Pulses: Status and Contribution to Food Security

Govt. of India, Directorate of Pulses Development
Min. of Agri. & FW, (DAC&FW), Bhopal (MP)

1.0 BACKGROUND

Pulses are staple protein food item for India's vegetarian and rural population to ensure nutritional security. The edible legumes are not only rich source of protein but their low fat and higher fibre content add to their nutritional value and preference over non-vegetarians now–a-days. Thus India's stake as the largest producer, processor and consumer of this food grain commodity remains as usual.

1.1 Global Pulse Scenario

Globally, pulses are grown in an area of about 81 million ha with 73 million tons production. India ranks first both in area and production of pulses with 35 % of global acreage and 25 % of world production

Table 1: Global Scenario of Pulses

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

Country	Area		Country	Production		Country	Yield
	Area	% to world		Production	% to world		
India	281.70	34.88	India	183.11	25.08	Ireland	5333
Niger	48.41	6.00	Canada	61.05	8.36	Tajikistan	4753
Myanmar	38.88	4.81	Myanmar	54.37	7.45	Belgium	4224
Nigeria	33.3	4.12	China	44.73	6.13	France	3637
China	28.845	3.57	Brazil	29.46	4.04	UK	3526
Brazil	28.55	3.54	Australia	27.04	3.70	Netherland	3441
Canada	24.22	3.00	Nigeria	25.60	3.51	Denmark	3416
Australia	19.18	2.38	USA	22.33	3.06	Switzerland	3302
Russian fed.	17.01	2.11	Russian fed.	20.84	2.85	Luxembourg	3191
Pakistan	14.804	1.83	Niger	13.63	1.87	India	650
World	**807.54**		**World**	**730.07**		**World**	**904**

Source: (FAO, Stat. 2013)

1.2 National Pulse Scenario

The normal total acreage under all 09 pulses is 24.52 lakh ha (ave: 2009-10 to 2013-14) with the production of 17.5 million tons at a total per ha productivity level of 714 kg. The IInd advance estimates of productions are 17.33 million tons during 2015-16. The domestic demand of pulses continuously outstrips domestic production. Among all pulses chickpea is the major pulse and rank first in term of area, production and productivity at national level.

Table 2: **Crop-wise Status: Total Pulses**

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

CROP-WISE	Normal *			2014-15		
	Area	Production	Yield	Area	Production	Yield
Tur	39.28	28.35	722	37.07	28.10	758
Chickpea/gram	88.21	83.52	947	81.92	73.30	895
Urad	31.25	16.82	538	31.92	19.60	614
Moong	32.38	13.99	432	30.53	15.00	491
Masur	14.81	10.37	700	-	-	-
Peas & Beans	7.95	7.48	941	-	-	-
Kulthi (Horse Gram)	4.80	2.28	475	-	-	-
Lakh /Khesari	4.86	3.4	700	-	-	-
Moth	12.4	3.77	304	-	-	-
Others	9.30	5.17	556	49.54	35.40	715
Total Pulses	**245.24**	**175.15**	**714**	**230.98**	**171.50**	**742**

**** Ave.(2009-10 to 2013- 14), Source: Directorate of Economics & Statistics, Ministry of Agri. Govt. of India***

1.3 State-wise Status

Table 3: Area, Production: Per cent contribution

(A- lakh ha, P- lakh tones)

States	Area	% Contri.	States	Production	% Contri.
Madhya Pradesh	53.64	23.20	Madhya Pradesh	47.05	27.40
Rajasthan	33.62	14.60	Rajasthan	19.50	11.40
Maharashtra	31.39	13.60	Maharashtra	17.38	10.10
Uttar Pradesh	23.41	10.10	Karnataka	14.88	8.70
Karnataka	23.09	10.00	Uttar Pradesh	14.47	8.40
Andhra Pradesh	14.50	6.30	Andhra Pradesh	11.56	6.70
Tamil Nadu	9.40	4.10	Chhattisgarh	6.55	3.80
Odisha	8.35	3.615	Tamil Nadu	6.47	3.80
Chhattisgarh	7.85	3.40	Jharkhand	5.97	3.50
Other	25.73	11.09	Other	27.82	16.24
All India	**230.98**	**100**	**All India**	**171.65**	**100**

Source: Directorate of Economics & Statistics, Ministry of Agri.& F W Govt. of India

1.3.1 Major Kharif Pulses include Arhar (pigeonpea/redgram), Urdbean (Blackgram), Mungbean (Greengram), Moth, Horsegram (kulthi). Tur/arhar has a lion share of area (36%) and production (48%) followed by Urdbean and Mungbean.

1.3.2 Rabi/Summer season pulse crops are gram (chickpea/bengalgram), lentil (masur), Field pea (matar/batri), Urd, Mung, Rajmash etc. Gram crop has a major share under area sown (65%) and production (72%) followed by lentil and field pea.

1.3.3 The prominent total pulses producing states combining both Kharif + Rabi/summer are Madhya Pradesh (24.7%), Maharashtra (15.1%), Rajasthan (12.4%), Uttar Pradesh (11.8%), Andhra Pradesh (8.3%) and Karnataka (7.6%).

1.3.4 The 07 states ruling Kharif season production of > 84% are Maharashtra (25%), Rajasthan (15%), Karnataka (11.2%), Uttar Pradesh (10.5%), Madhya Pradesh (9.7%), Gujarat (6.9%) and Andhra Pradesh (6%).

1.3.5 More than 81 per cent of Rabi/summer season pulse production come from 6 states. These states are Madhya Pradesh (32.3%), Uttar Pradesh (12.5%), Rajasthan (10.9%), Maharashtra (10.2%), Andhra Pradesh (9.5%) and Karnataka (5.8%).

1.3.6 The top 06 gram producing states are Madhya Pradesh (39%), Rajasthan (14.6%), Maharashtra (14%), Andhra Pradesh (8.8%), Karnataka (7.2%) and Uttar Pradesh (6.8%). These together produce > 90 per cent of the total gram commodity in the country.

1.3.7 The major arhar producing states are Maharashtra (33.6%), Karnataka (15%). Madhya Pradesh (10.5%), Uttar Pradesh (10.1%), Gujarat (8.8%) and Andhra Pradesh (7.8%).These 06 states together contributes about 86 % per cent of Tur.

1.4 Contribution of pulses to total food grains to India

Percentage share of pulses to net food grain availability has been oscillating between 6 to 7.5 percent during 2007 to 2015.

Table 4– Pulses share to total food grain basket

(A-Million ha, P- Million Tons, Y -kg/ha)

Year	Pulses			Food grains			Pulses % to Food grains		
	A	P	Y	A	P	Y	A	P	Y
2007-08	23.63	14.76	625	124.068	230.780	1860	19.046	6.396	33.580
2008-09	22.09	14.57	660	122.834	234.470	1909	17.984	6.214	34.554
2009-10	23.28	14.66	630	121.334	218.110	1798	19.187	6.721	35.031
2010-11	26.40	18.24	691	126.671	244.490	1930	20.841	7.460	35.803
2011-12	24.46	17.09	699	124.755	259.286	2078	19.606	6.591	33.638
2012-13	23.25	18.34	789	120.779	257.125	2129	19.250	7.133	37.060
2013-14	25.21	19.25	764	125.042	265.043	2120	20.161	7.263	36.038
2014-15	23.10	17.20	744	122.07	252.68	2070	18.924	6.807	35.942

(Source: Directorate of Economics and Statistics, DAC&FW)

2.0 Pulses availability

Net daily pulses availability for Indians has increased slightly from 35.5g per capita in 2007 to 41.9 g per capita in 2013.

Table 5: Per capita availability

Year	Pulses Availability	
	(*g per capita per day*)	(*kg per capita per year*)
2007	35.5	12.9
2008	41.8	15.3
2009	37.0	13.5
2010	35.4	12.9
2011	43.0	15.7
2012	41.7	15.2
2013	41.9	15.3

Source: Ministry of Commerce & DES, Ministry of Agriculture & Farmers Welfare

2.1 Production Gap

Long term solution to fulfil the demand for pulses lies in increasing the pulses production in the country. The total availability of edible pulses, including production, import and some exports, has been 22 million tons (ave. 2012-13 to 2014-15) as per Ministry of Commerce and Ministry of Agriculture, Govt. of India. The production gap of 3.8 million tons culminated into import of 4 million tons of pulses from Myanmar, Tanzania, Republic Australia, Russia, USA, Canada, Ukraine, Uzbekistan etc.

2.2 Import and Export

To meet out the demand of Pulses, on an average 40 lakh tonnes of different pulses has to be imported from other countries. The major import share belongs to peas (39%) followed by lentil (17%), urd/mung (16%), pigeonpea (13%) and chickpea (12%). A negligible export of 2.55 lakh tones on an average is also made with major share of chickpea (94%) (**Table 6-7**).

Table 6 – Availability status of pulses production, import and export

Year	Production (lakh tons)	Import (lakh tons)	Export (lakh tons)	Total availability (lakh tons)
2006-07	141.98	22.71	2.51	167.19
2007-08	147.62	28.35	1.64	177.61
2008-09	145.66	24.74	1.36	171.76
2009-10	146.62	35.10	1.00	182.72
2010-11	182.41	26.99	2.08	211.48
2011-12	170.89	33.65	1.74	206.28
2012-13	183.43	38.39	2.02	223.84
2013-14	192.53	30.49	3.43	226.45

Source: Ministry of Commerce & DES, Ministry of Agriculture & Farmers Welfare

Table 7.Availability and Production Gap (Ave: 2012-13 to 2014-15)

(Quantity in 000 tons)

Crop	Production	Import	Export	Total Availability	Production Gap
Pigeon pea	2992.10	515.74	0.96	3506.88	514.78
Chickpea	8509.57	464.21	239.64	8734.13	224.57
Lentil	1075.75	677.17	3.25	1749.67	673.92
Peas	881.85	1551.07	1.78	2431.15	1549.30
Urd/Moong	3271.97	629.95	2.51	3899.41	627.44
Total Pulses	**18262.23**	**4026.31**	**255.78**	**22032.76**	**3770.52**

Source: Ministry of Commerce & DES, Ministry of Agriculture & Farmers Welfare

2.3 Strategy to Augment Production

The cropping system approach to inculcate pulses under, new niches- such as chickpea in rice fallows; pigeon pea in rice-wheat cropping systems, rice bunds and at high altitude /uplands; spring/summer pulses and inter-cropping etc, may be the areas expansion strategy.

To exploit the existing yield potentials with aggressive ToT and location specific agronomic modules, as under, need to be initiated:

3.0: Yield Gaps: National vis-a-vis Madhya Pradesh

Crops/Commodity	Yield kg/ha		Gap	
	FLD	State Average	Actual (kg/ha)	Percent
Pigeonpea (Early duration)				
All India	1142	833	309	37.10
M.P.	1159	632	527	83.39
Pigeonpea (Medium duration)				
All India	1433	675	758	112.25
M.P.	1198	632	566	89.56
Mungbean Kharif				
All India	786	453	333	73.61
M.P.	-	-	-	-
Mungbean Rabi				
All India	888	365	524	143.62
M.P.	-	-	-	-
Urdbean Kharif				
All India	830	494	336	68.08
M.P.	-	-	-	-
Urdbean Rabi				
All India	968	472	495	104.87
M.P.	-	-	-	-

Urdbean Rice fallows				
All India	802	531	272	51.18
M.P.	-	-	-	-
Chickpea				
All India	1341	867	474	54.68
M.P.	1683	951	732	76.92
Lentil				
All India	1044	655	389	59.43
M.P.	932	424	508	119.72

*FLD/State Yield –(Avg. 2007-08 to 2011-12)

4.0 National Food Security Mission: Pulses

4.1 To promote the pulses, Govt. of India has implemented NFSM which covers 644 districts in 29 states. The NFSM pulse has been under implementation since 2007-08.

4.2 Various developmental interventions like demonstration of improved technologies, quality seeds, integrated pest management, water saving devices and capacity building of farmers, RCT etc., have been provisioned.

4.3 To accelerate the promotion of pulses during Rabi/summer 2015-16 followings steps have been taken such as:

i) Rs.440 crore allocation under additional pulses, ii) Inclusion of cluster demonstrations in rice fallows under BGREI (Bringing Green Revolution in Eastern India) scheme in Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Eastern U.P. and West Bengal, iii) A special programme for demonstration of new varieties of pulses through Krishi Vigyan Kendra (KVKs) to increase availability of seeds of new varieties of pulses and promote adoption of new varieties; iv) Increase in MSP for gram from Rs.3175 to Rs.3425 and for lentil (Masur) from Rs.3075 to Rs.3325 for *rabi* marketing season 2016-17.

4.4 During 2016-17, the NFSM under state plan scheme-*Krishi Unnati Yojana* has been allocated with Rs. 1100 crore as Central share with sharing pattern of 60:40 between Central + State for general category states and 90:10 for Himalayan & NE states.

5.0 Climate change: Pulses for sustainability

5.1 Pulses help to mitigate climate change- The heat stress is likely to be the biggest threat to pulses and bean production in the coming decades. The climate-resilient varieties would be of critical importance for low input producing system. The manufacture of synthetic fertilizers is energy intensive and emits greenhouse gases.

5.2 Pulse species have a broad genetic diversity, an attribute essentially required to breed more climate-resilient varieties. The International Center for Tropical Agriculture (CIAT) is working on generation advancement of pulses suited to grow at temperatures above the crop's normal "comfort zone".

5.3 Pulses have multiple functions to make agriculture more sustainable- Pulse legumes are attributed to their ability to biologically fix nitrogen, in symbiosis with certain types of bacteria (e.g. *Rhizobium, Bradyrhizobium*). These bacteria are able to convert atmospheric nitrogen into nitrogen compounds to the tune of 72 to 350 kg of nitrogen per ha per year. Additionally, some of the species of pulses are able to free soil-bound phosphorous. These two features make this crops highly suited to low-input agricultural production systems and fit to agro-ecological principles.

5.4 Pulses in inter-cropping systems allow higher underground utilization efficiency due to their root structures and also reduce pesticide utilization. The deep tap rooting pulses like pigeonpeas helps to supply groundwater to intercropped companion species.

5.5 To improve the food and nutritional security the food legume has a major role. The dried seeds of pulses have ability to be stored for long periods without compromising their nutritional value, thereby, increased food availability till the new arrivals. The pulse growers have both the options of self-consumption and also cash crops, to fetch income.

6.0 Opportunities: Potential to be harnessed

There are opportunities to exploit the yield potential. The yield gap between FLD and State/National average yields; wide gap in production versus demand; adaptability in different agro-climatic conditions, to suit stressed regions; thriving well as inter-crop under normal/wider spacing crops in mono-cropped *rainfed* regions; utera cultivation in predominate rice based cropping system with short duration pulses varieties; to restore soil health/fertility through atmospheric nitrogen and biomass.

6.1 Pulses are best to exploit soil carbon sequestration potential by inclusion of pulses in cropping systems, such as intercropping or crop rotations to have a higher soil carbon sequestration than mono-crop systems.

6.2 The commodity is suitable for organic farming as it fulfil most important criteria of selection of a crop/varieties with high value crop and low nutrition requirement, (pulses fulfil both criteria as high-value crops, usually getting 2-3 times higher prices than cereals and as nutrient requirement usually pulses required low amount of nutrition).

6.3 With higher MSP and good trade opportunities, employment generation at local area by forming FPOs federation of pulses grower and processing of pulses at cluster/federation level may generate employment in rainfed areas.

7.0 Constraints

7.1 Climatic factor is one of the major area of pulses are under *rainfed* regions, therefore, their productivity is governed by amount and distribution of rainfall. Rainfall intensity and distribution leads to vulnerability of *kharif* pulses to water stagnation (oxygen stress) and *rabi* pulses, subjected to water deficit. Extreme weather conditions such as sudden shifting of temperatures i.e. low and high temperature beyond threshold level of tolerance cause flower abortion and hasten the reproductive period and lower grain yield Occurrence of mid-season cold waves and terminal heat during winter season has also been causing losses to crop productivity during rabi pulses, high temperature adversely affects productivity of winter pulses

7.2 During kharif, the edaphic factors play a major role. Pulses are most sensitive to water logging condition, in black cotton soil in *kharif* season water logging situation results in poor aeration and failure of crop, especially pigeonpea.

7.3 Insects and diseases is major challenge. NCIPM study has recorded pod borers (*Helicoverpa armigera*), fusarium wilt, root rots, and ascochyta blight in gram to cause 10-90 % loss in MP, Karnataka, Rajasthan, Maharashtra, UP, Gujarat & Telangana. In pigeonpea the percentage damage due to pod borer, pod fly, fusarium wilt, and sterility mosaic disease is 15-60 %. Similarly, pod borer, aphids, cutworm, powdery mildew, rust and wilt are the major pests and diseases affecting lentil production.

7.4 Lower productivity and low yield potential, under pulses as compared to cereals besides allocation of poor, marginal lands and improper nutrition.

7.5 Poor or no critical irrigation, especially in rainfed *rabi* season,further limits the yield. The variability in climatic situations such as high temperature and poor or no rainfall special variation during winter season drastically affected the yield.

7.6 Poor seed and varietal replacement in pulses is one of the major issues related to low yield and exploit the potential.