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Can India sustain high growth of pulses production?

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India has made remarkable progress in enhancing production of pulses during the past 15 years. During 2005-06, the total production of pulses in India was 13.38 million MT, which increased to 25.58 million MT during 2020-21. This shows an impressive growth of 91% or a compound annual growth rate (CAGR) of 4.42%. During 2020-21, chickpea had a lion's share of 49.3% in the total pulses production. Among remaining pulses, pigeonpea contributed 16.2%, mungbean 10.3%, urdbean 9.3%, lentil 4.9% and other pulses 9.9%. During the past 15 years, the highest growth in production was observed for mungbean (178%), followed by chickpea (125%), urdbean (90%), pigeonpea (51%) and lentil (34%).

This is a big leap by India towards attaining self-sufficiency in pulses. This has been possible because of the recent mission mode approach adopted by the country in boosting pulses production. The contributing factors to this success include (1) availability of high yielding cultivars well adapted to different environments and growing conditions, (2) improved crop production technologies, (3) enhanced uptake of improved cultivars and production technologies through knowledge empowerment of farmers and by ensuring supply of quality seed and other inputs (establishing 15 seed hubs, conducting large number of demonstrations on improved cultivars and best production technologies, etc), (4) expansion of the area of pulses in rice-fallows, spring/summer season and other non-traditional areas, and (5) government policies in favor of pulses.

The dedicated efforts of Indian Council of Agricultural Research (ICAR) through Indian Institute of Pulses Research (IIPR) and various All India Coordinated Research Projects (AICRPs) on Pulses and a network of partners have made significant achievements in development of high yielding cultivars and their production technologies. Partnership of ICAR with international institutes, particularly ICRISAT in chickpea (desi and kabuli) and pigeonpea; ICARDA in lentil, chickpea (kabuli) and grasspea; and World Vegetable Center in mungbean and urdbean, have been very fruitful. Germplasm and breeding materials supplied by these institutes have contributed to development of several widely grown cultivars. For example, short-duration chickpea varieties, such as JG 11 and JAKI 9218, developed in collaboration with ICRISAT contributed significantly to expanding chickpea area in southern India. The National Food Security Mission (NFSM) launched by the Ministry of Agriculture and Farmers Welfare, Government of India in 2007 boosted efforts on outreach activities on pulses.

One of the greatest success stories for pulses in India is the spectacular increase in area and productivity of chickpea in central and southern India, outperforming rest of the world (all chickpea growing countries excluding India) in chickpea production. During the past four decades (1979-2019), chickpea production in central and southern India increased by 445% (from 1.27 to 6.95 million MT) due to 177% increase in area (2.42 to 6.71 million ha) and 97% increase in yield (527 to 1036 kg/ha), while in the rest of the world, chickpea production increased by 133 % (1.85 to 4.31 million MT) due to 49% increase in area (2.80 to 4.17 million ha) and 57% increase in yield (659 to 1033 kg/ha). This outstanding achievement by India in chickpea production in central and southern India largely remained unnoticed, as bulk of this increased production went in compensating for the huge reduction in chickpea production occurred in northern India, which was due to replacement of chickpea with wheat and other irrigated crops in about 4 million ha (almost equivalent to the total chickpea area of the rest of the world). Expansion of wheat area was crucial for India for ensuring food security and, fortunately, expansion in chickpea area in central and southern India fully compensated for the loss in chickpea area occurred in Northern India.

India has ample opportunities and capabilities to sustain this high growth of pulses production. There is a need to maintain this momentum and make adequate and sustained investments in pulses research and developments and provide favorable policy support for boosting pulses production.

The crop improvement programs are now better equipped to develop varieties in relatively shorter period and meeting the existing and evolving requirements of farmers, consumers and the industries. The crop improvement scientists now have access to advanced tools and techniques to realize high genetic gains. These include genomics resources and high throughput phenotyping methods for achieving high precision and efficiency in breeding; rapid generation advancement methods for speed breeding; novel crossing methods, such as multiparent advanced generation intercross (MAGIC) method for enhancing genetic recombination; and efficient data management systems for making better decisions. The research programs need to be adequately funded so that these can develop/upgrade research facilities and have trained human resources needed to integrate modern tools and techniques and gain enhanced efficiency.

Some the areas which need greater attention in development of varieties/hybrids include (1) improved resilience to climate change and adaptability to new niches (early maturity, heat tolerance, etc), (2) region-specific hybrids of pigeonpea with suitable maturity duration and efficient seed production and genetic purity assessment system, (3) traits that facilitate mechanization (suitability to machine harvesting, herbicide tolerance), (4) further enhanced nutritional quality (protein, iron and zinc contents), and (5) traits needed by the industries. The crop improvement programs should consider exploitation of wild species for introgression of novel genes conferring resistance/ tolerance to existing and emerging biotic and abiotic stresses and controlling other desired traits for which genetic variability in the cultivated germplasm is not adequate.

Though pulses already have appreciable amount of protein and micronutrients, opportunities exit for further enhancing protein content by 20 to 30% and some of the micronutrients, such as iron (Fe) and zinc (Zn), by 50 to 100%. The crop improvement programs should aim for mainstreaming these traits in development of breeding materials, so that all future varieties have higher contents of protein and micronutrients, and the consumers can get higher nutritional benefits even if they consume the same quantity of pulses.

India still has vast scope of bringing additional area under pulses cultivations. Concerted efforts need to continue on expanding area of pulses in rice-fallows available in eastern and southern states and promoting spring/summer cultivation of mungbean and urdbean in areas with assured irrigation.

Wide yield gaps still exist between the realized and potential yields of pulses with varying range across crops and geographies. There is a need to map yield gaps for each pulse crop in major growing geographies, identify the major contributing factors to yield gaps, and develop suitable strategies for bridging the yield gaps. This will involve targeted development of improved varieties and production technologies and enhancing their adoption by empowering the farmers with required knowledge and inputs supply.

Crop production technologies which are expected to have high potential impacts on production of pulses need to be given special attention. These include (1) planting methods, such as raised bed and ridge and furrow methods, to avoid water logging in rainy season pulses, (2) integrated water management and efficient irrigations systems to ensure need-based supplemental irrigations to post rainy season pulses, (3) soil-test based application of fertilizers to meet the requirements of both macro and micronutrients, (4) enhanced mechanization in pulses cultivation, and (5) promoting conservation agriculture. It is also important to promote efficient and cost-effective seed/ grain storage methods to minimize losses during storage. Development of pulses value chain involving farmers among the value chain actors would be important to provide much-needed additional income to farmers.

Pulses would continue to be important in India in the diets of people for nutritional benefits and in sustaining agriculture production systems. The demand of pulses will continue to escalate because of population growth and increasing awareness of consumers about the nutritional benefits of pulses.

There are not many countries exporting pulses that are in high consumption in India (desi chickpea, pigeonpea, mungbean, and urdbean). Thus, India should continue concerted efforts towards achieving self-sufficiency in pulses. The rapid strides taken by India in pulses production in the recent years and the vast opportunities available for increasing both area and productivity of pulses in the country suggest that India is well-positioned to achieve self-sufficiency in pulses.