

## Lentil: Sustainable Food for Future

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### Population growth and climate change

The world's population continues to grow, reaching 7.9 billion by mid-2021 and is expected to reach 9.9 billion by 2050. The average annual population growth rate was around 1.1% in 2015–2020, steadily decreasing after it peaked at 2.3% in the late 1960s. So, it can be said that the world's population continues to grow, albeit at a slower pace. Such a large world population will demand more food in the future. Despite the fact that agricultural growth has been higher than the rate of population growth, concerns have been raised whether the landmass of the world can support its expanding population by 2030 and 2050. Food security remains a relevant and priority of many nations, emphasizing developing countries. The other primary concern will be climate change and diminishing natural resources due to modern agricultural practices in the upcoming years. By the end of this century, the average global temperature is predicted to rise due to the increased release of greenhouse gases into the atmosphere. Different predictive models inferred that climate change would reduce yields of major cereal crops such as Paddy, Wheat and Maize across different regions of the globe, resulting in food insecurity challenges.

### Changing Eating habits

According to the Food and Agriculture Organization (FAO), the consumption of pulses has steadily decreased in the recent past. This is majorly due to the increasing disposable income in various countries which led to the change in the diet of an individual. Changing consumption patterns, including shifting diets toward highly water-intensive foods such as meat (15,000 liters of water is required for 1 kg of beef production), will worsen the situation in the future. While a person may drink 2–4 liters of water a day, it takes 2000–5000 liters of water to produce a person's daily food. For this reason, in the coming time, humans will have to make changes in their eating habits. Fortunately, the health-conscious generation is already asking for more plant-based products on the market. Moving towards plant-based substitutes could result in 15 times less water utilization and a reduction in methane gas emission.

### Why Lentil

Lentil (*Lens culinaris* L. Medikus), commonly known as 'masoor' in India, has all the features to become the food of future. The nutritional content of lentils is of great interest to consumers, who are more focused on health and wellness than ever before. Where raising cereals for human consumption and livestock animals is harming the planet with herbicides, pesticides, chemical fertilizers and the methane produced by the animals, lentils and other legumes do the opposite. The drought-tolerant nitrogen-fixing lentil is a very inexpensive, delicious and highly nutritious food. Lentils require minimal irrigation and they work with the soil bacteria to create healthier soil. Healthy soil can keep carbon out of the atmosphere where it traps heat accelerating global warming. Lentil has great significance in cereal-based cropping systems because of its high nitrogen-fixing ability as it adds 32.8 kg/ha nitrogen and 4-5 t/ha organic matter into the soil. Lentil can be called as poor man's meat because protein content in lentil grains ranges from 22.0 to 34.6 percent and 100 g dried seeds contain 340-346 kcal, 20.2 g protein, 0.6 g fat, 65.0 g total carbohydrates, about 4 g fiber, 2.1 g ash, 68 mg Ca, 325 mg P, 7 mg Fe, 29 mg Na, 780 mg K, 0.46 mg thiamine, 0.33 g riboflavin and 1.3 mg niacin. Furthermore, because of its high lysine and tryptophan content, it provides a balance in amino acid uptake when consumed with wheat or rice, as these amino acids are scarce in cereals.

### Current production trend

Globally, lentil ranks fourth in production among the major pulse crops after dry bean, pea and chickpea. World lentil production during 2020 was 6.54 million tons, which was approximately 8 percent of total dry pulse production. The major lentil-growing countries are Canada, India, Turkey, Australia, USA, Nepal, China, and Ethiopia. Canada is the world's leading lentil producer, followed by India. Together, Canada and India hold a 65 percent share in world lentil production. World lentil production has risen steadily by six times (626%) from an average of 917,000 tons in 1961–1963, when data collection started, to 6,547,000 tons in 2020-21. In past few years lentil consumption has gone up four to five times relative to the human population.

### Challenges and Future Prospects

- **Yield stagnation:** In developing countries like India lentil has received little attention in research and development. Despite of increasing demand the yield of lentil has been stagnated in last few decades around 10-12 q/ha. One of the reasons for this yield stagnation is the narrow genetic base of Indigenous *microsperma* germplasm, which led to repeated use of identical genotypes in breeding programs. A study conducted at the Indian Institute of Pulse Research has revealed that most of the important released varieties in India share a common parentage. The "bottleneck" of the narrow genetic base of lentil can be overcome through introgression of new gene combinations from the available germplasm accessions.
- **Weed problem:** Weeds are one of the major problems in lentil cultivation because of its small height. Weeding in lentil is labor intensive as generally it is carried out manually. Herbicide tolerance in lentils gives farmers an extremely good alternative for weed management. It is projected that in near future roughly 80 to 90 per cent of cultivated lentil will be herbicide tolerant in U.S.A.
- **Mechanical Harvesting:** Another important aspect of lentil cultivation on large scale is research on the development and promotion of mechanical harvesters that would enable



farmers to harvest lentil on time. Breeders in Canada are working to create tall, low-shattering lentil varieties that can be harvested mechanically. Harvesting, on the other hand, is often done manually in nations like India due to small land holdings.

- **New food items based on Lentil:** Because more and more people are interested in plant-based proteins, lentils have emerged as a frontrunner. Many vegetarian food dishes are now available in the United States, with meat being replaced with lentils without losing taste. Chilis, burgers, tacos, and meatless meatballs are among the dishes available. More of these types of items are expected to be available in the future.

### Conclusion

In addition to ensuring food security, part of our long-term goal should be to reduce the environmental impact of agriculture. Lentil is one of the best-fitting solutions for most of the future agricultural and environmental challenges. Ability of lentil to grow in stress hardy conditions with minimal water requirement makes it a good candidate in changing climate. Also, the cropping systems involving pulse crops like lentil can be a cheaper and more sustainable alternative to conventional practices. Given the above reasoning, it is reasonable to consider lentil as a future food.

