

Scenario of pulses production in India

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Pulses are the backbone of Indian agriculture due to their significant role in human and animal nutrition, soil ameliorative properties, environmental sustainability and economic viability. India is the largest producer, processor, importer and consumer of pulses in the world with more than 12 major and minor pulses cultivated over 29-30 million ha. The country witnessed production of 26.05 million tonnes of pulses during 2022-23. This article deals with scenario of pulse production, import-export status, yield gap and delineates constraints along with strategies to overcome these constraints.

Keywords: Pulses, Scenario, Self-sufficiency, Trends

Pulse constitute important dietary constituent for humans and animals because of their richness with proteins (ranging from 20 to 27%, depending upon the crop species) and essential minerals, vitamins and dietary fibres. The protein content of grain legumes is double that of wheat and three times that of rice. Therefore, pulses as a complement to cereals, make one of the best solutions to protein-calorie malnutrition. Beside proteins, pulses are also important source of the 15 essential minerals required by human beings. Due to their diverse uses as atmospheric nitrogen fixing agents, green manure and cover crops, catch crops in short season cropping windows, breakfast grains and ingredients of specialty diets, pulses are an important subject of agricultural, environmental and biotechnological research.

To commemorate the importance of pulses in world nutritional security and health, the Food and Agriculture Organization of the United Nations recognized 2016 as the International Year of Pulses. This celebration has been more important in Indian context where a large majority of population is dependent

upon pulses for their protein requirements making this country the largest producer, consumer and importer of pulses in the world.

Pulses as a source of nutrition

Nutritional value of pulses is quite high as compared to most of

the cereals. The nutritional profile of major pulses is described in Table 1.

Pulses trends

India has been a leader in production as well as consumption of pulses in the world. During the last two years, a production of more

Table 1. Nutritional profile of pulse grains (per 100 g, on average basis)

Pulse crop	Energy (Kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Total dietary fiber (%)
Chickpea (<i>Cicer arietinum</i> L.)	368	21.0	5.7	61	22.7
Pigeonpea (<i>Cajanus cajan</i> L.)	342	21.7	1.49	62	15.5
Lentil (<i>Lens culinaris</i> Medik)	346	27.2	1.0	60	11.5
Mungbean (<i>Vigna radiata</i> L.)	345	25.0	1.1	62.6	16.3
Urdbean (<i>Vigna mungo</i> L.)	347	24.0	1.6	63.4	-
Fielpea (<i>Pisum sativum</i> L.)	345	25.1	0.8	61.8	13.4
Rajmash (<i>Phaseolus vulgaris</i> L.)	345	23.0	1.3	62.7	17.7
Cowpea (<i>Vigna unguiculata</i>)	346	28.0	0.3	63.4	18.2
Horsegram (<i>Macrotyloma uniflorum</i>)	321	23.6	2.3	59.1	15.0
Mothbean (<i>Vigna aconitifolius</i>)	330	24.0	1.5	61.9	-

Source: 'Pulses for human health and nutrition', Technical Bulletin, IIPR, Kanpur

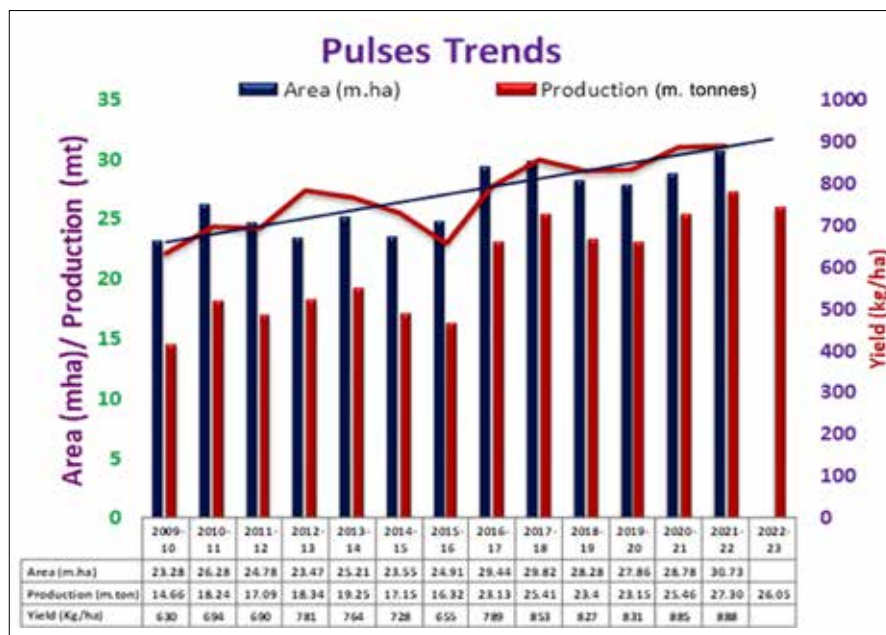


Fig. 1. Pulses trends in India since 2009-10. Source: DES, DAC & FW, New Delhi

than 27.0 million tonnes has been recorded. The trends of pulses are depicted in Fig. 1.

Per capita net availability of total pulses in India

Per capita availability of pulses in India has seen an upward movement during the last two decades although it is still low as compared to the recommendations of ICMR (52g/capita/day). The current per capita availability is estimated at 53.8 g/capita/day which was quite low (35.4 g) in 2010 (Table 2). The current availability

Table 2. Per capita net availability of total pulses in India

Year	Availability	
	Per day (g)	Per Annum (kg)
2010	35.4	12.9
2011	43.0	14.4
2012	41.7	15.2
2013	43.3	15.8
2014	47.2	17.2
2015	43.8	16.0
2016	43.1	15.7
2017	54.7	20.0
2018	51.3	18.7
2019	42.6	15.5
2020	43.8	16.0
2021	44.5	16.3
2022	53.8	19.6

Source: Economic Survey 2022-23

is quite significant from nutritional point of view since besides pulses, there are now a number of other options such as milk and milk products, meat, eggs, etc. available to consumers for meeting their daily dietary protein requirement. The progressive trend in per capita availability of pulses is indicated in Table 2.

Import-export status

The increase in production of pulses is supplemented by declining imports during the last few years. During 2010 to 2015, the pulse import was in the range of 2-5 MMT valuing ₹ 7500-17,000 crore per annum. The imports reached a peak of 6.66 MMT valuing ₹ 28,750 crores in 2016-17. During the last five years, an overall declining trend in the import of pulses has been witnessed. The

Table 3. Pulses import trends in India

Year	Quantity (mt)	Value (₹ Crore)
2013-14	3.18	11036.75
2014-15	4.58	17062.94
2015-16	5.80	25619.06
2016-17	6.61	28523.18
2017-18	5.67	19052.65
2018-19	2.59	8289.59
2019-20	2.89	10221.35
2020-21	2.46	11937.58
2021-22	2.77	17105.31
2022-23	2.52	15985.85

volume of imports fell to the lowest level of around 2.46 MMT in 2020-21, which is the lowest in the last ten years. During 2022-23 also, import is well within 2.5 MMT (Table 3).

India today is a major exporter of various food and agricultural products. Among these, we have seen exponential growth in the pulses export from India in the past few years. The export of pulses from India was around 7.75 lakh tonnes which are worth ₹5397.85 crores in the year 2022-23 (Table 4). Major exporting crops are chickpeas and lentils to meet the increasing demand in Bangladesh, UAE and Iran. Chickpea contributes 47% of total export mainly to UAE, Iran and Saudi Arabia.

Table 4. Pulses export trends in India

Year	Quantity (000' T)	Value (₹ In Crore)
2013-14	0.345	1748.81
2014-15	0.222	1218.31
2015-16	0.256	1655.90
2016-17	0.137	1277.70
2017-18	0.179	1469.63
2018-19	0.285	1801.51
2019-20	0.229	1511.79
2020-21	0.276	1977.88
2021-22	0.410	2834.29
2022-23	0.775	5397.85

Targets for achieving self-sufficiency in pulses in India

In order to ensure self sufficiency, the pulse requirement in the country is projected at 32 million tonnes by the year 2030 and 39 million tonnes by the year 2050. This necessitates an annual growth rate of 2.2% requiring a phenomenal shift in research, technology generation, its dissemination, and commercialization along with capacity building in frontier areas of research. Keeping in view the availability of land, population growth pattern and technological developments, five-yearly projections have been made. In every five-year interval, productivity will have to be enhanced by an average of about 80 kg/ha over the previous one to achieve a final productivity rate of 950 kg/ha by the end of 2025

and 1335 kg/ha by the end of 2050. The above-stated projections have been made assuming that practically it will be feasible to increase about 4 million ha additional area under pulses.

Yield gap

In most of the pulses, there is a huge gap between the potential yield and the realized yield. It is evident that the actual productivity of different pulses is considerably lower as compared to their potential yield as well as that realized on farm demonstrations (Table 5). One of the most important reasons behind low productivity in pulses is that these are generally grown in poor and marginal lands with minimum inputs. About 87% of the pulses cultivation in the country is rainfed. Many farmers still use old varieties and grow their home-saved seeds. Further, they sow the seeds year-after-year and that too through broadcasting instead of line sowing and hence are not able to maintain recommended plant population in the fields. Farmers also do not use pre-emergence herbicides to control the initial weed growth. This leads to heavy investment on manual labour and also decreases economic yield. Farm mechanization is lagging far behind in pulses cultivation in the country. Most of the farmers are generally resorting to manual operations right from sowing to harvesting. This not only increases cost of cultivation and drudgery but also leads, to more economical losses. Further, many farmers still do not follow recommended practices for pulses cultivation. Instead, they prefer to follow their age-old traditional way and do not adopt diseases and pest management recommendations.

Major constraints in increasing pulses production

Low realized yield, instability in production, risk due to climate change, sharp decline in area of pulses in Indo-Gangetic plains (IGP), inadequate seed replacement rate, post harvest losses, wide fluctuation in prices, poor availability of critical inputs, poor transfer of technology,

Table 5. Yield gap in different pulse crops (2022-23)

Crop	FLDs	Yield with improved practice (kg/ha)	Yield with Local practice (kg/ha)	Yield gap (%)
Chickpea	459	1820	1513	20.29
Pigeonpea	455	1409	1116	26.2
Mungbean	110	862	721	19.5
Urdbean	115	983	815	20.5
Lentil	120	1245	1031	20.75
Fieldpea	70	1463	1185	23.45
Cowpea	22	1165	949	22.06
Guar	24	1021	837	22.82
Moth bean	7	504	398	26.63
Horse gram	17	708	550	8.83

Source: IIPR, Pulse Front Line Demonstrations. Potential yield in FLD; Realized yield is the yield in farmers field; Present status is the average yield at national level.

poor seed storage facilities and less mechanization are the major impediments.

Challenges

Major challenges in pulses production

- Biotic stresses: Diseases: Wilt, root rot complex, MYMV
Insect pests: pod borer, *Maruca*
- Abiotic stresses: Drought, terminal heat, salinity, frost, water-logging
- Climate change: Unpredictable weather conditions and extreme events
- Shrinking agricultural land
- Growing population with high demand of protein

Major achievements and its impact

A number of area and season specific varieties have been developed in different pulses which are not only high yielding but are also resistant to most of the disease and insect-pests. These varieties have proven their potential in farmers' fields as also in large scale demonstrations. It has been demonstrated that improved varieties of pulses have a positive impact of 15-20% in increasing pulses production in all major pulse crops including chickpea, mungbean, urdbean and lentil while in pigeonpea, improved varieties increased the yield by 10-12%.

As a result of planned and concerted efforts, several breakthrough achievements were recorded in the research

front including reduction in crop duration: [mungbean (75 to 55 days), lentil (140 to 120 days), chickpea (135 to 110 days)]; increase in seed size (100-seed weight) of Kabuli chickpea from 35 to 55 g; development of YMV resistant, non-shattering and synchronous varieties in mungbean and urdbean; development of high input responsive, wilt resistant varieties in chickpea and early maturing and machine harvestable varieties in pigeonpea for multiple cropping; development of green seeded variety in field pea and bio-fortified varieties in lentil and chickpea. Hybrids were successfully developed and adopted in pigeonpea besides development of cultivars in the backgrounds of most successful chickpea varieties of past years through marker assisted breeding. Since the inception of Pulses research network in India, more than 775 high yielding varieties with resistance to major biotic and abiotic disease have been developed. Some of the landmark varieties developed by the NARS of pulses are given in Table 6.

Further, a large number of crop production, management and protection technologies have been developed for pulses whose potential has been shown in large scale demonstrations as well. Such technologies include:

- Weed management through application of Pendimethaline (30 EC) @ 1.0 Kg a.i./ha as pre-emergence application and Imazethapyr @ 70-80 g/ha as

Table 6. Landmark varieties of pulses

Variety	Special feature
IPM 205-7 (Virat)	Super early mungbean variety
IPL 220, L 4717	High Fe and Zn fortified lentil variety
IPH 15-03, IPH 09-5	Pigeonpea hybrids
IPFD 10-12	Green seeded variety-Fieldpea
IPC 2005-62	High protein contents (26.47%)-Chickpea
PDAT 16	Short duration pigeonpea
Phule Vikram, NBeG 47, RVG 204, Pusa Parvati, JG 24, IPCB 2015-132	Machine harvestable chickpea
Samriddhi (IPCMB 19-3) IPCMAS-1, Super Annigeri 1, Pusa Chickpea 20211, BG 4005, Pusa JG 16, NC 7, NC 9	Chickpea MAS product, wilt resistant, drought resistant
PDL 1, PSL 9	Salinity tolerant lentil

post-emergence application at 20-25 DAS during *kharif* season after assuring the germination of weed.

- Seed treatment with 5 ml of Imidacloprid (17.8 SL) per kg seed followed by usual plant growth promoting agent (PGPA) seed inoculation.
- Control of thrips by spraying Imidachloprid (17.8 SL) dissolving 3 ml in 10 liters of water @ 600 to 800 liters of solutions.

- Adoption of life saving irrigations in Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, Andhra Pradesh and Karnataka.
- Seed priming by soaking seeds for 6-8 hours in water (Chhattisgarh, Bundelkhand region, Bihar, West Bengal, Odisha and Assam).
- Ridge planting of pigeonpea in high rainfall and low lying plain areas. Use of critical nutrients such as sulphur @ 20-25 Kg/ha.
- Adoption of efficient and remunerative cropping systems viz. rice-wheat-mungbean, pigeonpea-wheat and maize / sorghum / pearl millet-chickpea / lentil.
- Seed inoculation with efficient strains of *Rhizobium* and phosphate solubilizing bacteria (PSB) @ 15-20 g/kg seed led to 10-15% increase in yield over un-inoculated control.
- Raised bed planting for population management and ridge & furrow system to conserve and enhance water use efficiency in pigeonpea.
- 100 kg DAP per ha along with basal application of sulphur @ 20 kg and zinc @15 kg/ha. Seed treatment of chickpea and lentil with Mo.
- Seed treatment with Thiram + carbendazim (2:1) @ 3 g per kg of seed to ensure good plant stand.
- Bio-control of soil borne

diseases by use of *Trichoderma* + carboxin (4 + 1 g/kg seed) has been recommended.

- Use of Pheromone traps (@ 4-5 traps/ha) for control of pod borer in chickpea and pigeonpea.

Policy initiatives

To make India self-sufficient in pulses production, availability of quality seed is one of the most crucial factors which ensures enhanced per unit yield of pulses in farmers' fields. For augmenting the availability of quality seeds of pulses, the Department of Agriculture, Cooperation and Farmers' Welfare, Government of India, has planned to improve availability of quality seeds of major pulse crops locally with financial support of more than ₹ 225 lakh through 150 Seed-Hubs across the country in ICAR Institutes/State Agricultural Universities/Central Agricultural Universities/Krishi Vigyan Kendras along with one more project 'Enhancing Breeder Seed Production for increasing Indigenous Production of Pulses in India' for making quality seeds available locally for most suitable varieties of different pulse crops in 2016-17. Since the inception of seed hub project more than 4.0 lakh quintal quality seeds has been produced and distributed to the farmers of the Country.

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