-agents like Trichoderma. Availability of good quality bio-agents are important to tackle menace of root diseases in the crop. Bio-agents and bio-fertilizers units need be strengthened/ installed in these states for timely availability of such crucial inputs. Terminal moisture stress for cultivation of lentil in Uttar Pradesh and Madhya Pradesh further aggravated the problem of realizing productivity. Promotion of extra short duration varieties (~ 100 days maturity), adoption of in situ moisture conservation measures, water harvesting and recycling need to be popularized and strengthened. Provision of life saving irrigation through sprinklers can boost up the productivity of rabi pulses enormously. Increased yield of lentil in utera cultivation in Uttar Pradesh and Bihar can be obtained by seed priming, enhanced seed rate and inoculation with rhizobium and foliar spray of 2% DAP / Urea at flowering and pod development stage. Use of lime in acidic soils of West Bengal, Bihar and Assam can be popularized in programme mode.
- Pulses for rice-fallow cultivation: Promotion of pulses such as lentil in Assam, West Bengal, Jharkhand, Bihar and eastern Uttar Pradesh and Mungbean in coastal Andhra Pradesh, Tamil Nadu, and Odisha under utera cultivation after the harvest of short season rice can provide ample opportunity to produce additional food from fallow lands. This requires appropriate varieties and matching production technology of lentil, Mungbean and Urdbean which may suit to rice-fallow ecology. Seed priming, foliar nutrition, planting techniques using zero-till seed-cum fertilizer drill and post- emergence herbicides may play vital role in improving productivity of rice-fallow pulses.
- Use of post-emergence herbicides: Lentil is poor competitor of weeds. Similarly, weeds are serious menace for kharif Mungbean and Urdbean. Application of pre-emergence herbicides could provide protection from weed from 20-25 DAS. One or two manual weeding requires further protection during growth stages of the crop. Non-availability of manual labour for weeding in these crops is crucial for realizing good crop growth. Successful application of post-emergence herbicides like imazethapyr and quizalofop in soybean encouraged to identify molecules which can provide protection against weeds in lentil, Mungbean and urdbean. Therefore, efforts are being made to use of post-emergence herbicides for MULLaRP crops.
- Improved adaptation to climate change: In central India, lentil suffers heavily from terminal moisture and heat stress. Similarly, the productivity of Mungbean and Urdbean affected due to sudden increase in temperature during flowering. Therefore, efforts are being made to identify suitable genotypes tolerant moisture stress and high temperature. The tolerant genotypes will be used in varietal development

programme for improved adaptation to climate change.

- Increased attention will also have to be paid to development of sustainable production systems that protect the natural resource base as well. Recent evidence of resource degradation and declining productivity in some intensively cropped areas is of particular concern. Also population driven intensification of agriculture without the use of external inputs, is leading to a serious problem of decline in soil fertility.
- Resource use efficiency in agricultural production has been a major concern in India. Due to decrease in resources (land and water) and increasing demand by other sectors limit the availability of resources for agriculture and that too for pulse crops. Thus, any decrease in marginal returns as predicted by the law of diminishing returns is more or less compensated by the benefits of other technological changes. Therefore, development of resource use efficient genotypes, precisely irrigation water and fertilizer delivery system, slow release fertilizers, integration of bio-fertilizers with other fertilizer sources, pulse based cropping systems including intercropping and other resource conservation agronomic practices may help to utilize available resources to the maximum possible level. While developing resource efficient technology, due consideration may be given for "eco-efficient" agriculture.
- Improved agricultural technology, irrigation, livestock sector and literacy will be most important instruments for improving the nutritional security of the farm-households. Watershed development and water conservation techniques will have far reaching implications in increasing agricultural production in the rainfed areas. Need based and location specific community programs, which promise to raise nutritional security, should be identified and effectively implemented. Small-mechanized tools, which minimize drudgery but do not reduce employment and add value to the working hours, are needed to enhance labour productivity. Special safety nets should be designed and implemented for them. There is need to disseminate widely post-harvest handling and agro-processing and value addition technologies not only to reduce the heavy post-harvest losses but also improve quality through proper storage, packaging, handling and transport.
- Farmers' perception and literature reviewed both revealed that inclusion of legumes in dominated cereal-based cropping system increased the yield of subsequent cereal crops and reduce the fertilizer cost too resulting decrease in cost of production and increase profitability. Inclusion of pulses in various ways is technically feasible as well as economically viable in long run.

Convergence approach of programme implementation

- The various initiatives taken by the government between 2015-16 to 2017-18 under all CSS/CS on crop and agricultural development shall have to be converged. The infrastructure created on water resources, customs hiring centres, seed hubs and EBSPs, and the capacity buildings of famers. FPOs, SHGs and extension workers would be needed to fully utilized in favour of the growth of the pulse sector.
- To sustain the production and fulfill the demand as also to achieve the target of Zero Hunger by 2030, the DAC&FW has formulated the strategy by delineating the districts of the country into four categories : i) High area high productivity districts (HAHP) ii) High area low productivity districts (HALP) iii) Low area high productivity districts (LAHP) iv) Low area low productivity districts (LALP).
- The Government has resolved to make strategic interventions in all four category districts involving the approach of horizontal and vertical expansion, inclusion of traditional wisdom as well as recent improved technologies.

GLIMPSES OF ACTIVITIES : IYOP-2016

Closing Ceremony of IYOP at Agra

Hon'ble Agri. Minister, M.P.(Shri. Gauri Shankar Bisen)and Union RDMinister (Shri. Narendra Singh Tomar) at Tikamgarh: BundelkhandSrajan 2017-National Agriculture Expo.

GLIMPSES OF ACTIVITIES/REVIEW

Secretary (DAC&FW), GoI, visiting ZARS, Pawarkheda, Hoshangabad, (M.P.)

Secretary (DAC&FW), Review of Mechanization/CHC, CFMTTI, Budni, (M.P.)

Secretary, (AC& FW) inaugurating E-KisanSarthi portal under CHC-MP

Secretary (DAC& FW) adressing Krishak Sammelan at Sonkachch, Distt. Dewas

OVERSEAS CONSULTATIONS ON PULSES

FAO Regional Initiative on Zero Hunger Challenge
Regional Inception Workshop for Regional TCP on Creating Enabling Environments for Nutrition-Sensitive Food and Agriculture to Address Malnutrition

GLIMPSES OF ACTIVITIES/REVIEW




IYOP-2016: *National Workshop" Pulses Opportunities in Central and Southern States" (Feb, 03-04, 2016) (ICAR-CIAE-M.P)*


IYOP-2016: *"National Workshop/Brainstorming Session on Promotion of Pulses in New Niches: Summer Cultivation" (Feb. 9-10, 2016) (ICAR-IIPR, Kanpur)*

GLIMPSES OF ACTIVITIES/REVIEW/FIELD VISITS

IYOP-2016: *Farmers Training "Production and Protection Technology of Pulses, KVK-Ichhawar, Sehore*

IYOP-2016: *Farmers Training "Production and Protection Technology of Pulses KVK- Raisen*

NATIONAL LEVEL MONITORING TEAM (NLMT) VISITS

Propagation of Hybrid cultivation : Tur (Var-ICPH-2740) Dist.-Gulberga, Karnataka

Area expansion through intercropping : Tur (Transplanted) + Maize (Sweet corn) District-Chhindwara, (M.P.)

Resource Use Efficiency: Arhar (Transplanting + MIS-Drip) District-Betul (M.P.)

Organic Farming: Pigeonpea Nursery for Transplanting District- Narsinghpur (M.P.)

NFSM ACTIVITIES/MONITORING

Mechanization : NFSM-RCT, Tractor
District-Harda, (M.P.)

Local Initiative : Spiral Grader,
District- Indore (M.P.)

Conservation Agriculture: Happy Seeder,
District- Betul, (M.P.)

Local Initiative: Processing Unit -Dal Mill,
Chhattisgarh

NFSM ACTIVITIES/MONITORING

Crop- Chickpea, Variety JG-14
Harvesting, Madhya Pradesh

Seed-hub Production of Mungbean
at Dantewada, Gujarat

Cluster Demo.-Gram: District-Harda, M.P.

NFSM-Demo., Gram (JAKI 9218),
Block-Lohandiguda, District-Bastar, CG

NFSM ACTIVITIES/MONITORING

Crop- Pigeonpea, Variety TJT-501
Hand dibbling on ridge , Madhya Pradesh

Crop- Pigeonpea, Variety – Rajiv Lochan
Hand dibbling on ridge, Chhattisgarh

Innovation: Intercultural operation of Gram
District-Indore, Madhya Pradesh

NFSM-Outreach Programme in Naxal
Affected Area, Bastar, Chhattisgarh
District- Bastar, Chhattisgarh

NFSM-PULSES IN TRIBAL DISTRICT- (BAIGA TRIBES)

Vill. Silpidi: Kisan Gosthi/Baiga Tribes, District-Mandla, M.P.

Vill. Silpidi: Indigenous Storage Bin/ Baiga Tribes, District-Mandla, M.P.

RKVY- Solar Fencing, District-Mandla, M.P.

BGREI (Check-Dam), Block-Tokapal, District-Jagdalpur (Bastar) , C.G.

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Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation & Farmers Welfare
Krishi Bhavan, New Delhi – 110 001

SOIL HEALTH CARD
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