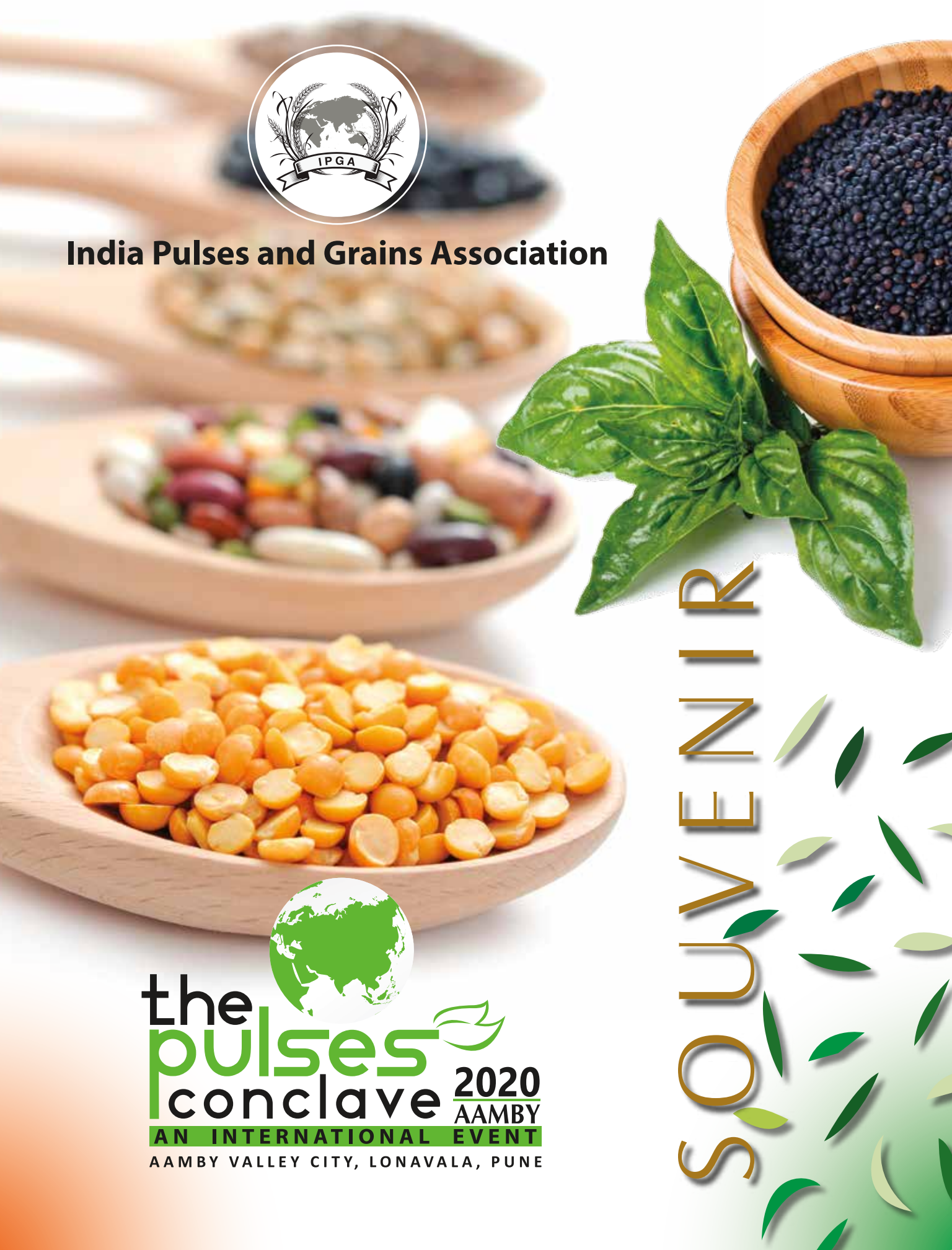

India Pulses and Grains Association

the pulses conclave 2020

AN INTERNATIONAL EVENT

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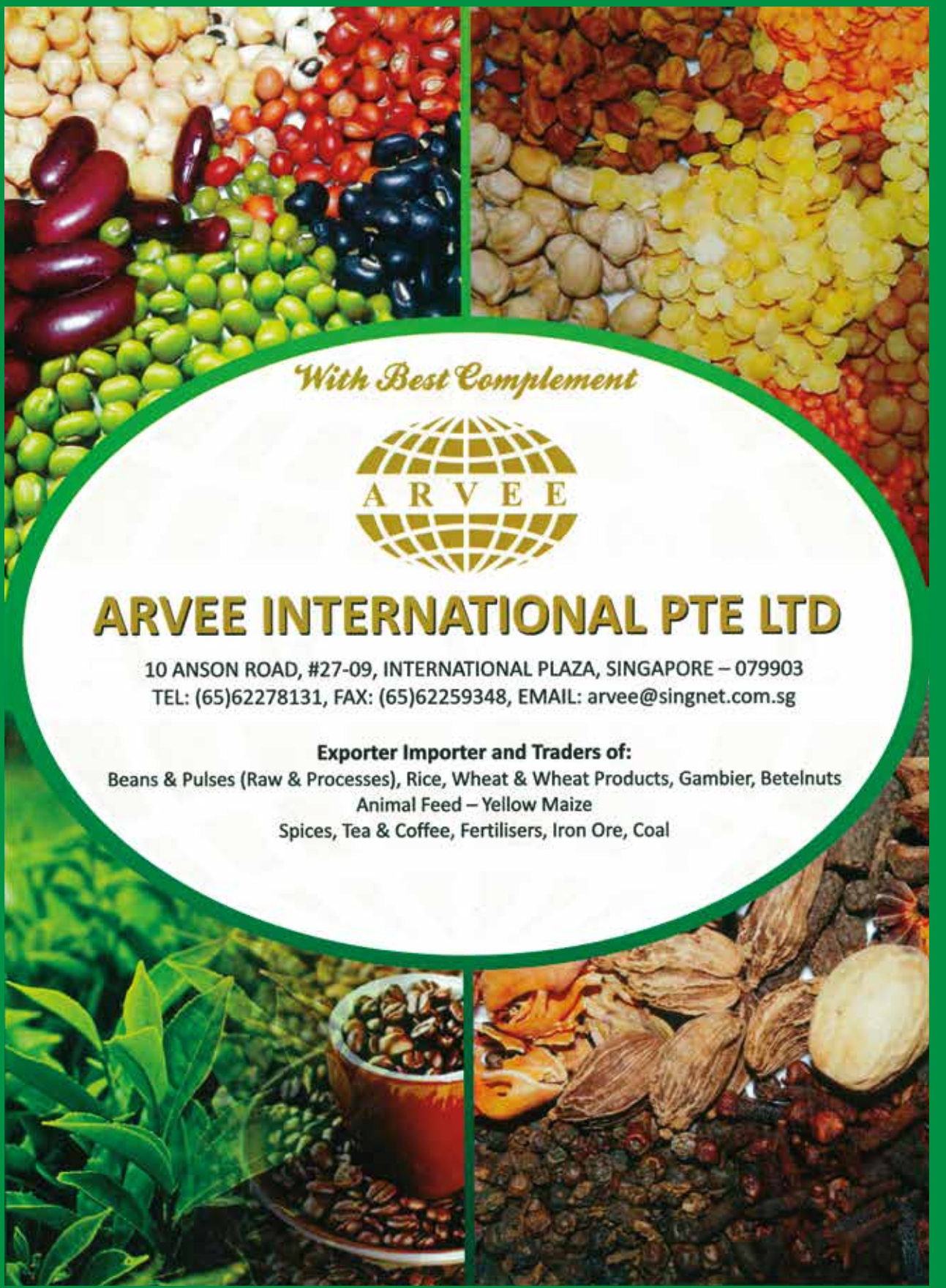
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Dear Friends,

Firstly let me welcome you all to the 5th edition of The Pulses Conclave 2020 at the picturesque location of Amby Valley Lonavala.

It has been an eventful couple of years for the pulses trade with import tariffs and restrictions on various pulses leading to significant disruptions, being witness to ways and means deployed to get pulses into the country, litigations across the country etc.

IPGA on its part has always steered clear of controversy and tried to keep focus on the challenges facing the sector with respect to quotas imposed on imports of pigeon peas, black matpe, mung beans and peas and the issue of allowing only millers to import the said pulses. Continuous follow-ups and representations have been made with various ministries and successfully with respect to the splitting of HS code for peas and now we are hopeful that post budget the import restrictions on green peas will be removed. In all such representations IPGA has always striven for a uniform, consistent and well thought out trade policy so that loopholes are plugged and uncertainties removed.

This year we have prepared a slightly different programme for The Pulses Conclave 2020, which as a part of its agenda will not just discuss increasing domestic production and consumption but will also bring to fore other areas of the trade like Improving Processing efficiencies, increasing Consumption, Exports, Value Addition, Protein Extraction, Post-harvest Crop Management, etc.

We have created a focussed approach towards pulses processing this year. Pulse processors are actively engaging in developing an alternative protein sector in India which will include developing tasty, affordable and high-protein foods, making plant-protein products from pulses, developing plant-based and cell-based alternatives to meat, dairy and eggs to reduce environmental strain on the planet caused by the livestock sector in agriculture so as to reduce greenhouse gas emissions of the food system, save precious water hence cutting our carbon footprint which will ultimately pave the way for a brighter greener future for all life on earth. **It is said that the real war against climate is being fought on our plates multiple times a day with every food choice we make.**

The growth and development in the processing sector will see the flow of domestic and foreign investments into the sector and help the Indian Pulses Trade contribute to the Hon'ble Prime Minister's vision of making India a $ 5 trillion economy

I take this opportunity to thank you all for your support and trust that you will enjoy the interactions at the pulses conclave 2020.

Zaverchand (Jitu) Bheda

CHAIRMAN
India Pulses and Grains Association

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The Future of Food – Plant-Based Proteins and the Rise of the Global Middle Class in India

Huseyin Arslan
Executive Chairman , AGT FOODS AND INGREDIENTS INC.

As the world's population climbs to 9 billion people by 2050, the questions of food security and protein availability have become paramount to organizations and governments worldwide. According to the United Nations Food and Agriculture Organization, we must produce in the next 40 years the equivalent of all the food produced in the last 10,000 years in order to feed our growing population.

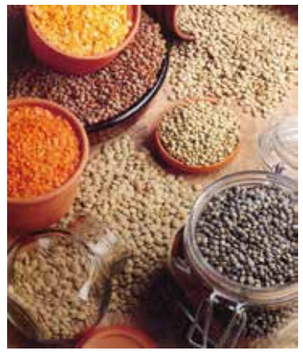
Simultaneously, as the world's population grows, its economic demographics have shifted in a dramatic way, with a new middle class growing rapidly in developing economies worldwide. This is particularly true in India, where a booming economy has lifted millions of people out of poverty and into the middle class over the past three decades.

While the definition of "middle class" varies, most organizations, including the World Bank, define the middle class as people whose earnings lie between $10 and $100 USD per day.[1] By this definition, India's middle class will be made up of approximately 200 million people in 2020, and is expected to expand dramatically over the next decade, reaching up to 475 million by 2030 and creating a middle class larger than that of China, the United States and Europe. With a young population expected to reach 1.6 billion in total by 2022, India is poised to become a leading consumer market for the next half century and beyond.

As other recent emerged markets such as Turkey have shown, the new Indian middle class is likely to start with the basics in its spending patterns: consuming more, and better quality, protein. With the majority of its population being vegetarian, most of this protein will continue to come from *pulses*, including lentils, chickpeas, peas and pigeon peas, the traditional sources of vegetable protein for most Indians in any income bracket. Pulses are inexpensive, high in protein, high in fibre and low in fat, shelf-stable and easy to cook, and can be afforded by even the economically downtrodden. The more affluent class, which tends to be more health-conscious, is also turning to vegetable protein due to the healthful benefits enjoyed by eating them.

However, the ability to decide to choose higher-quality pulses, and where those pulses are sourced, may now be factors in a middle-class consumer's shopping decisions; for example, a consumer may now have a choice of lentils produced in a great number of emerging production origins such as Canada, the United States, Australia, Russia and in Central Asia over local Indian production if desired.

1 "The Middle Class in India From 1947 to the Present and Beyond". Abihjit Roy. *Education About Asia, Volume 23, Number 1.* Spring 2018.



Additionally, with their time constrained by the extended hours they work, convenience is also likely to become a major factor in the purchasing choices of these consumers, who will be purchasing packaged, quick-cooking or other convenience foods instead of staple or less finished products. Cultural changes and the growth of the job market have also seen many women leave the home and enter the workforce, changing how meals are prepared in many households and further driving the convenience market. Furthermore, they will be paying more for the convenience.

With more money to spend and a desire for higher-priced packaged products, there is significant potential for the retail grocery sector of India to modernize to meet this demand. There are nearly 12 to 15 million grocery outlets in India, ranging from push carts, wet markets and *kirana* (small neighbourhood stores) to supermarkets and hypermarkets. Selection at *kirana* can vary wildly, and the complicated distribution system necessary to fulfill so many outlets provides many disadvantages to an organized retail market. With an estimated $270 billion market for food retail in the nation, and a potential market base of 200 million customers in the next ten years, there is significant room to grow for the grocery sector of India to meet these emerging market dynamics.[2]

This fragmentation is reflected in the pulses processing industry of India, with everything from the local hand-milled producer to large-scale industrial processing facilities competing for the same marketplace. Quality can vary, and processors are limited by the pulses produced by local farmers. Consumers may desire higher-quality pulses, but they may not be able to get them until the industry is capable of producing and distributing them.

Ultimately, modernization of the pulses and retail sectors of India are fundamentally linked—the improvement of one will lead to the improvement of the other. The drive to modernize the pulses sector in India will come from consumers demanding convenience, nutrition, and value, as well as from farmers producing crops that maximize their return and create sustainable opportunities for themselves.

Perhaps the most significant challenges for the modernization of India's grocery business are the policies set in place by the Government of India which have ultimately altered traditional trade flows in the region. For the past several years, the Indian government has enacted market interventions, including tariff and non-tariff barriers, expanded duty structure and volume restrictions, aimed at supporting local pulses production and prices and ultimately at stabilizing domestic food supply. While well-intentioned for Indian farmers and consumers, without easy access

2 "India Retail Foods 2014." USDA GAIN/McKinsey. December 29, 2014.

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Our Agri trading business provides bespoke offers for soft commodities to meet the specific requirements of our clients.

GP Global Agri trades and originates grains, pulses and oilseeds, which are the most essential food and feed ingredients. Agriculture is likely to be one of the most important challenges of the 21st century as an ever growing demand in emerging markets would need to be met while natural resources are a limiting factor.

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Chickpeas
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Mustard Seeds
Yellow Millet
Soybeans

to the growing Indian marketplace, global trade in whole and split pulses has slowed, requiring the pulses industry to realign itself with market requirements, consumer and customer demands in order to maintain growth in the sector.

The modern reinvention of pulse ingredients, including pulse flours, proteins, starches and fibres, has the potential to crack the code on the Indian market and create significant inroads in the convenience-driven marketplace. Pulse ingredients are not subject to the same tariffs issued by the Indian government as whole and split products, giving companies the opportunity to sell into the market, meet demand and generate sustainable profit. While whole pulse flours have been traditionally enjoyed as long as pulses themselves, pulse fractions are a relatively new technology, and have the potential to create new opportunities for non-allergenic, vegan, and sustainable food products.

Globally, the ingredient protein market is expected to reach $28.9 billion by 2020[3], with plant protein expected to continue accounting for the majority of the protein ingredient market. [4]

Pulse ingredients may find their most ingenious niche in their supplementation of the meat and dairy industries in North America and the West. While traditional markets like India largely continue to consume their protein through pulses (either by choice or by economic necessity), consumers in North America have begun to adopt pulses for their health and nutritional benefits, as well as in recognition of consumer trends towards sustainable sources of protein and away from the inefficiencies of animal husbandry. Protein has a positive image with consumers, who demand more proteins for a variety of reasons, including sport and fitness, nutrition, satiety, weight loss, and building muscle.

Additionally, pulses have only a fraction of the environmental impact of animal proteins; for example, a single pound of beef requires 1,857 gallons of water to be produced, while the same weight of pulses requires only 43 gallons of water to produce, and produces none of the environmental issues inherent with livestock production, such as runoff and methane production.[5]

Companies are reacting to consumer demand for sustainable proteins with innovative products that supplement traditional Western diets. There is no reason to believe that similar consumer market trends will not emerge in India. For example, as a non-allergenic vegetable, pulses are suitable

3 Innova Market Insights. 2017.
4 Clotilde analysis. 2018.
5 "Globalization of Water". Hoekstra and Chapagain. *National Geographic.* U. of Twente, Waterfootprint.org. April 2010.

as replacements for allergens or dietary-restricted ingredients such as milk and eggs. Pea milk, a mixture containing pea fractions that imitates the taste and texture of cow's milk, has skyrocketed in popularity in the past years, with the global non-dairy milk market projected to reach revenues of more than $38 billion by 2024.[6]

With an estimated 65% of people worldwide having some form of lactose intolerance, pea milk, containing no lactose or allergens resulting from pulses, is safe for consumption by everyone, providing avenues for food manufacturers to reach new markets for things like plant-based cheeses that could otherwise not be enjoyed by those consumers.[7] Plant-based food sales grew over 20% in 2018, with plant-based cheeses and yoghurts leading the way at 43% and 55% respectively. Plant-based milk sales rose 9%, while cow's milk sank 6%.[8]

The simple addition of pulse ingredients can also dramatically change the nutritional structure of foods; wholesale replacement of products is often not the goal, but rather to enhance existing food products. In pastas, replacing 25% of the wheat flour in the formulation with lentil flour can increase fibre content by 100% and lower the carbon footprint, while maintaining the same taste and texture as regular pasta.

There are also complete replacement products available, including *Veggipasta*™, a pasta product under development by AGT Foods that is made from 100% peas, combines pea fractions to create a pasta with the same taste and texture as regular wheat pastas.

While Indian consumers are represented by a large number of vegetarians who consume protein through plant-based foods, the country's large population means plant-based meat alternatives may have significant market opportunities. Plant-based meat alternatives, such as "burgers" and ground "beef" made with texturized pulse proteins, have become strong competitors in the field in recent years, with major international meat producers even entering the market space with their own meat alternatives. New players, such as Beyond Meat, whose burger products made from pulses are available in grocery stores and at quick service restaurants across Canada and the U.S., opened its IPO on the New York Stock Exchange to incredible success, closing its first day at $65.75 or 163%, making it the best-performing first-day IPO in nearly two decades.[9] Alternatives to traditional animal protein sources are available, sustainable, and ubiquitous, a trend the pulses industry will be happy to see continue indefinitely.

Pulses are also making significant inroads in the snack food industry, with pulse-based snacks such as crackers and chips becoming common on store shelves. Demand for healthy snacks, driven by families with children and millennials, has been and will be a strong driver for the market, as well as continued interest in snacks that offer the flavour and texture varieties offered by alternative ingredients. Growth of the alternative ingredient snacks market is expected to remain moderate to strong over the next three years through 2019, with a compound annual growth rate of 6.2% to reach sales of $1.7 billion.[10]

As the Indian marketplace grows, it is expected that many of these same trends experienced by North America, including demand for healthy and sustainable proteins, will be reflected in consumer demand going forward. The pulses industry has a unique opportunity for growth in India through pulse flours to provide the growing middle class with innovative products that they are familiar with, meet their tastes and preferences, and fall within the category of pulses.

Ultimately, value creation and success will come to companies who can play multiple links in the global value chain. A company that only processes and sells whole pulses will not make as much headway into the Indian marketplace; neither will a company that only mills chickpeas into flours on behalf of other companies. Pulse companies must be able to capture value at as many stages as possible, by processing, milling and marketing their own products. The more value captured, the more value earned.

The global race for protein is underway, and the pulse sector must be aware of the changing market dynamics and emerging opportunities. As a sector, we must be ready to support local needs for pulses to meet the wide variety of local taste, preference and market offerings that have become part of an evolving sector. If pulses make up a significant part of the protein highway, we are just embarking on this journey, and we can expect it to be an interesting and exciting one.

6 "The global non-dairy milk market is projected to reach revenues of more than $38 billion by 2024". Reportbuyer. *MarketWatch.* March 26, 2019. https://www.marketwatch.com/press-release/the-global-non-dairy-milk-market-is-projected-to-reach-revenues-of-more-than-38-billion-by-2024-2019-03-26

7 "Lactose intolerance". U.S. National Library of Medicine. Accessed January 7, 2020. https://ghr.nlm.nih.gov/condition/lactose-intolerance#statistics

8 "2018 U.S. Retail Sales Data for Plant-Based Foods". Plant Based Foods Association. Accessed January 7, 2020. https://plantbasedfoods.org/consumer-access/nielsen-data-release-2018/

9 "Beyond Meat goes public with a bang: 5 things to know about the plant-based meat maker". Ciara Linnane. *MarketWatch.* May 28, 2019. https://www.marketwatch.com/story/beyond-meat-is-going-public-5-things-to-know-about-the-plant-based-meat-maker-2018-11-23

10 "Snack Food Nutrition Trends: Pulses, Vegetables, and Grains in Salty Snacks and Crackers". Packaged Facts. January 20, 2017.

PULSES: Higher MSPs to Protect and Promote Interest

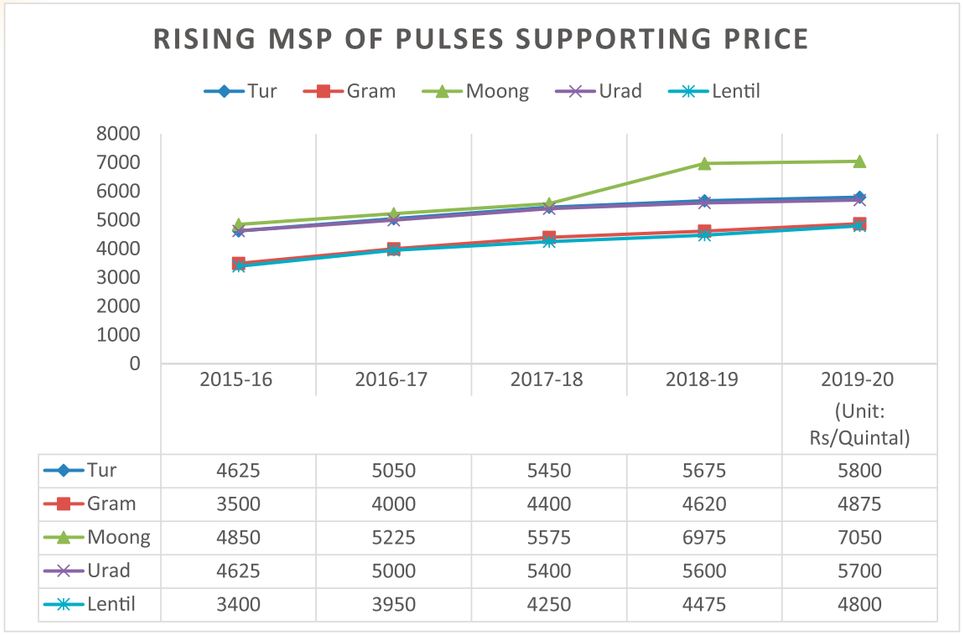
Ravi Diyora
KUNVARJI GROUP

To promote and encourage the farmers in the country, government continuously focusing on higher realization of crops. As part of the strategy government is increasing minimum support prices of Rabi and Khariff crops. To achieve the target of the doubling of farmers' income by 2022, government has launched series of steps. The government targeting the steps like higher MSP, crop insurance, financial assistance, advanced farming technology, high quality inputs and better infrastructure to farmers. The first advance estimate of production of major Kharif crops for 2019-20 was released by the Department of Agriculture, Cooperation and Farmers Welfare. The production of most of the crops for the agricultural year 2019-20 has been estimated higher than their normal production. However, these estimates would undergo revision based on further feedback from the states, the government said. Production of Kharif Nutri/coarse cereals is estimated at 32.00 million tonnes. It is higher by 1.01 million tonnes than the production of 30.99 million tonnes achieved during 2018-19. Total Kharif pulses production during 2019-20 is estimated at 8.23 million tonnes, higher by 1 million tones than the five years' average production of 7.23 million tonnes.

Minimum Support Prices for Kharif and Rabi Crops of 2019-20:

The Union Government has announced an increase in MSP for Kharif 2019-20 season. MSP of Tur, Moong and Urad pulses raised by Rs.125, Rs.75 & Rs.100 per quintal respectively. The Government has announced the increase in the Minimum Support Prices (MSPs) for Rabi Crops of 2019-20 to be marketed in Rabi marketing season (RMS) 2020-21.Increasing of MSP of Gram by Rs. 255 per quintal, Lentil by Rs. 325 per quintal. In percentage term highest MSPs seen on Lentil as more than 7 percent hike seen among the Lentil during the crop year.

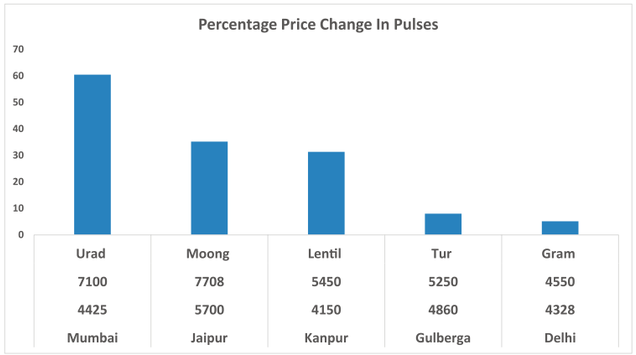
Based on the MSP recommended by Commission on Cost and Agricultural Prices (CACP) for 2015, the movement of MSP for major pulses in last five years has shown a continuous increase. Among the major pulses, the compound annual growth rate in the MSP for Tur, Gram, Moong and Urad has been higher than that of cereals. However, lucrative MSPs alone will not be enough to persuade farmers to produce pulses. However the prices of Pulses except Chana seen higher during the calendar year, leaded by the price jump in Urad and Moong.

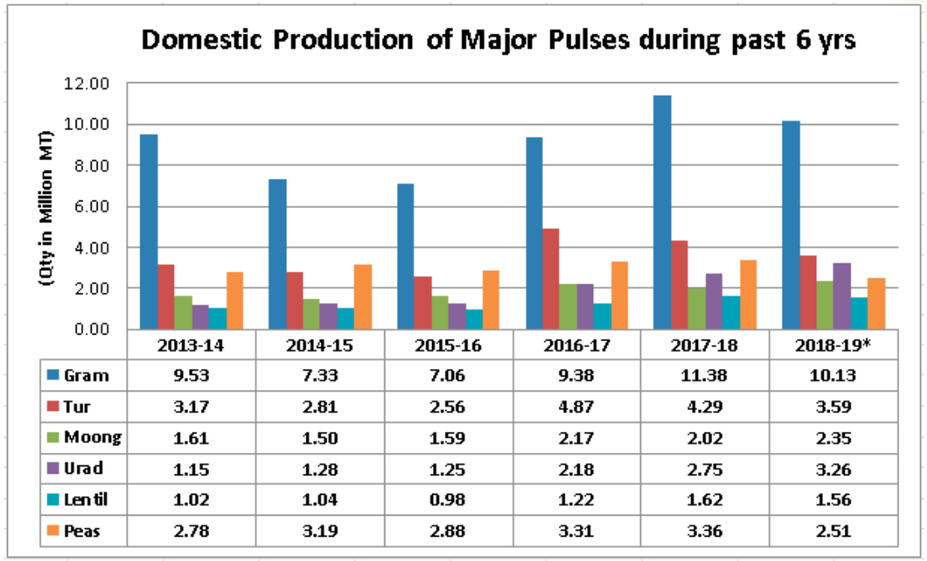


Change in prices of Pulses YoY:

The major pulses seen uptrend in the prices during calendar year 2019 on back of weather disturbance and hope of lower yields on pulses. Urad prices have surged 60 per cent during the year owing to crop damage in the kharif sowing period following incessant rain and floods in the monsoon season. According to prices historical data, the prices have seen sharp jump during the year. On expectation of lower yields for the Urad and Moong, prices seen sizable jump during the calendar Year 2019. All other pulses, including milled (dal) tur, gram and masur have also become costlier following urad. Due to lower historic prices and change in weather, farmers had given lower focus on sowing of Urad and Moong during the year.

To ease the price pressure, the government has allowed urad imports to the tune of 400,000 tonnes for the one-year period ending December 18, 2019. India's pulses output for 2019-20 will take a hit due to erratic rains and will miss the government's target, a trade body forecast. It also sought a removal of import duties and caps on peas.The Centre's production target for pulses and grains is 26.30 million metric tonnes (MT) for 2019-20.





Pulses Production and Sowing data

As per Third Advance Estimates for 2018-19, total Food grain production in the country is estimated at 283.37 million tonnes which is higher by 17.62 million tonnes than the previous five years' (2013-14 to 2017-18) average production of food grain. Total Pulses production during 2018-19 is estimated at 23.22 million tonnes which is higher by 2.96 million tones than the Five years' average production of 20.26 million tonnes. It covers Gram – 10.09 million tonnes and Tur –3.50 million tonnes. Total Kharif pulses production during 2019-20 is estimated at 8.23 million tonnes, higher by 1 million tones than the five years' average production of 7.23 million tonnes. On annual basis, India's pulses production seen rising trend during past six years. Urad and Moong production seen uptrend, however during the current season both crop seen yield damage.

Crop and PHMF Division (Rabi crop as on 03 Jan 2020) (Area in Lakh Hactare)

Sr No	Crop	Normal Rabi Area (DES)	Normal Corresponding Week	Area Sown		Diff. of 2019-20 over	
				2019-20	2018-19	Normal Corr. Week	2018-19
	Pulses	145.99	140.69	146.22	142.22	5.53	4.00
1	Gram	93.53	90.92	98.52	93.19	7.60	5.33
2	Lentil	14.19	15.72	15.46	16.33	-0.26	-0.87
3	Fieldpea	9.45	9.50	9.27	9.08	-0.23	0.19
4	Kulthi	2.04	4.37	4.98	5.20	0.61	-0.22
5	Urdbean	8.61	6.88	6.42	6.16	-0.46	0.26
6	Moongbean	10.10	4.10	3.31	3.65	-0.79	-0.34
7	Lathyrus	4.13	3.65	3.02	3.09	-0.63	-0.07
8	Other Pluses	3.94	5.55	5.24	5.52	-0.31	-0.28

Increase in mandi arrivals and NAFED's plan to offload approximately one million tonne of Chana from its buffer stocks during Nov 2019 till Jan 2020 undermined market sentiments. All India Chana arrivals stood at 1.70 Lakh tonnes in Nov 2019, up by 4.68% compared to corresponding period of last year. They were also higher by 25% compared to 1.36 Lakh tonnes reported in the last month. In key growing states, viz., Madhya Pradesh, Uttar Pradesh and Rajasthan arrivals were seen higher by 40%, 5% and 7%, respectively, on the month-on-month basis. (Source: Agmarknet)

The area under pulses cultivation too went up by nearly 2.5 per cent to 146.2 lh, as against 145.22 planted in the same week last year. Gram, which recorded an increase of over 3 per cent to top 98.5 lh, accounted for this increase. There was substantial increase in gram cultivation in Maharashtra and Rajasthan, which is enough to offset the drop in gram acreage in Madhya Pradesh and Karnataka.

Better than expected, but uneven distribution of monsoon

Last rainy season for the country was better than expected after consecutive two lower than expected rai was coming. For the country as a whole, cumulative rainfall during this year's post monsoon season upto 25 Dec, 2019 was above Long Period Average (LPA) by 32%. Despite below normal rainfall during 2016 (97% of normal rainfall) and 2017 (95% of normal rainfall), two successive years, 2016-17 and 2017-18, of bumper harvest of food grains is a commendable achievement of Indian agriculture. Details of the rainfall distribution over the four broad geographical regions of India are given below:

The year of Strom:

This year, there has been some exception with Arabian Sea seeing two storms namely Vayu and Hikaa in the Monsoon season. Meanwhile, two more storms came up in the Post Monsoon season namely Kyarr and Maha. Bay of Bengal saw Pabuk at the beginning of the year, Fani in the Pre Monsoon season, and Bulbul in the Post Monsoon season. In Arabian Sea most of storms weaken Out of the four that formed in the Arabian Sea this year, three did not even make a landfall. Only Hikka made a landfall, It was only Hikaa which made a landfall as a Severe Cyclonic Storms. Other three storms failed to make a landfall, Vayu weakened off Gujarat Coast as a Depression, Kyarr, which was a Super Cyclone dissipated close to the coast of Somalia, Maha also weakened before it could hit the Gujarat Coast. The frequency of storms has been high this time, but majority did not hit the coast. Bay of Bengal had three storms, Pabuk which came from Thailand in January, entering Andaman Sea did not make landfall. The Bay Cyclone Bulbul was also strong enough and only weakened from a Very Severe Cyclone to a Severe Cyclone at

Regions	Actual Rainfall(mm)	Normal Rainfall(mm)	% Departure from LPA
Country as Whole	159.0	120.2	32%
NorthWest India	98.5	48.9	101%
Central India	123.3	75.2	64%
South Peninsula	320.8	273.9	17%
East & NorthEast India	151.5	163.9	-8%

the time of landfall. The southwest monsoon which triggered heavy rain across many parts of the country officially came to an end with “above normal” rain at 110% of long period average (LPA), as per the IMD.

The late arrival of the monsoon means that harvests and crop arrivals also began slightly later than expected, especially for arhar or tur dal, so procurement is likely to continue, though tapering, until February. The Khariff crop also faced a late arrivals sue to the storm and long lasting rain showers. To control the inflationary pressure and shortage, government taken various steps in advance. The import in India seen sharp jump due to late arrivals and festival demand.

Pulses: Import and Global scenario

As cogencis reported, Indian pulses imported around 2.3 mln tn, up from 1.6 mln tn in the year-ago period during the April-November time horizon. However, if we consider the historical data than 5.37 million tonnes and 6.34 million tonnes pulses imported during 2017-18 and 2016-17, respectively. Pulses production in the 2019-20 (Jul-Jun) kharif season fell to 8.2 mln tn from 8.6 mln tn a year ago. Output of legume during 2018-19 was 23.4 mln tn, down from 25.4 mln tn in the previous year, farm ministry data showed. The government is currently sitting on a buffer stock of 800,000 tonnes of tur and 1.5 million tonnes of chana for market intervention in case prices escalate.

Masur accounts for the largest share in the import basket for pulses. Total masur imports during Apr-Nov are seen at 688,817 tonnes against 151,403 tn. Traders imported 337,359 tonnes tur during the period, up from 320,812 tonnes a year ago. Import quota for tur and urad is 400,000 tonnes each, while for moong it is 150,000 tn. The government had raised the import quota for urad to 400,000 tn from 200,000 tn earlier. Urad imports are at 192,165 tn during Apr-Nov compared with 317,466 tn during the corresponding period last year. Standing pulses crops are reported to have been badly damaged due to water logging in the field, following incessant unseasonal rainfall in October and November. Heavy crop damage was seen in Madhya Pradesh, Maharashtra and other growing states, with an overall estimate *urad* output loss of 50 per cent.

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). Mexico, the

INDIAN PULSES IMPORT

Pulses	Apr-Nov (2019) (in tn)	Apr-Nov (2018) (in tn)	(%)Change
Tur	3,37,359	3,20,812	5.2
Chana	79,867	16,740	377.1
Kabuli Chana	1,65,212	71,686	130.5
Urad	1,92,165	3,17,466	-39.50%
Moong	67,541	78,397	(-)13.8
Masur	6,88,817	1,51,403	355
Peas	6,12,697	4,89,517	25.2
Others	1,58,794	1,31,609	20.7
Total	23,02,452	15,77,630	45.9

spring-summer bean crop is estimated at around 400,000 MT, down 52% from the previous spring-summer season. US dry bean crop at 1,079,550 MT (23.8 million cwt), down nearly 4% from last year. According to StatCan’s online database (accessed December 16), Canada’s dry bean harvest amounted to 316,800 MT, down 7% from last year and a far cry from earlier expectations of 350-360,000 MT.

The country has exported 2.7 lakh MT of pulses to the world for the worth of Rs. 1680 crores during the year 2018-19. Algeria, U Arab Emts, Sri Lanka, Turkey, Bangladesh and USA are major export destinations for India’s export. Canada, Australia, USA, Russia and Myanmar are top import sources for Indian Pulses. Despite the higher import restrictions and duties, import of pulses in the nation continuously increasing.

India’s Trade Destination of Major Pulses for 2018

India’s Trade destinations of Major Pulses (In term of Value)			
HS Code	Pulses	Top 5 Export Destinations	Top 5 Import Sources
07131000	Peas (Pisum Sativum)	Shri Lanka DSR (75.0%), U Arab EMTS (5.6%), Nepal (4.2%), Turkey (3.9%), Myanmar (3.3%),	Canada (42.9%), Russia (20.8%), Ukraine (13.6%), Romania (6.4%), Australia (4.5%)
07132000	Chickpeas (Garbanzos)	Algeria (19.7%), Pakistan (12.5%), Turkey (9.7%), U Arab EMTS (8.7%), Saudi Arab (7.2%)	Australia (83.5%), USA (3.8%), Myanmar (3.5%), Tanzania (3.3%), Sudan (2.1%),
07133100	Moong/Urad	USA (38.3%), UK (11.3%), Canada (9.5%), U Arab EMTS (8.8%), Sri Lanka (5.9%)	Myanmar (72.5%), Tanzania (7.6%), Australia (5.6%), Uzbekistan (3.8%), Mozambique (3.5%),
07134000	Lentils (Masur)	Sri Lanka DSR (20.7%), Bangladesh (14.7%), Qatar (12.3%), Netherland (11.4%), USA (10.2%)	Canada (62.9%), Australia (33.0%), USA (3.9%), Turkey (0.08%), Ukraine (0.0%)
07136000	Pigeon Peas (Tur)	USA (50.0%), Canada (18.6%), U Arab EMTS (7.8%), Australia (4.0%), UK (3.9%)	Myanmar (60.6%), Mozambique (20.8%), Sudan (11.4%), Tanzania (3.7%), Malawi (2.3%),

Source: Department of Commerce

Pulses: Summary

The price gap between MSP and spot prices capped during the year on back of weather and arrivals related issues. The spot prices trailed with MSPs during past season on back of higher supply, but margin narrowed during current season and that’s key positive factor for farmers and government both. The calendar year 2020 expected to remain important for the pulses as the higher realization could attract the farmer towards the pulses. The government efforts for higher realization to farmers on agriculture output seen on track. However the higher MSPs not only tool to change the pulses prospects in India. The technological advancement, irrigation, high quality inputs and better market infrastructure are also key parameters to change the future of the Indian Pulses market.

Pulses Scenario in Canada

Gordon Bacon
CEO, Pulse Canada

Canada has developed a multibillion-dollar pulse industry and continues to be a leader in global pulse trade, providing over 120 countries with Canadian-grown pulses every year. Canadian farmers produced approximately 7.8 million metric tonnes of pulses in 2019, making pulses Canada's fifth largest crop overall after wheat, canola, corn and barley.

Canada continues to value its role as a supplier of safe and nutritious pulses to the Indian market. As India strives to meet its domestic policy goals of increased production and consumption of pulses, the Canadian pulse industry hopes to find a predictable and transparent trading environment that allows Canada to augment India's domestic programs with imports when needed.

In 2018 and 2019, India substantially decreased the import of peas from Canada. However, Canadian pulse growers produced approximately 4.2 million metric tonnes of peas in 2019 in response to strong global demand. Canada exported more peas to China in 2018 and 2019 than have ever been exported to a single market in Canada's pulse trading history. In addition to strong demand from China, new end uses for all Canadian-grown pulses continues in both the domestic and global marketplace. Major investment into pulse processing capacity continues to be made on the Canadian prairies and throughout North America as consumer demand for plant-based protein booms. Global use of pulses in the food manufacturing and pet food industry has increased 500% over the last decade[11]. In North America, 1,241 new food and pet food products containing pulse ingredients were launched in 2017, up from 171 in 2005[12].

In an effort to further diversify export markets and move significant volumes of Canadian pulses into new processing and value-added applications, the Canadian pulse industry has implemented a "25 by 2025" strategy; a goal of having 25% of Canadian pulse production utilized in new markets and new use categories by 2025. This translates into new demand for 1.1 million tonnes of peas, 625,000 tonnes of lentils, 100,000 tonnes of faba beans, 100,000 tonnes of chickpeas, and 75,000 tonnes of beans by 2025.

Learn more about the Canadian pulse industry at the 34th annual Pulse & Special Crops Convention (PSCC), a world-class event and the largest of its kind in North America. Hosted by the Canadian Special Crops Association, PSCC brings together hundreds of industry leaders, exporters and buyers from around the globe to network, discuss global industry-wide challenges and grow their businesses.

This year, PSCC is expected to bring in over 400 delegates from 25 countries around the world. The convention will be held in beautiful Whistler, Canada from September 15 – 17, 2020. With its awe-inspiring scenery, Olympic history and adventurous outdoor activities, Whistler is one of Canada's top destinations for Canadians and international visitors alike.

To learn more about the Pulse & Special Crops Convention, visit: www.PulseAndSpecialCropsConvention.com

11 & 12 Mintel GNPD

You've Got What They Want: Protein Market Growth Helps Advance Pulse Opportunities Globally

Robynne M. Anderson
Emerging Ag inc.

The evolving debate on sustainable diets and demand for pulses

The debate on sustainable healthy diets has recently gained momentum, and the pulses market stands to gain significantly as the evolving definition of sustainable diets strongly advocates for more plant-based diets for a healthier planet. While food and healthy diets have traditionally been discussed within the confines of the Food and Agriculture Organization of the UN (FAO) and the World Health Organization (WHO), the subject is now finding its way into non-traditional venues such as the United Nations Environment Assembly and the Convention on Biological Diversity (CBD) which are now looking up to sustainable food systems as part of the solution to tackling climate change.

Non-profits including conservation organizations such as the World Wildlife Fund (WWF) and the International Union for Conservation of Nature (IUCN), funding organizations such as the Wellcome Trust, and global platforms such as the EAT-Lancet Commission have become major voices calling for global food systems that "operate within boundaries for human health and food production to ensure healthy diets from sustainable food systems for nearly 10 billion people by 2050." The EAT Lancet report recommends a doubling of global consumption of fruits, vegetables, and legumes and notes that, "a diet rich in plant-based foods and with fewer animal source foods confers both improved health and environmental benefits." At the UN Committee on Food Security (CFS), the definition of sustainable healthy diets is evolving, and the strength of the benefits of pulses are leading to a discussion where legumes are actually called out in the current draft of the Voluntary Guidelines on Food Systems and Nutrition.

The past few years have seen pulses gain more attention globally such that 2016 was declared by the UN General Assembly as the International Year of the Pulses and February 10, 2019 marked the first World Pulses Day, an annual event to celebrate pulses worldwide and continue the important gains made with the 2016 International Year of Pulses.

Consumer behaviour is also shifting as consumer-based alternative food movements are on the rise and demand more ethical and high-quality diets. In a 2018 consumer trends report, the World Business Council for Sustainable Development (WBCSD) notes an increase in the number of "flexitarians (those who prefer plant-based dishes with the occasional inclusion of meat)" and that the number of products labelled as vegetarian has increased by 25% and those labelled as vegan by 257%!

Market Outlook

What does this shift in policy environments and consumer behaviour mean for the pulses industry? I am from Manitoba and we recently saw three large investments in plant-based proteins by the French-based Roquette and Nestlé. Roquette, a developer of plant-based ingredients, is currently building a $400-million pea processing facility in Manitoba for its multi-year partnership to supply pea protein to Beyond Meat. Nestlé on the other hand is partnering with Merit Functional Foods and Burcon NutraScience to supply protein from peas and canola that will be used in food and beverages. Merit is setting up a 94,000-square-foot production facility in Winnipeg. Protein Industries Canada has also launched a $19.1 million project that will work to commercialize high quality plant-based proteins.

According to the "Plant-based Protein Market - Global Outlook and Forecast 2020-2025" report, the demand for plant-based proteins is expected to grow at a CAGR of over 8% between 2019-2025, as the world witnesses a rise in health conscious consumers who are "demanding for healthier products including plant-based variants." The "alternative protein boom", as described by the World Economic Forum, has challenged global food giants such as Nestlé to diversify "protein sources away from over-dependence on animal proteins – both to leverage market opportunity and to de-risk supply chains."

FAIRR is a network of over 250 institutional investors who since 2016 have coordinated collaborative investor engagement with 25 global, listed food companies to diversify protein sources. The network's new report Appetite for Disruption, notes that "companies are using plant-based products to drive sales growth, and that protein diversification is a driver of business growth with plant-based foods leading growth for the food sector." In the US, for example, plant-based foods sales have grown by 31% over the last two years.

World Pulse Day first commemoration at UN headquarters in New York co-hosted by FAO, Burkina Faso and the Global Pulse Confederation 2019. The Government of India attended and spoke.

FAO's 2019 The Global Economy of Pulses report indicates that between 2001 and 2014, the global production of pulses increased by over 20 million tonnes. Since 2001, the area under cultivation of pulses has increased by more than 20% while pulse production has increased by more than 40%. In 2018, the global pulses market reached a volume of 102.7 Million tons, registering a CAGR of 5.7% during the year 2011-2018. It is proof positive of the importance of research.

India is the leading producer as well as the largest market for pulses and the Government of India has launched several programs to increase awareness of modern crop production technologies and provide financial assistance to farmers. Despite being the leading producer, there has been a consistent supply-demand gap leading to a rise in prices by 150% to 200% in recent years. India accounts for a quarter of world production of pulses and consumes almost one third, leading to imports of between 2-6 million tons annually to meet the domestic demand. Some critics argue that India's actual pulses demand may be underestimated. In terms of exports, the country exported 2.7 Million tons of pulses to the world worth $242.66 million during the year 2018-19, with major export destinations being Algeria, United Arab Emirates, Sri Lanka, Turkey, and the US.

Moving Forward: Streamlining Value Chains

Keeping in mind the current trends, it is unlikely that the growth in demand for pulses will go down, both in India and globally. As a leading producer and market for pulses, India stands to gain from this increasing demand and global investments in plant-based proteins. The pulses industry in India must overcome the challenges currently facing the sector and leverage the current opportunities to benefit from the "alternative proteins boom". The government, private sector and farmers must work together to streamline value chains, increase efficiencies and reap from the boom! FAO report notes that India experiences substantial post-harvest losses at the farm-level and improvement of farm-level infrastructure is crucial to curbing these losses. The India Pulses and Grains Association (IPGA) is already making strides to overcome some of the challenges faced by the industry along with ICRISAT and other research bodies.

World Pulses Day is an ongoing fixture on February 10 following the United Nations approval thanks to the good work of the government of Burkina Faso and the Global Pulse Confederation, including the leadership of the past chair Huseyin Arslan. It a moment to help the sector work together continually building on the momentum in the sector at a consumer level, despite trade insecurities.

IPGA's leadership and Indian pulse businesses, plus Cindy Brown and Randy Duckworth at the Global Pulse Confederation now have a moment to speak to consumers in new ways and with new enthusiasm.

India should be at the forefront in celebrating the day and solidify its position as the world leading producer and consumer of pulses. It is an opportunity to showcase the country's pulses diversity and to seek global partnerships that will grow the sector in India to meet the "alternative protein boom" demand.

Rajma
(Kidney beans)

Sheryl Salis(RD,CDE) & Shefa Syed (PGCND, CDE)
Nurture Health Solutions, Mumbai. www.nurturehealthsolutions.com

Just as its name suggests, the kidney bean is shaped like a kidney. Since these red beans hold their shape really well during cooking, they are a favorite bean to use in simmered dishes.

Kidney beans and other beans such as pinto beans, navy beans and black beans are known scientifically as Phaseolus vulgaris. They are referred to as "common beans" probably owing to the fact that they all derived from a common bean ancestor that originated in Peru.

They spread throughout South and Central America as a result of migrating Indian traders who brought kidney beans with them from Peru. (1)

India produces more dry beans than any other country followed by Myanmar, Brazil, and the United States. (2)

Kidney beans have become a popular food all over the world due to their savory texture and ability to absorb flavors. But many don't know that these are a source of health benefits too.

Rajma masala is a popular North Indian dish that is made very often in Punjabi households. Boiled Red kidney beans are simmered in spicy onion-tomato gravy. In short, it is Indian style red kidney beans curry. It is best served with rice hence the name rajma chawal. It has mesmerizing aroma and delicious flavor that you just cannot resist at one serving.

They are great in mixed bean salads and stews such as chilli con carne.

Nutritional Profile of Kidney beans (Rajma) (3):

Nutritional Composition of Kidney beans per 100g

Dietary Fiber									
	Moisture (g)	Protein (g)	Ash (g)	Total Fat (g)	Total (g)	Insoluble (g)	Soluble (g)	Carbohydrate (g)	Energy (KJ)
Rajma (Black)	8.69	19.01	3.35	1.62	17.74	15.16	2.58	49.59	1247
Rajma (Brown)	9.68±0.79	19.50±0.84	3.36±0.19	1.68±0.07	16.95±0.27	14.33±0.19	2.62±0.16	48.83±0.59	1245±12
Rajma (Red)	9.87±0.30	19.91±1.44	3.28±0.21	1.77±0.04	16.57±0.63	13.86±0.43	2.70±0.20	48.61±0.65	1252±14

Kidney beans are mainly composed of carbohydrates and fiber but also serve as a good source of protein.

Kidney beans are mainly composed of starchy carbs, which account for approximately 65% of the total calorie content (3). Beans have a relatively high proportion of amylose (30–40%) compared to most other dietary sources of starch. Amylose is not as digestible as amylopectin (4)

For this reason, bean starch is a slow-release carb. Its digestion takes longer, and it causes a lower and more gradual rise in blood glucose than other starches, making kidney beans particularly beneficial for people with type 2 diabetes (5).

They contain about 26% protein. Although the nutritional quality of bean protein is generally lower than that of animal protein, beans are an affordable alternative for many people.

In fact, beans are one the richest plant-based sources of protein, sometimes referred to as “poor man’s meat”(6)

They contain substantial amounts of resistant starch, which may play a role in weight management (7)

Kidney beans also provide insoluble fibers known as alpha-galactosides, which may cause diarrhea and flatulence in some people (8)

Kidney beans are a good source of several vitamins and minerals, such as iron, folate, copper, manganese, potassium, and vitamin K1.

Serving size of Kidney beans:

In India, the Dietary Guidelines for Indians—A Manual (2010) specifies 30g of uncooked pulses as a serving and suggests that 30 g and 60 g of whole uncooked pulses be consumed daily by non-vegetarians and vegetarians, respectively (9)

Health Benefits of Kidney beans:

Kidney beans have several health benefits which are discussed as follows:

1. Weight loss:

Kidney beans are good source of fiber (4.8g fiber/30g). Results support increasing fiber in weight loss diets with a variety of fiber sources including dry beans. Consumption of beans increase satiety and reduce hunger. Hence, helpful in weight loss (10).

Papanikolaou Y et.al., showed that people consuming beans had a lower body weight and a smaller waist size relative to non-consumers. Additionally, consumers of beans had a 23% reduced risk of increased waist size and a 22% reduced risk of being obese (11)

2. Diabetes

Since they are good source of protein, fiber and contain slow releasing carbohydrates, kidney beans are effective in controlling high blood glucose levels. (3,5)

Dark red kidney beans with rice have shown to attenuate the glycemic response compared to rice alone (12) Pulses alone or in low-GI diet have shown to reduce fasting, post prandial and HbA1c levels (13)

3. Cardiovascular Disease

Consumption of kidney beans has shown significant reductions for both total and LDL-cholesterol (14). Baked bean consumption was associated with a lower systolic blood pressure (11)

A meta-analysis of observational studies found that consumption of legumes four times/week is inversely associated with Coronary Heart Disease (15).

Consumption of legumes has shown to improve CVD risk factors, such as waist circumference, cholesterol, BP, C-reactive protein, glucose; and is protective against T2DM. (16-22)

Legumes are rich in phytosterols, which can reduce serum total cholesterol and low-density lipoprotein cholesterol and a significant increase in high density lipoprotein cholesterol (23).

4. Cancer

Emerging evidence indicates that common bean consumption is associated with reduced cancer risk in human populations and rodent carcinogenesis models. Epidemiological and preclinical studies evaluating colon cancer, prostate cancer, mammary cancer has lent further support for an inverse relationship between bean consumption and the development of cancer. (24)

Investigations have demonstrated the potential of bean-based diets to inhibit azoxymethane (AOM)-induced colon cancer (24).

As discussed earlier, kidney beans contain both resistant starch and alpha-galactosides which works like a prebiotic. Prebiotics move through your digestive tract until they reach your colon, where they’re fermented by beneficial bacteria. The fermentation of these healthy fibers results in the formation of short-chain fatty acids (SCFAs), such as butyrate, acetate, and propionate, which may improve colon health and reduce your risk of colon cancer (25)

Antinutrients in kidney beans

Raw and improperly cooked kidney beans harbor many antinutrients, which are substances that reduce nutritional value by impairing nutrient absorption from your digestive tract.

Although they may sometimes be beneficial, antinutrients are a serious concern in developing countries in which beans are a staple food.

The main antinutrients in kidney beans are (26,27,28):

Phytic acid: This compound, also known as phytate, impairs your absorption of minerals, such as iron and zinc.

Protease inhibitors: Also known as trypsin inhibitors, these proteins inhibit the function of various digestive enzymes, impairing protein digestion.

Starch blockers: These substances, sometimes called alpha-amylase inhibitors, impair the absorption of carbohydrates from your digestive tract.

Phytic acid, protease inhibitors, and starch blockers are all completely or partially inactivated when beans are properly soaked and cooked (27,29).

Raw kidney bean toxicity

Raw kidney beans contain high amounts of a toxic protein called phytohaemagglutinin (30).

Phytohaemagglutinin is found in many beans but is particularly high in red kidney beans.

Kidney bean poisoning has been reported in both animals and humans. In humans, the main symptoms include diarrhea and vomiting, sometimes requiring hospitalization.

Soaking and cooking the beans eliminates most of this toxin, making properly prepared kidney beans safe, harmless, and nutritious

Conclusion:

Kidney beans are a good plant-based source of protein. They are also rich in various minerals, vitamins, fibers and antioxidants. They help in weight loss, promote colon health, protects from cancer and improve blood glucose levels.

However, kidney beans should always be eaten well cooked. Raw or improperly cooked beans can be toxic.

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Sustaining Self sufficiency in Pulses Production- Status, Issues and Strategies

SK Chaturvedi[1], AK Tiwari[2], AK Shivhare[2], Shailesh Tripathi[3] and C Bharadwaj[3]

[1]Rani Lakshmi Bai Central Agricultural University, Jhansi 284 003, India
[2] Govt. of India, Directorate of Pulses Development, DAC&FW, Ministry of Agriculture and Farmers Welfare, Bhopal 462004
[3]ICAR-Indian Agricultural Research Institute, New Delhi 110012

The pulses contributed about 8.21% (23.40 m t) to the total food grains (284.95 m t) basket of the country during 2018-19 which is less by 0.70% in comparison to 2017-18 owing to various reasons. More than a dozen pulse crops are known as major source of the dietary protein for largely vegetarian mass of the country. During last few years pulses sector has shown impressive growth as Indian farmers could produce more than 20 m t of pulses annually with highest peak of 25.42 m t in 2017-18 (**Source: GoI, DES)**. The additional production came from increase in area as well as productivity of major pulses including chickpea. Still pulses are mainly cultivated under rainfed area (80%) and remaining 20% is under supplemental irrigation. Out of various pulse crops, chickpea has a maximum area under irrigation (35%) and remaining pulse crops have <10% area under irrigation. This situation indicate that ample scope exist to improve productivity of pulses by extending micro-irrigation in major pulses producing states of central and southern India. India has achieved self-sufficiency in indigenous production of pulses through spread of quality seeds of high yielding varieties, matching integrated crop production technologies developed by the ICAR mission mode crop development schemes under NFSM-Pulses and positive policy support from DAC&FW, Min. of Agriculture and Farmers Welfare., Government of India in terms of remunerative minimum support price (MSP) and direct procurement from cultivators on MSP etc. All these efforts led in maintaining pulses production to the level of ~23 m t even when price surge in domestic market and less area was covered with pulses during 2018-19 in comparison to previous year (**Source**: http://agricoop.nic.in/sites/default/files/Cwwg%20Data%20as%20on%2005.12.2019.pdf).

Status

Pulses production has made a global records as during 2017 total world acreage spreaded over to 198 countries of 5 continents to the level of about 85.40 m ha contributing to 87.40 mt to the world's food basket with appreciable productivity (1023 kg/ha). Dry beans contributed maximum (31%) with 37% of total area covering 152 countries. The chickpea is usually grown in 58 countries on about 15% area followed by dry pea (98 countries: 9% area), pigeonpea (23 countries: 7% area), lentil (56 countries: 7% area) and

remaining area (25%) is occupied by other pulses. The share to total production of dry bean was about 31% followed by dry pea (17%), chickpea (15%), lentil (8%), pigeonpea (7%), and others (22%) at global level (Fig. 1-2). Globally, India ranked first in area (36%) and production (23%), however, productivity (853 kg/ha) is far below the average productivity of pulses (1023 kg/ha) of the world. This indicates ample scope for increase in pulses' productivity. Total p**ulses** production during 2018-19 has been estimated at 23.40 m t as per 4th advance production' estimates (DES, GoI) which are higher by 3.14 m t than the last Five years' average production of pulses (20.26 m t). Efforts have been made to bridge yield gaps by ensuring availability of quality seed of newly released varieties and popularization of matching integrated crop management technologies. The contribution of new initiatives under NFSM -seed-hubs (2016-17) in ensuring quality seed availability and development of human resources has been widely appreciated. The indirect impact of seed-hubs has been tremendous in terms of conduct of technology demonstrations (>15000 nos.) and human resources development and exposure to related technologies for pulses cultivation (at least 30000 farmers) in one go. On policy front, announcement of remunerative minimum support price (MSP) well before commencement of sowing, direct procurement of produce from farmers at remunerative MSP, increase in import duty of some of the pulses like pea, investment in micro-irrigation and higher budgetary support under NFSM-Pulses crop development, etc. have played critical role.

The sector has shown tremendous growth during last 5 years as pulses production gone up by about 6 m t in 2017-18 and by 4.0 m t in 2018-19 when compared with the year 2013-14 having highest production in Indian history (Fig.3.). Major 6 states of India, namely Madhya Pradesh (32%), Rajasthan (13%), Maharashtra (13%), Uttar Pradesh (9%), Gujarat (9%) and Karnataka (8%) contributed more than 83% (21.16 m t) to the total pulses' basket of the country during 2018-19. As a result import of the pulses came down to 2.53

Fig.1. Global: Share of various pulses in total pulses production

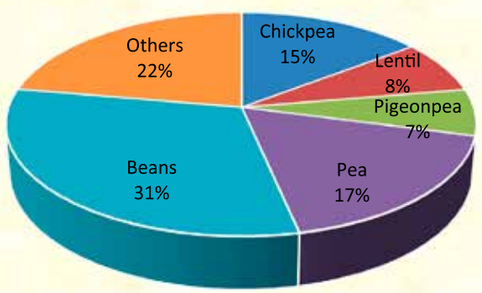
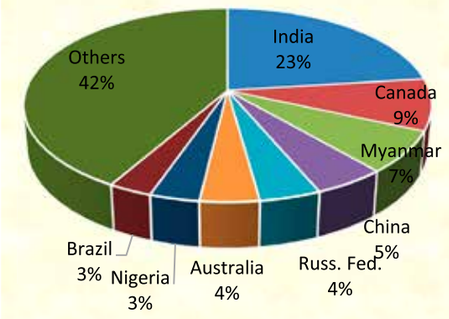
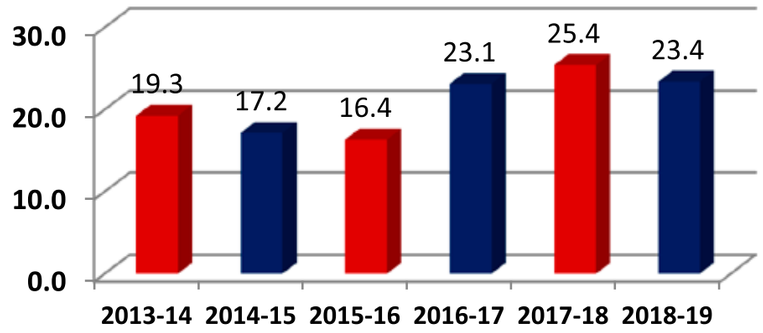


Fig.2. Global: Share of different countries in pulses production



m t from 5.61 m t of the previous year. The chickpea ranked first and shared maximum during 2017-18 (44.77%) and 2018-19 (43.29%) in total pulses production which led in export of pulses (0.285 m t) and of kabuli chickpea (0.023 m t) in 2018-19 to different countries mainly Algeria, United Arab Emirates, Shri Lanka DSR, Turkey and Morocco. Though this export is minimal but certainly indicates about the potential, if not for large scale export, at least to meet domestic demand of pulses.

Fig.3. Total production (m t) of pulses during last 6 years



Issues

India has not only to sustain current level of pulses' production (~25 m t) but has to produce more to meet future demand of protein for agrarian population of the country and to achieve UN's Zero Hunger Target by 2030. To feed ~1.51 billion Indians, the projected demand of pulses by 2030 is likely to be approximately 35 m t (consumption: 28.70 m t + seed and post harvest losses: 5.72 m t) indicating required annual growth rate of 3.57 per cent in production of pulses. This required growth rate can be achieved by increasing productivity from current level (850 kg/ha) to (1050 kg/ha). It is also a hard fact that land resources are limited and there is tough competition for the crops' allocation at the farmers' level. Farmers often choose the crops for cultivation based on the sale price of the previous year vis-à-vis available irrigation resources. There is need to reduce cost of cultivation and enhance profitability so that pulses remain competitive under rainfed or limited water availability conditions.

Strategies

Multipronged strategies need to be adopted not only to ensure sustainability of current level of production but also to increase pulses production to the level of 35 m t during next 10 years to meet domestic demand for ever-growing population. The production enhancement can be achieved by adopting following strategies in integrated manner:

Bringing additional area under pulses

Bringing additional area under any crop directly contributes towards production increase. However, due to tough competition with the companion crops it becomes difficult to bring additional area under particular crop(s) and to sustain the same in subsequent years. As per empirical estimates, about 3-4 m ha area under pulses can be added which can ensure to sustaining current area (~29-30 m ha) under these crops. Further, expansion in area beyond 30 m ha seems difficult task if not impossible due to rising price and pressure of import for other commodities, particularly oilseeds. Therefore, development and promotion of short duration and high yielding varieties, especially pigeonpea, in various intercropping systems and non-traditional seasons/areas are likely to play major role in bringing additional area. For example, short duration varieties of *Vigna* pulses (mungbean: Virat, Kanika, Varsha, Shikha, IPM 02-3 etc.; urdbean: IPU 2-43, Pant U 40 etc.) can be popularized in spring/summer season in northern and eastern India; urdbean and mungbean in coastal areas on southern and central India during rabi season; and pea and chickpea as vegetables in all major states growing these crops during pre-rabi or rabi season. In northern and central India where pigeonpea is consumed more and irrigation facilities are available, popularization of short duration pigeonpea varieties (PAU 881, Pusa 16, and Pusa 992) are likely to make dent as pigeonpea-wheat cropping sequence will be more profitable. This will also help in increasing cropping intensity as well. Ample scope exists to promote rabi pulses (chickpea and lentil) after rice in eastern India, Madhya Pradesh, Chhattisgarh and parts of Uttar Pradesh as late sown crops. A large number of short duration and high temperature tolerant varieties of chickpea (IPC 2006-77, JG 14, Rajas, Pusa 547 etc.) and lentil (Moitree, IPL 316, Pusa Vaibhav, IPL 526 etc.). Similarly, lot of area can be added under fieldpea in Tamilnadu and Karnataka during rabi as huge demand for immature green peas is there and climate is also suitable the cultivation of pea. Govt. of India has launched a special program to bring additional area under pulses rabi (chickpea, lentil, fieldpea and rabi pigeonpea) and summer (mungbean and urdbean) with the financial support of about Rs.296 crores (Govt. of India share). The additional allocation for implementation of the above said programme has been made to 15 states covered under NFSM pulses. Targeted Rice Fallow Area Programme (TRFA) with the financial support of about Rs. 267 crore (2019-20) in 75 districts of 12 states envisaged to harvest additional 02 MT production. Similarly, another dedicated program "National Food Security Mission (NFSM)- Intercropping of Pulses with Sugarcane" to promote intercropping of pulses with sugarcane has been initiated in 12 states during 2018-19 with funding support of Rs. 5.55 crore (Govt. of India share) involving 3 Central Agencies in training and demonstrations namely ICAR-Indian Institute of Sugarcane Research, Lucknow, Directorate of Sugarcane Development, Lucknow and ICAR-Sugarcane Breeding Institute, Coimbatore. Horizontal expansion through diversification of rice-wheat system in Indo-Gangetic plains (IGP); promoting urdbean/mungbean cultivation in rice fallow in peninsular India and chickpea lentil in north east hill region, Jharkhand, Bihar, Assam, West Bengal and Chhattisgarh;

promotion of pulses in intercropping of chickpea with mustard/linseed and pigeonpea with groundnut, soybean or millets, etc. offer opportunities. These efforts are likely to help in adding more pulses from additional area to the food basket of the country. Ample scope exists to promote comparatively more climate resilient minor or less known pulses (Table 1) as these can be grown under varying environmental conditions ensuring better productivity.

Table 1. Minor pulses having potential for expansion in niche areas

Pulse crop	Growing season	States/niche where these crops can be promoted
Horsegram	Kharif, Rabi	Karnataka, Madhya Pradesh, Maharashtra, Andhra Pradesh, Odisha, Bihar, Himachal Pradesh, Jammu & Kashmir, Kerala, West Bengal, Chhattisgarh
Mothbean	Rabi	Rajasthan, Maharashtra, Gujarat, Jammu & Kashmir, Punjab, Uttar Pradesh, Haryana
Lathyrus	Rabi	Chhattisgarh, Madhya Pradesh, Bihar, West Bengal, Maharashtra, Uttar Pradesh
Cowpea	Kharif	Karnataka, Madhya Pradesh, Maharashtra, Rajasthan
Rajmash	Kharif, Rabi	Jammu & Kashmir, Himachal Pradesh, Plains of Uttar Pradesh, Bihar, Orissa and Maharashtra
Fababean	Rabi	West Bengal, Bihar, Uttar Pradesh and Madhya Pradesh
Ricebean	Kharif	Uttarakhand, Himachal Pradesh, Assam, Meghalaya, Tripura, Mizoram, Manipur, Arunachal Pradesh, Nagaland, Sikkim, West Bengal, Bihar, Odisha
Adzuki bean	Kharif	Himachal Pradesh, Jammu & Kashmir and Uttarakhand
Winged bean	Kharif	Tripura, Manipur, Mizoram, Nagaland, Assam, Western Ghats, Maharashtra, Karnataka and Kerala
Cluster bean	Kharif	Rajasthan, Haryana, Gujarat, Uttar Pradesh and parts of Madhya Pradesh

Increase in productivity of pulses

Bringing additional area under pulses and sustaining it is not a simple task. Therefore, much reliance is on enhancing productivity of protein rich crops through adoption of high yielding and climate smart varieties along with matching crop production and management technologies. During 2009-2019 scientists have developed more than 217 high yielding varieties insulated against major biotic and abiotic stresses for cultivation in different parts of the country (Table 2). Development of climate smart varieties, particularly drought (Pusa chickpea 10216) and high temperature tolerant (JG 14, IPC 2006-77) chickpea varieties are likely to ensure much needed stability in chickpea production. Encouraging farmers to grow more pulses is difficult task if we do not devise strategies to help in increasing farm profit from each unit area of pulses' cultivation. Efforts have been made in development of chickpea varieties (NBeG 47, RVG 204, etc.) suitable for machine harvesting. Similar efforts are required in other pulse crops as well so that desired level of productivity can be achieved at national level. The only pulse crop, pigeonpea offers scope for exploitation of commercial hybrids. There is need to popularize recently developed hybrids in targeted areas to enhance productivity of pigeonpea. Massive technology demonstrations and stakeholders are required through Seed-Hubs and Krishi Vigyan Kendra (KVKs) to create demand for quality seed and sustain pulses production at current growth rate to meet future demand.

Table 2. Number of varieties of pulse crops released and notified during 2009-2018

Crop	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Chickpea	3	7	2	4	3	1	3	8	10	4	**45**
Mungbean	7	3	1	3	1	3	2	10	3	7	**40**
Pigeonpea	3	1	1	2	3	2	0	5	2	8	**27**
Urdbean	3	4	2	5	1	1	1	2	1	5	**25**
Fieldpea	0	3	2	2	0	2	1	4	2	5	**21**
Lentil	3	2	3	1	0	1	1	2	6	5	**24**
Cowpea	2	3	0	1	0	1	0	1	4	5	**17**
Other pulses	0	6	1	1	0	1	0	2	3	4	**18**
Total	**21**	**29**	**12**	**19**	**8**	**12**	**8**	**34**	**31**	43	**217**

Policies favouring pulses industry

Long term policies for promotion of indigenous pulses need to be formulated not only to sustain current level of production but also to produce more to meet future demand of these protein dense crops. The timely and well planned implementation of Seed-Hub project targeting quality seed production of newly released varieties and development of trained human resources led in realization of '**Pulses Revolution'** in India in recent years and India could attain self-sufficiency in indigenous production of pulses. This is further important as the revolution in pulses production could be achieved through the technologies developed in India, and largely by Indian NARES (Chaturvedi *et al*. 2018). The favourable policies like declaring remunerative minimum support price (MSP) and procurement from producers at MSP, expansion of micro-irrigation network, value addition and processing, investment for promoting research and crop development interventions etc. is the key to ensure further growth in production of pulses, hence need to continue. Further, there is also need to identify

regions for promoting cultivation of varieties having special traits for domestic and export oriented market (Anonymous 2019). Special programs should be launched with dedicated funding support to develop and popularize biofortified varieties of major pulses to alleviate protein and minerals malnutrition in targeted pockets.

Summary

The present article clearly indicates vast potential to further increase pulses production through transfer of available technologies including seeds of new releases and matching package of practices, investment in research and development beside policy support. For example, there is need to extend production and distribution subsidy to 150 pulses Seed-Hubs in tandem with the public sector seed agencies so that seed-Hubs can remain viable and produce quality seed on sustainable basis; and strategy to identify regions for promoting cultivation of varieties having special traits for domestic and export oriented market. Similarly, investment is required for monitoring of increase/decrease in area and progress of pulses in other countries so that forecasting about crops and price can be done more effectively. This will certainly help Indian farmers to reduce or increase area under particular crop(s) in forthcoming season.

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Upcoming Rabi Pulses Crop

Nirav Desai
Managing Partner, GG PATEL & NIKHIL RESEARCH COMPANY

RABI PULSES CROP-WISE AREA COVERAGE AS OF 02 JAN' 2019 ('000' HAC)

S No.	Pulses Crops	Area Covered		Change	Final area
		2019-20	2018-19		2018-19
1	Chana	9496	8989	507	9659
2	Lentil	1518	1590	-72	1693
3	Others	2999	3104	-105	4278
	Total	**14013**	**13683**	**330**	**15630**

Area coverage during Rabi 2019-20 Pulses is increase by 330 thousand hectares compared to corresponding period of Rabi 2018-19.

State-wise Area coverage of key pulses crop AS OF 02 JAN' 2020 ('000' Hac)

CHANA

S No.	States	Area Covered		Change	Final Area
		2019-20	2018-19		2018-19
1	Andhra Pradesh	431	402	29	470
2	Karnataka	1075	1175	-100	1238
3	Madhya Pradesh	2640	3340	-700	3432
4	Maharashtra	1650	1134	516	1314
5	Rajasthan	2068	1457	611	1502
6	Telangana	134	102	32	110
7	Uttar Pradesh	586	571	15	583
8	Others	912	808	104	1010
	Total	9496	8989	507	9659

LENTIL

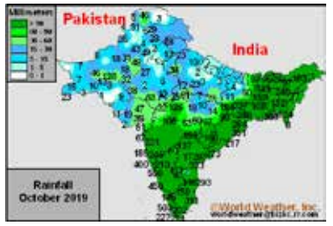
S No.	States	Area Covered		Change	Final Area
		2019-20	2018-19		2018-19
1	Madhya Pradesh	473	539	-66	560
2	Uttar Pradesh	602	585	17	580
3	Other states	443	466	-23	553
	TOTAL	**1518**	**1590**	-72	**1693**

MAIN FEATURES

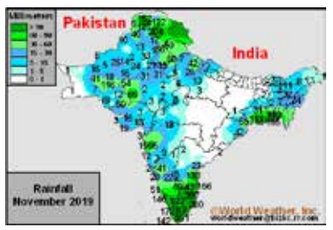
- Late season Monsoon rains continued till mid October. Monsoonal rainfall has never been so late withdrawing from India. Many areas reported record or near-record rainfall for the monsoon season although nationally rain totals were 110% of normal.
- The progress of Khariff crop harvesting struggled due to excessive wet conditions. This has delayed Khariff crop harvesting at least by 10-20 days.
- Weather finally returns to normal in November month.
- Delay in khariff harvesting has pushed behind the Rabi planting from regular schedule.
- Though planting started late but advanced well. This season Rabi pulses planting is delayed but not late. So this may not have any major impact on yields.
- Unusually great and above average monsoon precipitation this year has provided Rabi Crops with one of its best reservior for irrigation seen in years.
- Area covered under Rabi pulses crop 2019-20 has increased by around 2.41 to 140.13 Lac Hac over last year. Except Chana all the Rabi pulses are showing a net decline in acreage.
- All Area covered under Rabi Chana crop has increased by 5.07 Lac Hac from previous year to 94.96 Lac Hac.
- Area covered under chana in Rajasthan has jumped by 6.11 Lac Hac in Rajasthan and 2.76 Lac Hac in Maharashtra. While, other state area is little changed from last year.
- Due to good rainfall this year percent of barren land (uncultivated area) has shrinked to minimum due to which there is a good increment in Chana area.
- The area covered under main Chana growing area of Madhya pradesh has significantly reduced by 6.01 Lac Hac.
- Due to good reservior for irigation there is a shift towards wheat from Chana crop as wheat in Madhya Pradesh gives better returns than chana.
- All India area covered under Lentils crop has marginally reduced by 72k hac to 15.18 Lac hac. All lentils growing states including Madhya Pradesh are showing small decline in acreage except Uttar Pradesh.
- Farmers in Madhya Pradesh have reduced lentils area and shifted towards wheat crop mainly due to higher returns in wheat and also Govt fails to provide MSP for pulses to farmers.
- In West Uttar Pradesh this year there was 27% below average monsoonal rains. Due to which there is a marginal increment in lentils acreage.
- Chana and Lentils crops so far has prospered well with time.
- Frost and a couple of light freezes occurred in northern India impacting a few winter crops including pulses, but the impact was suspected of being mostly minor.
- Hard freezes were noted in far northern India in Jammu and Kashmir, Punjab, Haryana, North Rajasthan, Uttarkhand and Himachal Pradesh. These are not the pulses growing areas.
- Most of the low temperatures in main pulses growing areas were not that cold and any damage should have been superficial.
- Periodic winter rains occurred from Madhya Pradesh and southern Uttar Pradesh to Odisha probably getting 1.00 to 2.00 inches of moisture.
- The winter rains are always beneficial for all winter crops including pulses.
- Most of the crop is in Northern India is in vegetative and flowering stage.
- Reproduction will occur from late January through February and as long as weather conditions are close to normal production will be high.
- Cool weather is expected to prevail in India and there may eventually be another threat of frost and light freezes. But GGN Research do not anticipate any widespread serious threat, but the situation will be closely monitored.
- Chana crop in Sountern India (Andhra Pradesh, Telengana and Karnataka) is prospering well with time.
- Southern India there were not much extreme conditions and most of the crop has prospered in non threatenening conditions.
- Most of the Chana crop in Southern belts are in Flowering and prodding stage.
- On account of slightly higher acreage and considering normal yields Chana crop output prospects would be better by around 5-15% over last year.
- On accounts of marginal lower acreage and average yields, thus lentils crop output this season may not drastically change as compared to last year.

Weather Analysis

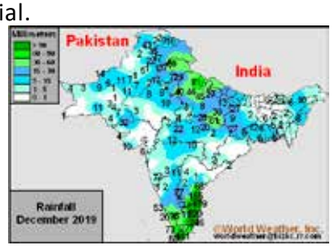
As we can see late season monsoonal rains did not abate in Oct months. However Monsoonal rains were more active in southern half of the nation . These late season have kept the soil saturated diffcult for machines to operate and delayed khariff crop harvesting.



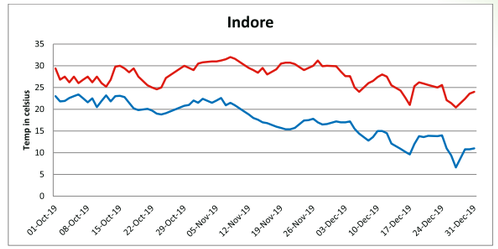
As we can see in the month of Nov. intensity of rainfall declined and weather have improved in all major pulses growing areas. This has helped completion of kharif crop harvesting and also supported the progress of Rabi pulses planting.

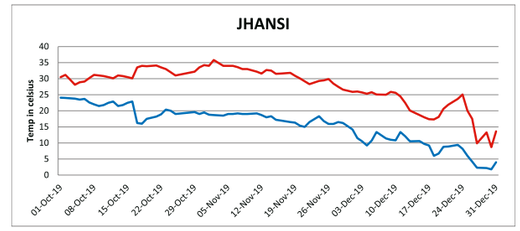


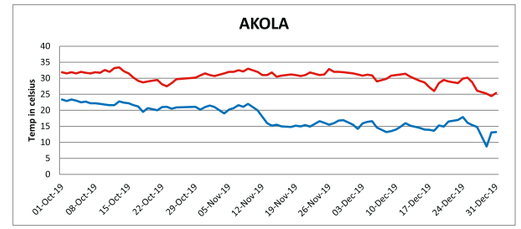
In the month of Dec, Weather turns mostly dry and there were significance of light winter rainfall in uttar Pradsh, East Madhya Pradesh, Maharashta Karnataka and Nort Rajasthan. Provided. All the rains were beneficial.



Temperture Analysis







So far, there are no threatening cold conditions, but now temperatures are gradually declining which is needed to be watch.

Indian Lentil Market Scenario

Harsha Rai
Global Sales Head, MAYUR GLOBAL CORPORATION

Pulses have been in the news for the last few years. The rabi harvest represents close to two-third of the annual production in India. Lentils comes under rabi crop which normally is seeded in November, preferably after the monsoon rains are over, and harvested in Feb mid/March. Lentils are also rain-fed crops, majorly grown in Madhya Pradesh, Uttar Pradesh, West Bengal, Bihar, and Assam . Madhya Pradesh typically contributes 40% of the total lentil production in India. Consumption in India for lentils either in form of splits and footballs which both account for 90% of demand or polished whole which account for 10 % of demand is increasing. Although lentils are small, they filled with flavor and pack of powerful nutrition punch. New products are springing up fast and furiously on to the main stream supermarkets shelves.

To cushion the farmers against the unexpected and inevitable losses, the Government of India came up with the concept of Minimum Support Price Scheme in 1966-67.

The MSPs are decided based on the recommendations of Commission for Agricultural Costs and Prices (CACP). CACP puts forward recommendations separately for both the seasons – Kharif and Rabi. The MSP serves the objectives of ensuring stable price environment for the farmers, preventing the farmers from the distress selling of their produce and procuring food grains for the Public Distribution System. Minimum support price (MSP) for Rabi Marketing Season 2020-21 is set Rs 4800 per quintal , an absolute increase of Rs 325 per quintal (100 kg) from Rs 4475 pre quintal last year . Below is the table for lentils MSP for last few years.

The imports of lentils were sharply increasing over the last couple of years especially since 2012. The imports of lentils increased from around 206 thousand tonnes in 1988 to 1123 thousand tonnes in 2017. In 2012 it was 441 thousand tones.

Low prices , continuous imports and burdensome stocks that hurt growers' interests had forced the government to undertake price support operation and hence government placed Tariff plus government of India surcharge on lentils import on December 2017 as under :-

33 percent import tariff on lentils for all origins , also note Indian government Imposes Additional Tariffs on U.S lentils at 55 percent. Important to note there is no import quota restriction but only a custom duty levied.

MINIMUM SUPPORT PRICE OF VARIOUS PULSES IN RS. PER QUINTAL (SOURCE CACP)

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
GRAM	1760	2100	2800	3000	3100	3175	3425	4000	4400	4620	4620	4875
LENTILS (Masur	1870	2250	2800	2900	2950	3075	3325	3950	4250	4475	4475	4800

Acreage :- This year excess rain had slowed the planting of rabi pulse crops. Continuous rains in November first half brought excess moisture to soil and hence delayed seeding. Initially the seeding progress was lagging behind but in December it picked up. Acreage of Lentil in the current week is 15.80 lakh hectares while, 16.60 lakh hectares areas was reported in corresponding week of 2019. As per the government estimates , seeding (in lakh ha) in Madhya Pradesh so far stands at 4.81 , Bihar at 2.07 , Uttar Pradesh at 6.02, West Bengal at 1.53 and rest others states. This is third consecutive year where seeding for lentils has decreased every year but it is still above the average of last five years that is 14.19 lakh ha.

Below is the table for last five years sowing acreage.

DIRECTORATE OF PULSES DEVELOPMENT, BHOPAL

RABI CROP SOWING COVERAGE 2019-20 WEEK ENDING 08.01.2019

YEAR	AREA
2014-15	14.928
2015-16	13.958
2016-17	17.155
2017-18	17.097
2018-19	16.559
2019-20	15.804

Weather and Crop Progress :-

Crop sowing is completed by now and crop is in vegetative growing stage. Generally, the month of December and January remain almost dry in Madhya Pradesh and Chhattisgarh. But this year unseasonal rains were seen . Start of January 2020 witnessed rain in all growing areas for lentils but no damage was reported and in-fact it was beneficial for crops in few areas. So far (January mid) crop conditions are normal. Rain forecast again January third week in central part of India. For sure weather will go on varying from day to day and has been very uncertain for all parts of India this whole year . Crop progress will largely be dependent on intensity of these weather events now till the crop is harvested. Expecting harvest in March due to late seeding which is otherwise seen in February mid.

DOMESTIC PRODUCTION OF MAJOR PULSES
(SOURCES DIRECTORATE OF ECONOMICS AND STATISTICS)
QUANTITY IN MILLION MT)

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
GRAM	9.53	7.59	7.06	9.38	11.23	5.52
TUR	3.17	2.71	2.56	4.87	4.25	3.68
MUNG	1.61	1.39	1.59	2.17	2.01	2.41
URAD	1.7	1.7	1.95	2.83	3.56	3.36
LENTIL	1.02	1.04	0.98	1.22	1.61	1.53

The factors influencing the market:-

Factors which influence the market include, buffer stocks , information flow regarding the supply of the pulse, price movements of the substitute pulses and production level in the main exporting countries, weather fluctuations.

Buffer Stock :- In 2015, the GOI decided to set up a buffer stock of pulses with the National Agriculture Cooperative Marketing Federation of India (NAFED), Small Farmers Agri-Business Consortium (SFAC), and Food Corporation of India (FCI) – all procuring domestic product – and state-run Metals and Minerals Trading Corporation of India (MMTC) and SFAC – both procuring imports, under the authority of the Price Stabilization Fund (PSF). Current Stocks for lentils under PSS (as on 09-01-2020) stands at 29669 mt.

Supply of pulses :-Good production in India in 2017-18 and their after, plus lot of carryover stocks for imported lentils, resulted in sharp price decline in local market. Also stocks of imported lentils with MMTC was in good amount. This added more pressure on lentils local price in India for last 2 years. Tariffs in December 2017 did result in decline in import business. As per the data available at ministry of commerce website , the import of lentils stood at 248969 mt in April –March 2019 , which was 796616 mt financial year April-March 2018. But stocks with growers , Importers and GOVT agencies didn't let price move to north. Even though acreage was going down in India in last three year , the availability of stocks was not the problem. Important to note that slowly these stocks were going into consumption and last year drought in India added more to this. The burdensome inventory that India carried in the last 12-15 months is now substantially lightened as stock levels fell further given the series of festivals during the August– October period when food consumption including pulses and edible oil rises.

Price movement of substitute pulses :- In recent time fundamentals of Indian pulse market has slowly changed. It became a inevitable situation where supply tightened. This year Khariff crop harvest in (October 2019) witnessed lot of weather issues and hence rain at the time of harvest damaged big percentage of crop in central and other parts of India. This resulted in big price jump in prices of few pulses and oilseeds and vegetables In other words it can be said that Indian pulses market saw its bottom and now price of most of the pulses have moved higher. But lentils was still trading at 15% below the 2019 MSP.

In October lentils prices started showing upside which was due to very good demand for the festive season in local market and less arrivals by growers in several market. Being the cheapest pulses available it was seen that lentils demand was more than expected. Imported lentils at various Indian port were shown good demand by manufacturers. Following months followed same pattern and in last four months and the consumption level is continuously on an increasing path .Lentils price in India has moved close to 30 percentage from their lower levels since September.

Weather Fluctuation :-

GLOBAL SUPPLY DEMAND
(BASED ON HISTORICAL DATA FROM THE FOOD AND AGRICULTURE ORGANIZATION)

ALL NUMBERS ARE IN TONNES

	2014	2015	2016	2017	2018	2019
PRODUCTION	4,06,7000	53,05,000	68,29,000	6,31,000	57,29,000	54,30,000
TOTAL SUPPLY	56,44,000	58,81,000	71,76,000	66,82,000	68,90,000	65,18,000
TRADE	29,60,000	29,05,000	41,36,000	24,82,000	25,30,000	28,60,000
INFERRED USE	50,68,000	55,34,000	66,24,000	57,01,000	58,02,000	60,42,000
ENDING STOCKS	5,76,000	3,47,000	5,52,000	11,61,000	10,88,000	4,76,000

There have been drastic changes in behavior of climate for the last so many years. Weather has been a major feature in pulse markets for several months and it seems destined to remain that way for a few more. This has not been the normal weather markets we see when plants are being sown, developing, or harvested. Rain fall in general has been erratic, uncertain and unevenly distributed. With still more than 45 days until harvest can be seen ,weather will play an important role in determining yields. we don't know is whether yields will be above , normal or lower . On that note, lentil prices are finding some strength on these acreage and moisture reports.

Production level in main exporting countries :-

Conclusion :

Increase in demand and low production in last few months has resulted in price moving higher for lentils in India. Traders/market Participants feel that actual crop size last year could be much lower than the government estimates. Carryover stocks disappearance clearly indicates increased in demand in last 7-8 months plus less availability of stocks in the hands than thought of. This year Seeded crop will take another 40-45 days to harvest and weather will help in determining whether we would see above normal yields which would compensate lower acreage or below normal yields which would add more to import demand in India.. Imports on the other hands did picked up which was very much visible with bulk ships coming to India every month. Export numbers from various origins like Canada and Australia did show that India was once again an active importer of lentils in last few months even with 33 percent of tariff on imports.

Genomics for Pulse improvement

Rajeev K Varshney
Research Program Director- Genetic Gain,International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Food security has become a major challenge in the wake of the burgeoning world population which is expected to increase beyond 13 billion by 2100. This also includes approximately 5.6 billion people from Asia and Africa, most vulnerable to the effects of climate change and water scarcity. Pulses, a key source of protein, play an important role in food and nutritional security especially in developing countries, besides replenishing soil fertility. Among pulse growing countries across the globe, India stands first in the production and consumption of variety of pulses that include chickpea (Cicer arietinum), pigeonpea (Cajanus cajan), urd bean (Phaseolus mungo), mung bean (Vigna radiata), lentil (Lens culinaris) and field pea (Pisum sativum). About 32% of global pulse area and 26% of pulse production comes from India. The ever increasing population, rapid climate change and urbanization are key factors that have strong impact on availability and market price of pulses. As cropping area is limited, the other alternative is to enhance productivity by 32% to feed 9 billion people by 2050 from now. In recent years, the yield gap between potential yield and realized yield in the field has been enormous. The estimated yield gap for chickpea is between 610 to 1,150 kg per ha and in the case of pigeonpea, it is estimated in the range of 550 to 770 kg per ha (Foyer et al. 2016, Nature Plants, Article 16112).

To meet the increasing demand, genomics-assisted breeding (GAB) offer powerful tools and technologies to overcome several limitations of conventional plant breeding and to accelerate the rate of genetic gains in pulse breeding programs. Towards this, the Center of Excellence in Genomics & Systems Biology, ICRISAT (CEGSB, cegsb.icrisat.org), working together with colleagues and collaborators at ICRISAT and its partner institutes has been making significant contributions towards developing genomic resources, trait dissection, GAB and capacity building in developing countries of Asia and sub-Saharan Africa.

The unprecedented evolution in the next-generation sequencing (NGS) technologies has made it possible to develop high quality genome assemblies in crop plants including complex and large sized genomes. CEGSB together with its partners have deployed NGS technologies in developing high quality reference genomes for ten crops including four pulse crops namely chickpea, pigeonpea, mungbean and adzuki bean. Furthermore, a range of other genomic resources such as high-density genetic maps, gene expression atlases, etc. have also been developed. In order to harness genetic diversity from germplasm collection in the pulse crops, several germplasm sequencing efforts have been/are being carried out. For instance, in the case of chickpea and pigeonpea, CEGSB-ICRISAT and its partner institutes have sequenced about 300 lines from the germplasm collection. These sequencing efforts have provided a better understanding of germplasm and also candidate genes associated with yield and climate change related traits. Inspired by the success of these efforts, CEGSB-ICRISAT and its collaborators have undertaken 'The 3,000 Chickpea Genome Sequencing Initiative'. This initiative has undertaken both whole genome sequencing as well as phenotyping of the 3000 lines at six locations in two years. Large scale

sequencing of several advanced breeding lines, cultivars, wild species, and accessions that are known to carry specific traits such as resistance to different biotic/abiotic stresses would identify new sources of genetic variation and allelic variants of candidate gene(s) associated with beneficial agronomic traits. All these efforts have provided insights into the genome diversity, domestication, evolution and agronomic traits.

Modern genetics and genomics approaches have been/are being deployed to provide relevant information on candidate genes and their biological function that modulate agronomic traits. Realizing the complexity of agronomically important traits, integrative biology approach has also been undertaken, for instance, for drought tolerance in chickpea and for heterosis (hybrid breeding) in pigeonpea. In brief by using a range of genetics and genomics approaches, trait association with markers and/or candidate genes has been established for about 20 traits in chickpea and pigeonpea.

Translating genomics information to develop superior lines for the trait(s) of interest is crucial to crop improvement. In this regard, molecular markers associated with different breeding traits, as mentioned above, were deployed in several breeding programs both in ICRISAT and other national programs in India, Ethiopia, Kenya and Tanzania. As a result of extensive collaboration with partners, superior lines through GAB have been developed in chickpea. After undergoing rigorous varietal release pipeline, Geletu, a high-yielding and drought tolerant chickpea variety developed through GAB has been released in Ethiopia. The variety delivered the highest grain yield of 3822 kg/ha at Arsi Robe, Ethiopia, which translates into an yield advantage of 15% over the check variety 'Teketay' and 78% more than the local check. In the case of India, Pusa Chickpea 10216 variety for drought tolerance has been released. This variety has an average grain yield of 1,447 kg/ha with over 11% yield superiority over the recurrent check variety Pusa - 372 under the moisture stress condition of the Central Zone of India. Similarly, the variety "Super Annigeri 1" resistant for Fusarium wilt has been released in India. Super Annigeri-1 variety has an average grain yield of 1,898 kg/ha and has recorded about 7% increase in yield over Annigeri-1 and is highly resistant to Fusarium wilt disease, an important yield reducing factor in South India. Lately, CEGSB has also started to work in the emerging area of metagenomics for leveraging the potential of microbiome for agriculture and human health. Sequencing and analysis of soil microbiome and their association with yield could allow exploring an alternative approach for enhancing crop productivity by reducing chemical fertilizers usage.

Success in translating genomics information to field could be achieved through adoption of genomics tools/ technologies with low cost genotyping platforms by National Agricultural Research System (NARS) partners. Collaboration and partnership among research institutes, agricultural research stations, and NARS will be crucial in developing better and faster products for farmers and consumers in the future. Therefore, by organizing 14 training courses, CEGSB has trained about 150 students/ post-docs and a total of 421 scientists (including 135 female scientists) coming from NARS institutes/ State Agricultural Universities (SAUs), Research organizations and other Public and Pvt. sector organizations of Asia and sub-Saharan Africa.

Pathancheru- 502 324, India
Email: r.k.varshney@cgiar.org;
Twitter: @rajvarshney

Challenges in Indian Pulses Industry

Dr. Hanish Kumar Sinha
Deputy Vice President - Research & Development, National Bulk Handling Corporation Pvt. Ltd.

Pulses are the important sources of proteins, vitamins and minerals and are popularly known as "Poor man's meat" and "rich man's vegetable", contribute significantly to the nutritional security of the country. Currently India is in the midway of self-sustaining in pulses production as we are the world leader in production, consumption and import. Since ages, pulses have been well integrated into the farming system of our country as the farmers could produce them by using their own seeds and family labour without depending much on external inputs. With the advent of Green Revolution, which promoted rice and wheat using external inputs and modern varieties of seeds, pulses were pushed to the marginal lands resulting in significant decline in productivity. The pulses are still cultivated on the marginal and sub marginal land, predominantly under un-irrigated conditions. The other constraints in the process of pulses production are unfavourable weather conditions, abnormal soil conditions, agronomic practices, input quality and its availability, availability of high yielding varieties, pests and diseases, availability of proper infrastructure, credit, marketing and pulses centric policy. If we analyse the development of the Indian pulses production trend, it is the culmination of all the above factors which has led to the underperformance of this sector.

Production of Major Pulses in India (Million MT)

Commodity	2015-16	2016-17	2017-18	2018-19	2019-20*
Chickpea	7.06	9.38	11.38	10.13	10.93
Lentil	0.98	1.22	1.62	1.56	1.48
Pigeon Pea	2.56	4.87	4.29	3.59	3.21
Black Gram	1.95	2.83	3.49	3.26	2.82
Green Gram	1.59	2.17	2.02	2.35	1.80
Other Pulses	2.18	2.66	2.62	2.51	2.38
Total Pulses	**16.32**	**23.13**	**25.42**	**23.40**	**22.62**

Source: Ministry of Agriculture, DACNET & *NBHC Estimates

India continues to be the largest producer (25 per cent of global production), consumer (27 per cent of world consumption) and importer (14 per cent) of pulses in the world. Pulses account for around 20 per cent of the area under foodgrains and contribute around 7-10 per cent of the total foodgrains production in the country. Though pulses are grown in both Kharif and Rabi seasons, Rabi pulses contribute more than 60 per cent of the total production. The stagnation in pulses production and continuous increase in population has led to significant decline in the per capita availability of pulses which in 1951 was 60 g and has dwindled down to about of 56 g in the year 2018. In India, pulses production during 2019-20 is expected at 22.62 million MT. About 75 per cent of total pulse production is being produced in 5 states of Madhya Pradesh (29.67 per cent), Maharashtra (14.66 per cent), Rajasthan (13.57 per cent), Uttar Pradesh (9.03 per cent) and Karnataka (7.60 per cent). India majorly produces Chickpea with the contribution of 48 per cent followed by Pigeon Pea 14 per cent, Black Gram 12 per cent, Green Gram 8 per cent and Lentil 7 per cent. As far as 2019-20 production is concerned, Green Gram, Black Gram, Pigeon Pea and Lentil production is expected to decline by 23 per cent, 13 per cent, 11 per cent and 5 per cent, respectively whereas the production of Chickpea is expected to improve by 8 per cent over the last year.

Uncertainty in Production Cycle - Yield Gap Analysis

Yield Gap Analysis

Pulses	Field Level Demonstration	2019-20*	% Yield Gap over 2019-20
Pigeon Pea	1394.00	701.50	49.68
Black Gram	813.00	538.11	33.81
Green Gram	781.00	428.83	45.09
Chickpea	1502.00	1032.99	31.23
Lentil	1289.00	795.32	38.30

Source: Indian Institute of Pulses Research & *NBHC Estimates

The yield gap analysis shows the wide potential up to which one can enhance the overall production of pulses in India without making substantive changes in the acreage. In the current system of production we are not even able to match up with lab yield and are lagging too far behind the international standards. In India the pulses yield gap (yield Achieved in Experimental Lab Conditions to the actual Farmer's field in India) in Pigeon Pea almost 50 per cent, followed by Green Gram 45 per cent, Black Gram 34 per cent, Lentil 38.30 per cent and Chickpea 31.23 per cent. The area under pulses has increased from 24.91 million hectares in 2015-16 to 29.41 million hectares in 2019-20, but pulses productivity in India is very low and has not allowed the level of production to match up to the growth in demand thereby has increased the dependency on imports.

Need for Long Term Policies Initiatives

Pulses production in India has been marred by absence of high yielding varieties which could be pests and diseases resistant, low level of mechanisation in entire framing practice, lack of assured market, ineffective government procurement operations, unfavorable prices and trade liberalization make pulse production less attractive for farmers compared to other crops. Sensible agronomic practices such as wet and dry system of irrigation, and profitable crop rotation should be encouraged to the farmers to reduce the build-up of pest, diseases and weeds. Concerted efforts should be made to supply agricultural equipment's including harvesters and threshing machines on custom hiring basis so that resource poor farmers can avail these services at the village level. Construction of common godown should be encouraged among local farmers with active support from various agencies. Infusion of new technologies, better practices, coordination and investment in rural infrastructure should be encouraged. Amount of pre and post-harvest losses caused by biotic and abiotic factors is found to be substantial and for this the advantages of Information and Communication Technology (ICT) should be tapped to provide practical advice for control of insect pests, diseases and weeds. There

is a need to step up not only the amount of public and private investment in building rural agricultural infrastructure, but also quality of such investments should be channelized properly. There is a need for rejuvenation of the government extension agencies for approaching the farming community and making themselves indispensable to curtail the dependence of farmers on private input dealer and traders & stockiest for selling off their produce. The lack of a supporting mechanism for the procurement and marketing of pulses has been a major impediment to the propagation of pulses. Incentivising pulse production through the price mechanism will only work once the farmer is assured that the government will procure pulses. The active participation of the government can be substantiated through a designated central or State nodal agency, similar to the FCI or NAFED, for assured procurement of pulses at the State level.

Inadequate Warehousing Facilities & Collateral Finance

Status of Indian Agri-Warehousing Industry (2018-19)	
Particulars	**Million MT**
Total Foodgrain Production	284.95
Govt. Procurement (~33%)	94.03
Minimum Buffer Stock	21.00
Total Stock in Stored by Govt.	115.03
Total Storage Capacity with Govt.	75.08
Overlapping factor for Kharif & Rabi*	1.23
Balance left for Pvt. Trade/Warehousing	169.92
Direct Industry Utilization (11%)	31.34
Retention by Farmers (10%)	22.80
Stock Left For Private Storage/Trade	115.78
Current Storage Capacity (Corporate + Private)	77.68
Total (C & P) Storage Available Annually	95.55
Potential of Expansion of Warehousing	**20.23**
* Overlapping Factor arrived on Hypothesis that all stocks are not cleared from warehousing once the season changes from Rabi to Kharif or wise-versa.	
Source: Data Analysis Done by the Author	

The demand for warehousing sector is been on the continuous rise with significant increase in overall food grain production. The total procurement by the Government agencies comes to about 33 per cent of the total production which totals to about 115.03 million MT once the minimum buffer stock is added. The above calculation leaves about 169.92 million MT for private & corporates which has the total warehousing capacity of about 77.68 million MT. We have considered the fact that as the Kharif season storage is being completed, the outgoing process is also proceeding for the already stored food grains simultaneously as per the industrial / retail demand and to incorporate that we have introduced the overlapping factor. The maximum foodgrain likely to be stored comes to about 95.55 million MT, which has been calculated based on the overlapping factor. Thus the final gap in the storage or the expected potential for expansion of agri-warehousing industry currently stands at 20.23 million MT.

The pulses enjoys about 7.5 per cent of the total organised warehousing space available in the country (~14.10 million MT) against the total production of about 23 million MT. The pledging /collateralization of agricultural produce with a legal backing in the form of NWR would lead to increase in flow of credit to the rural areas, reduce the cost of credit (due to certainty of recovering credit by the bank) and would spur other related activities, like standardization, grading, packaging and insurance services in the pulses sector. The potential size of the collateral financing market in pulses is about 8700 Crores of which Pigeon Pea takes the lion share of about 41 per cent followed by Chickpea with about 28 per cent and the other pulses cumulatively adds up to the balance 31 per cent.

SWOT Analysis – Indian Pulses Production

Pulses historically have been one of the most important constituent of the Indian cropping and consumption patterns. Pulse crops form a unique feature of our farming system, particularly in dry land agriculture. Pulses are

Collateral Financing Market in Pulses		
Commodity	**Loan Amount (Rs. Crore)**	**% Business Share**
Pigeon Pea	3577.94	41.12
Chickpea	2484.59	28.55
Other Pulses	2639.29	30.33
Total Pulses	**8701.82**	**100.00**
Source: Compiled from Sources		

packed with nutrients and have high protein content, making them an ideal source of protein particularly in regions where meat and dairy are not physically or economically accessible and in order to ensure self-sufficiency, the pulse requirement in the country is projected to be 32 million MT by 2030. With pulses playing a pivotal role in promoting national food security, we need to introduce better seed varieties that are high-yielding, disease and pest-resilient, improve crop production techniques and bring additional fallow lands under pulses production. It is here is where agricultural universities, research institutions and Krishi Vigyan Kendra (KVK) can play a big role in improving the lot of the farmers and empowering them. Agriculture Universities need to focus more on improving the yields of pulses, while KVKs should act as a bridge between scientists, governments, and farmers. Thus effective SWOT analysis is the need of the hour which can help to plug in the loopholes which is pulling restricting the significant rise in production in spite of several steps being taken up by the government and research agencies.

The strength in the Indian agricultural production system is that it has huge rice fallow acreage (> 11.7 m ha) which could be utilised for pulses cultivation. The other strengths are availability of cheap labour, possibility of higher yield realization and untapped yield potential in most of the pulses, feasibility and viability in growing pulses (technical & socio-economic considerations), unexploited and unexplored and soil fertility for successful pulses cultivation and large quantum on monsoon rains. The weak link in the production cycle is the unavailability of quality seeds (replacement of seed/variety), low level of mechanisation, unavailability of irrigation in major growing areas, acute abiotic stress (mid & late season drought or popularly called as terminal drought, low marketable surplus, uncontrolled Incidence of biotic stresses (pests & diseases) and lack awareness towards diagnosis and control. Going by the above weakness, the opportunities in this sector is huge. One can work to motivate farmers to grow more pulses leading to augmentation in farm income, generation of additional employment and leading the country to self-sufficient in pulses production. The major threats in the pulses production is the pushing back of the pulses to the marginal and sub-marginal areas with expansion of irrigation in command areas. Pulses are highly prone to damage by insect-pest, diseases, nematodes and weeds. Underutilizations of resources reflects a poor-resource base of the farmers and have implications for optimum utilization of inputs and production of outputs, both on farm and in processing unit to reduce allocation and scale inefficiencies. Improvement is much needed in field of better enforcement of regulated markets, strengthening the appropriate market institutions, introduction of forward marketing, contract farming and promotion of market forward and backward market integration.

Pulses production in East Africa: An Overview

Dr. Bharat Kulkarni
Chairman, Indo Global SME Chamber

East Africa, specifically Ethiopia, Tanzania and Kenya have become a major supplier of pulses. The export destination for the pulses grown in East Africa has been India. The major reasons have been the access to the market, preferential trade agreements, and the initial initiative led by the Government of India's State Trading Corporations has promoted the trade with India. The major pulses that India imports from East Africa is Pigeon Peas, Green Mung beans (Green Moong) and Chick Peas . However, with the policy decisions by the government of India has made African countries to look for alternate markets. Following is the profile of the three east African countries.

Ethiopia

In Ethiopia oilseeds, pulses are the major crops. Pulses like Chick Peas, Lentils and various types of Haricot Beans (specially red and white) are produced in Ethiopia. Pulses sector is well recognised by the government due to its export potential. Red lentil is locally consumed while haricot beans are majorly exported crop and chick peas is locally consumed as well as exported. Out of total cultivated land available in Ethiopia, land share for Pulses crop is 13 percent (approx). There are two harvesting seasons for pulses in Ethiopia one is belg (March-August) and other is Meher (September-February) during Meher crop seasons maximum agriculture output (91%) produced in Ethiopia.

Pulses are cheaper source of protein and contribute to 15% of total protein intake by human. Commercial value of pulses crop is also higher then cereals and it also aids in nitrogen cycle. In Ethiopia, many farmers' uses pulses as rotation crop for improving other crops yield and to lower down the cost of fertilizer. Small farm holders are major contributor in total pulses production. Women contribution is high on farm activities like labour during planting, harvesting season.

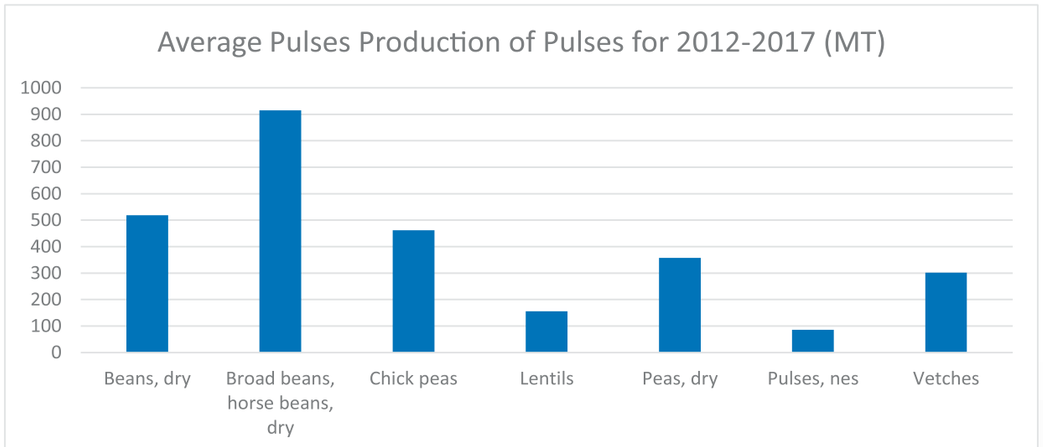
Ethiopian pulses sector has shown steady growth but still it is below the global benchmark. Following points are indicated by International Trade Centre (ITC) as weakness of Ethiopian pulses sector.

- Poor quality seeds and low yield
- Poor quality and limited use of pesticides and fertilizer
- Lack of knowledge of modern farm technologies
- Poor post harvest management
- Improper crop rotation
- Poor Agro-infrastructure

Pulses production by Season		
Season	Area (Hecht.)	Production (MT)
Belg	436,435.21	40,1361.73
Mehr	1,652,844.19	2,769,274.31

There is relationship between type of pulses produce, soil and climate of region in Ethiopia.

Pulses	Soil Type	Climate	Region
Chickpea and Lentils	Dark soil	Residual moisture	North and west shewa zone of oromiya,north and south gonder,south wollo,east and west gojam zone of Amhara and goro zone of SNNPR
Fava beans and field pea	Red and black soil	Cooler and dry	Amhara,oromiya and SNNP region
Haricot beans	Non acidic and well drained soil	Dry and warm	Riftvalley,SNNP region,Gambella,benshangul-gu-muz region



Crop Calendar of Ethiopia

Area	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Chick Peas	H								S	S		H
Dry Beans					S	S	S		H	H		
Lentils						S	S	S		H	H	

Tanzania

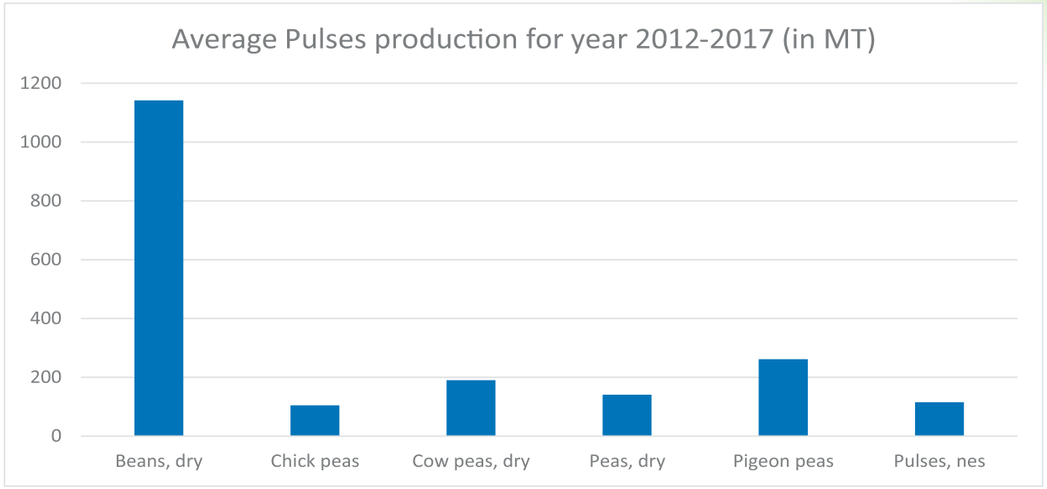
Tanzania is among the top ten pulses producing country in world. Pulses are one of the important crops of Tanzania and cultivated over 12% of total cultivating land. Green gram, chickpea, pigeon pea, cow pea, dry beans, yellow grams and green mung beans are important types of Pulses crop. Main four regions for pulses production are- Central, Southern, Northern and lake region. Small farmers (holding Less than 5 hectares) are major stakeholder in the region. Pulses sector is not well organized because it is majorly controlled by small famers.

All farmer's organizations, cooperatives and unions in Tanzania are not able to mark their presence; even then it is seen in one of the top pulses producing countries of the East Africa. Reasons behind its low performance are weak Leadership, lack of expertise in management and trade negotiation skills. Further these organizations are not financial strong to run their activities as most of their financial needs are satisfied by funding received from donor agencies and NGO's.These development agencies in Tanzania has made a lot of investment in developing these organisations but core issue like business management, skills development and sector specific issues are not properly taken into account.

Global export of pulses is largely hold by Myanmar, Canada, China, Argentina and Australia while Tanzanian share in global export is very less. Chickpea, pigeon peas and green mung beans are mainly exported pulses crops. India is largest importer of all types of pulses in the world and it imports 25% of pigeon peas of its total requirement from East Africa. Other export destinations for Tanzanian pulses are Pakistan and Middle East.

India is largest producer and consumer of pulses in world. Few African countries like Kenya and Malawi (for pigeon peas), Ethiopia (for chickpeas) and Tanzania (for pigeon peas) are considered as strategic supplier of India because of pulses crops production calendar. The recent import ban by India on pulses import, forces Tanzanian exporters to search for alternate market. USA, UK and middle east is the area where they find alternate market because of presence of sizeable number of Diaspora population of South Asians. To attract these premium destinations, continuous monetary support for improved production and processing technology is required.

In Tanzania yields are less than a ton per hectare but still it hold important position in East African pulses sector. Pulses are mainly used for subsistence farming and intercropping. For export, production and better yield, introduction of latest agro technologies and efficient input is needed in Tanzania.



Crop Calendar

Area	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Mbeya			H	H	H						S	S
Iringa/ Njobe		H	H	H						S	S	S
Arusha/ Manyara		S/H	S/H	S/H	H	H	H	H		S	S	S
Mwanza/Mara/ Musoma					S	S			H	H	H	
Dodoma				S	S			H	H	H		
Morogoro		H	H	H						S	S	S
Kilimanjaro		S/H	S/H	S/H	H	H	H			S	S	S

Kenya

Pulses are common crop among farmers. Pulses in Kenya are vital crop for small farmers because of irregular rainfall patterns. Apart from rainfall another challenge is drought but this challenge is easily won by Kenyan farmers as pulses have drought resistance crop.

Although area for pulses crops and its production keeps on changing from time to time but still Kenya has shown constant growth and is placed among leading producer of pulses in East Africa. Dry beans including green mung beans are leading pulses crop among other pulses produced in Kenya, pigeon peas and cow peas follows after that and also these crops are rotational crops with maize and sorghum. Eastern state of Kenya is main production hub for pigeon pea because the lands in this state are semi arid and arid (ASALS) which is favourable for its cultivation.

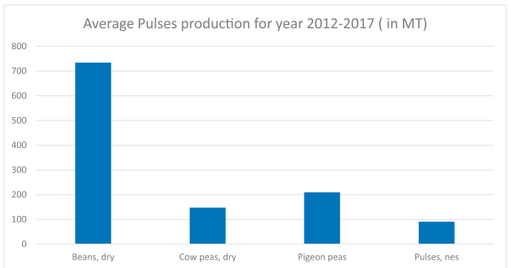
Crop Calendar

Crop	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Chick Peas		S	S			H	H					
Dry Beans (season 1)	H	H								S	S	
Dry Beans (season 2)			S	S			H	H				
Pigeon Peas		H	H							S	S	

Eighty percent of total pulses produce in Kenya comes from three districts. However risk associated with pulses production is very high due to unfavourable regional weather condition. Stakeholder in Kenyan pulses market are wholesalers, retailers, assemblers and processors

In Kenya Some of the processors are also exporters. Pulses export from Kenya depends upon prevailing international price. Kenyan market has huge potential and opportunity to grow and it is need of the time to take benefit of these opportunities and use the potential of this sector to support its farmers and agribusiness in Kenya.

India imports green mung and pigeon peas from Kenya, although its share is only 3.5% for mung beans and 1.5/% for pigeon peas respectively. of total Indian import of these two commodities Hence, there is a scope to increase supply and have a higher share in the Indian imports. Kenya is also exporting green peas and dry beans to Arab countries and there is scope of increasing market share too. Scope of entering in European market is very low due to quality issues. Kenya can take this as challenge and by using modern technologies for farming and processing of pulses for improving quality the situation can be changed.



By diversifying export market Kenya has chance to minimize risk of dependency on its traditional export destination and events like Indian ban on import of pulses in last year's can be avoided. South Asian used processed pulses as staple food and has considerable population percentage share in various countries of world like USA, UK and Arab countries. Kenyan pulses market needs investment in processing and farming facilities and it will lead to an easy access into national and international markets.

Conclusion: Several alternate markets are growing globally and these markets can access pulses in a much effective manner for these three African countries. Pulses like the Chick peas, Mung Beans, Dry beans and pigeon pea have seen a significant rise in the demand globally and East African suppliers have been producing these pulses. It's a matter of time that countries like Ethiopia, Kenya and Tanzania start exporting to these new markets.

Product Innovation In Pulses: Spotlight On The Alternative Protein Sector

Dhruvi Narsaria, Miranda Grizio, Siddharth Bhide, Varun Deshpande
The Good Food Institute

India Leads in Pulses But Needs More Avenues for Growth

As in many areas of the economy, the pulse sector in India simultaneously presents huge promise and several pressing challenges. India is the top producer (at 25% of global production), consumer (at 27% of global consumption), and importer (at 14%) of pulses worldwide [1]. Despite India's being the largest pulse crop cultivating country in the world, pulses' share of total national foodgrain production is only 6-7% [2]. A shift toward more lucrative crops, beginning in the 1990s, has contributed to the transition away from pulse cultivation. For example, farmers of the Indo-Gangetic belt who gave up pulses for wheat were rewarded with much higher yields—from about 800 kg per hectare for pulses to 3,000 to 4,000 kg for wheat [2].

Additionally, a lack of processing technologies has far reaching implications vis-à-vis value addition and by-product utilization of pulses. The produce of the farmers is sold in situ at low prices hardly meeting the economic aspirations of the farmers themselves. In order to meet the projected food demand of the growing population (there is a projected demand of 32 million tonnes of pulses by 2030), a growth rate of 4.2% has to be ensured [2].

This increase in productivity can only occur with a paradigm shift in new areas of commercialisation and technology generation. Indian suppliers have known for a while that if they want to even meet the domestic demand of pulse requirement (projected to grow 2% year on year) [3], they need to look at out-of-the-box solutions. As agriculture growth is limited, in the long term we will need to focus on productivity increases through quality seeds of promising varieties, the efficient use of water, and other necessary infrastructure inputs and technological intervention like the increase in value addition.

The Global Plant-Based Trend Provides an Exciting New Opportunity

Industry trends have a way of turning into revolutions that cause systemic change across the globe. These changes are often underpinned by the proliferation of exciting new technologies and their application in seemingly traditional sectors. While notable transformations continue to be accelerated by information technology, food product development is currently witnessing a very similar innovation-led reorganization—particularly in the sector of animal-sourced foods such as meat, eggs, and dairy.

Corporations like JUST, Inc. (making plant-based eggs using mung beans) and Beyond Meat (making plant-based meat products such as burgers incorporating yellow pea protein) are reshaping how the world eats by creating protein-rich meat, eggs, and dairy made without the animal, using sources of plant protein like pulses. Stakeholders across the value chain—from farmers to traders to processors—stand to benefit from this novel category. Perhaps most promisingly, these novel foods present the opportunity for orders of magnitude improvements over the resource burdens of their animal-sourced counterparts.

An image of pulses

Alternative Solutions—A Must for Feeding a Growing Population

Universal factors like climate change, dwindling resources, and compromised human health affect industry in more ways than one. The study "Shifting diets for a sustainable food future"

[4] highlights that we will need 70% more food by 2050 to feed the growing global population when compared to 2006. This increase comes from the fact that the population is expected to reach 10 billion by 2050. The expected rise in meat, dairy, and other animal product consumption will lead to increased environmental stresses like green-house gas emission [5], pressure on the world's freshwater resources [6], and deforestation [7], which is not sustainable.

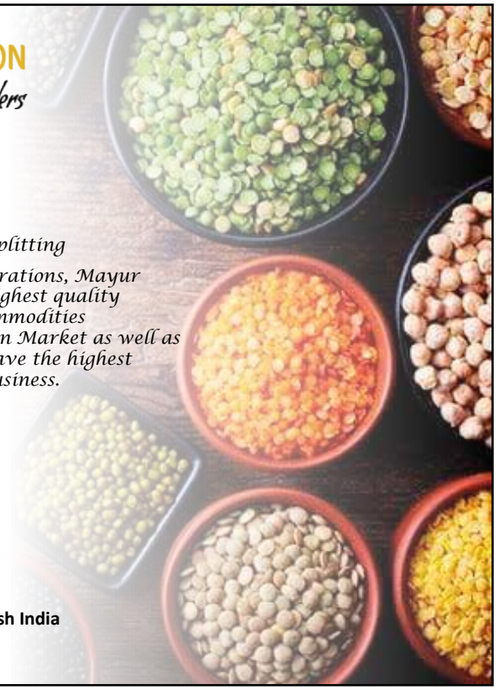
For an agrarian economy like India, the future seems especially daunting. It is predicted that we could face an agricultural loss of over $7 billion by 2030 due to the looming climate crisis.

Indians will comprise of 1/6th of the world's entire population in the next 30 years, but as of today, they are faced with the highest levels of antimicrobial resistance in farmed animals. Countries like India will need to be at the forefront when it comes to thinking up new ways to feed themselves.

Despite achieving food sufficiency in production, India still accounts for a quarter of the world's hungry people [1]. Feeding crops to animals and then eating a part of the animal is exceedingly inefficient, driving up the price of grains and legumes—wholesome foods by themselves—and entrenching poverty. Chicken, which is the most widely eaten animal in India, takes in nine calories of crops such as soya, wheat, and corn, for every one calorie it gives us in the form of meat. The land, water, and other resources used for those eight extra calories could be freed up to feed humans directly.

Pulses are rich in proteins, fiber, complex carbohydrates, B vitamins, and many other micronutrients while being low in fat and aiding in cholesterol management [8]. With renewed focus on human health, these innovative protein foods can also satisfy the local demand for tasty, cost effective, and convenient meals that utilise homegrown ingredients.

Food companies that want to evolve value-



added products using indigenous crops can solve for some core challenges faced by farmers and also help mitigate long term issues of climate change and human health.

Sustainability considerations notwithstanding, for consumers to accept plant-based foods as a viable alternative to their animal-sourced counterparts, these foods need to compete on the basis of cost, texture, flavour, and nutritional value. Protein-rich pulses could be solution to achieving this. Focused scientific approaches such as the screening of plants and the incorporation of modern processing techniques to enhance and deliver the functionality of animal proteins will be imperative to unlocking their potential.

Chickpea flour

Food By the Molecule

Food at its core is a mixture of macro- and micronutrients assembled in a certain manner to create a particular sensory experience, and animal-sourced products like meat, eggs, and dairy are no different. These macro- and micronutrients exist in plants too, and can be extracted with the help of modern technology and assembled in such a way to achieve the same sensory experience that animal products provide. There are meat, egg, and dairy analogues in the market right now that use plant-based proteins in this way, for example the BEYOND Burger (which uses the functionality of pea protein, rice protein and mung bean protein to replicate a meat burger) and JUST Egg (which uses the functionality of mung bean protein to replicate eggs).

It is important not to conflate today's plant-based meats with the traditional texturized vegetable protein used to make soya chunks, as the texture and flavour are dramatically different in modern plant-based meats. These products are optimized to give a texture and flavour very similar to the animal product they are replicating, whereas more traditional texturized vegetable protein is a generic product that, in fact, is sometimes used as a raw material in plant-based meat.

Unlocking the Potential of the Pulse

Of the variety of crops grown around the world, some of the most promising for use in plant-based meat, egg, and dairy products are pulses. This is largely due to their naturally high protein content (about twice the protein of cereal grains) which is key to creating products with the potential to perfectly match animal-sourced foods, including their nutritional and sensory attributes.

Protein is unique compared to other macronutrients such as carbohydrates and fats, not only because it contains nitrogen, but also due to the sheer diversity of molecular sequences and spatial conformations that exist. This diversity means that within a single food, which typically contains multiple types of protein, there exists a variety of amino acid sequences, ionic charges (polarity), and three-

dimensional shapes (tertiary structures) that can produce a range of effects in the food—all from the protein alone.

In meat, some of the most important proteins are actin, myosin, myoglobin, and collagen. Eggs contain a variety of proteins in the yolks, as well as in the whites, with some of the most significant being ovalbumin, conalbumin, and ovomucin. Casein and whey proteins are the main categories of proteins found in milk, within which are several specific proteins, each different enough to impact the food in different ways.

The effect that a protein has on a food can be described as a functional property. This includes aspects such as binding water, forming a gel, and emulsifying—all which influence the sensory experience of eating food. These protein effects can range from the moistness of a piece of chicken to the creaminess of yoghurt.

Like animal-sourced foods, pulses also contain a wide variety of proteins, especially proteins that fall in the categories of globulins and albumins. This means that pulses such as chickpeas, peas, and lentils naturally contain the building blocks needed to make plant-based meat, egg, and dairy products with the right properties to produce a realistic texture, taste, and appearance. To capitalize on the great potential of pulses, employing the right food technology processes is essential.

From Pulse to Plant-Based Meat with Food Technology

The journey from pulse to plant-based meat typically involves a series of processing steps that serve to concentrate the functional proteins contained within pulses and then form them into protein fibers resembling those found in meat. Various piece sizes and shapes can be produced from these fibers so that with the right seasonings added, you can have a plant-based meat ready to cook.

The first step consists of a standard dehulling and milling process to produce, for example, a chickpea flour. From here, an air classification step is used to separate the chickpea protein from the starch, based on differences in particle size and density. This is termed fractionation since the process results in two distinct fractions—the heavier, coarser starch fraction and the lighter, finer protein fraction (a protein concentrate). Another option is wet fractionation which, although more costly, can provide certain benefits over dry fractionation, including improved taste, colour, and protein purity.

To take the fullest advantage of the functional properties of the chickpea protein (which include water holding, fat absorption, emulsification, gelling, and more) further protein refinement is necessary. Processes such as ultrafiltration and isoelectric precipitation can be used to create a chickpea protein with up to 90% purity (a protein isolate).

With a high-protein pulse ingredient (such as a chickpea protein isolate) in-hand, the next step is to choose the right processing equipment. Extrusion is one of the widely used processes to convert plant proteins into fibrated meat-like products. By definition, extrusion is a technology platform that transforms native ingredient biopolymers (inputs) into a semi-solid, continuous fluid (output) using heat, shear, pressure, and moisture.

Extrusion is a common technology used in the commercial production of cereal, puffed snacks, and pastas, among other foods. Depending on the type of product and end use of the product, either low-moisture extrusion technology (which yields products with a moisture content less than 35%, such as cereal) or high moisture extrusion technology (for a higher moisture content, ranging from 40% to 70%) is used [9].

An image courtesy of CLEXTRAL showing fibrated plant based protein coming out of a twin screw extruder

High-moisture extrusion, which typically relies on the use of a twin-screw extruder, is responsible for a number of the high quality, next generation, plant-based meats that we see in the market today. Other ingredients, including starches, gums, fats, flavours, and colours, are often added (either pre-process, in-process, or post-process) to contribute to the desired meat-like appearance, texture and taste.

A considerable hurdle to this kind of innovation at the forefront of food product development is the availability of open-access or licenseable scientific information. Companies bringing plant-based meat products to market often need to internalize the majority of research and development costs, running into the millions of dollars. Increasing the availability of information detailing the genomic, agronomic, food science, and processing parameters needed to develop such products would therefore have a considerable effect on the availability of these products.

Market Success of Plant-Based Products

From U.S. meat producer Tyson to Nestlé of Switzerland, food companies are turning to protein from the yellow pea as the key ingredient for plant-based foods. The unprecedented success of companies like Beyond Meat (who uses protein from yellow peas) has resulted in increased demand for this crop, thereby providing jobs and business opportunities for processors in countries such as the United States and Canada. According to Henk Hoogenkamp, a protein technology adviser to food companies, pea protein consumption volumes have almost doubled to 275,000 tonnes from 2015. He expects the market to grow another 30% next year, rising to 580,000 tonnes in 2025 [10].

With processors already building stockpiles and supply dwindling, the global plant-based meat industry is now looking to expand their ingredient basket. Food companies are diversifying their products thus creating a huge white space opportunity for Indian players to become a sourcing hub and plug into this value chain. The halo effect is not stopping at just the yellow pea; France's Roquette is already considering foraying into fava beans as the boom in alternative proteins fuels demand for novel crop sources [10].

While burgers are the clear 'hero' products within the global plant-based meat industry, translating this trend for Indian consumers may mean applying it to fit into unique, local dishes like keema. Even McDonald's had to Indian-ise their offerings to succeed in the country! Online food delivery platform Swiggy reported that biryani topped their list as the most ordered dish for the third year in a row with 1.6 biryanis being sold every second on Swiggy in 2019 [11].

Buying and being 'Indian' can be seen as a winning brand proposition across geographies and income levels in the country. Food companies that can boast of the goodness of 'dal' in their plant-based meat offerings have a real chance to capture the market as young, millennial consumers increasingly favour local 'superfoods' and find pride in their heritage.

The future looks promising for plant-based meats made using pulses. Early consumer studies estimate that almost 63% of Indians (even higher than the United States) would like to try plant-based meat [12]. Surveys also find that local populations ascribe unique benefits to different pulse crops like immunity and digestive health to lentils and satiety to chickpeas—leaving opportunity to market each ingredient's special characteristics.

Looking Ahead: India's Role in the Future of Food

This is an exciting time for India, the world's largest producer and consumer of pulses, to take a natural leadership role in advancing product innovation in pulses. Building an ecosystem for the protein foods of the future is an opportunity that calls upon all segments of the food system.

While farmers provide the foundation, food distributors, processors, marketers, retailers, and foodservice providers all have vital roles to play in making alternative protein products a reality in India—and to facilitate the incorporation of plant-based meat, egg, and dairy products made from pulses into our favorite dishes as a nutritious, delicious, and sustainable choice.

Strengthening India's alternative protein ecosystem, especially regarding pulse protein research and the exploration of novel food technologies, is also an important opportunity to contribute to improving food and nutrition security around the world. In turn, this ecosystem has the potential to give a significant fillip to agriculture transformation in the country, by creating lucrative end markets for these indigenous crops.

In order to stimulate alternative protein product development utilizing a diverse array of inputs including pulses and millets, The Good Food Institute India houses an Indigenous Crops Initiative focused on making available open-access scientific information and technical advisory to entrepreneurs, large corporations, and governments. We will dive deeper into several of the business and technical topics mentioned in this article in future publications. Please reach out to The Good Food Institute India at india@gfi.org for any queries.

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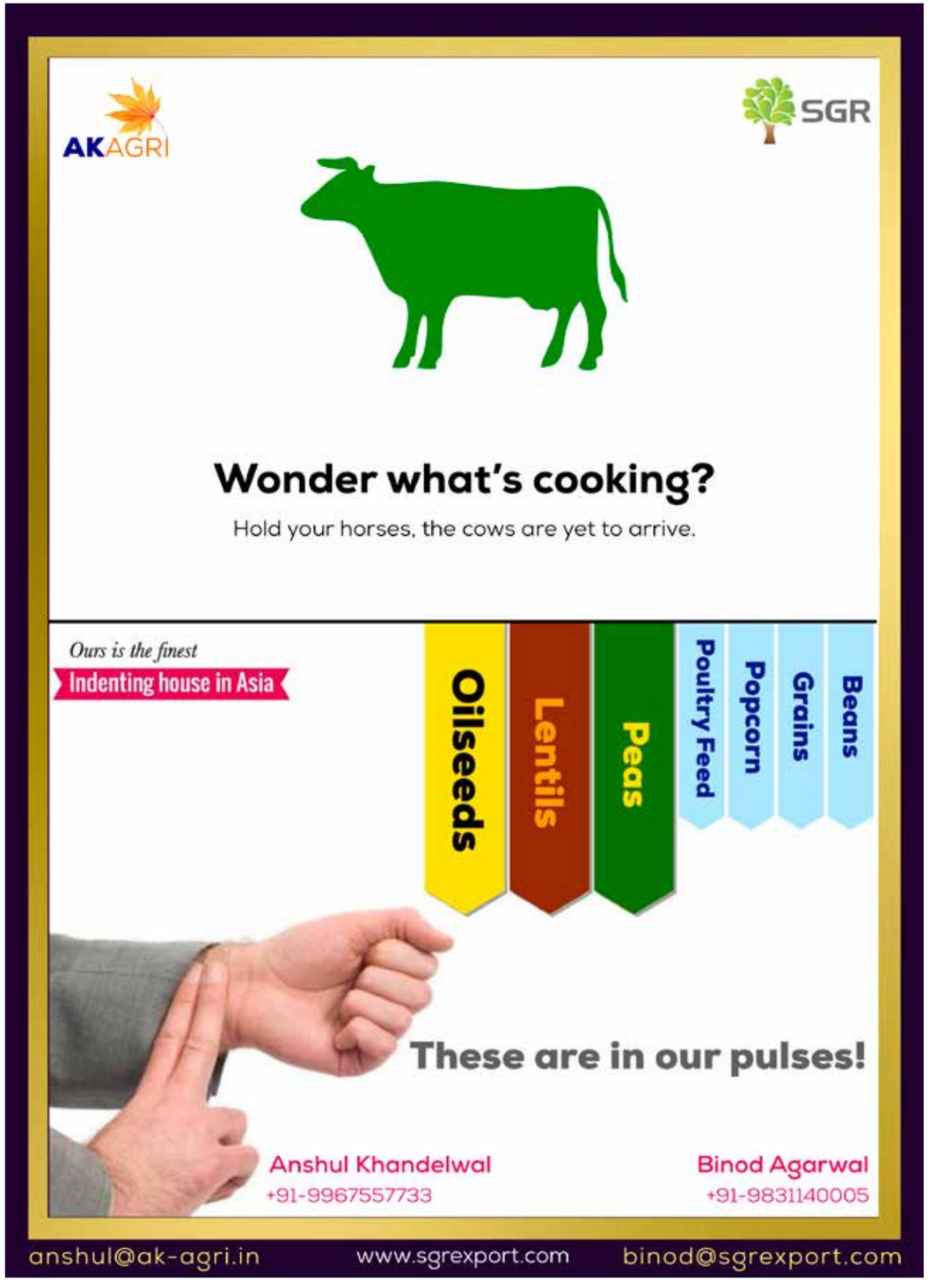

Global Pulse Markets Trending Upward

Brain Clancey
Stat Publishing

Production problems in many net exporting countries has changed the tone of international pulse markets, with prices for many commodities looking like the recent upward trend in prices will be maintained. That could be the case through at least this year's northern hemisphere harvests.

As was the case with India's kharif season crop, farmers in many parts of the world faced significant weather challenges this year.

Unusually dry conditions in Australia have been making headlines because of widespread bush fires. By contrast, farmers in India, Canada, the United States, and parts of Europe struggled with excess rain during planting.

The resulted in seeding delays not only increased the risks of poor weather during harvest, but in general, the later crops are seeded, the lower their yield potential.

This proved to the case with much of North America's pulse crop. Dry edible bean yields were around 22% lower on average than in 2018, chickpeas 7% lower, while pea yields slipped a modest 1%. By contrast, lentil yields for the Canadian and U.S. crops were 21% higher on average than in 2018.

India's pulse harvests are always controversial. Assertions that the government does not know how many farmers there are in country compounds the problem, with many market participants believing official crop estimates are overly optimistic.

There is an expectation the second advance estimates for the 2019-20 production cycle will show a massive drop in kharif season pulse output from last year. However, the losses in the summer crop could be more than offset by the rabi crop, which should benefit from the late withdrawal of the 2019 monsoon.

Assuming average yields for the rabi crop, total pulse production in India across its 2019-20 production cycle could reach 22.27 million metric tons, down from 23.4 million last year. The implication is not only that imports could decline during the 2020 calendar year, but there appears to be no incentive to moderate import policies for pulses.

Though India is no longer a key destination for peas and desi chickpeas, total pulse imports are currently averaging 2.5 million metric tons per calendar year. This is well below the average 5.3 million metric tons imported between 2013 and 2017. Demand should remain muted through the end of 2021, but there is a possibility import needs could start building again by 2022 unless there is continued expansion in that country's domestic output.

India's reduced presence on world markets has not resulted in an overall reduction in international trade in all classes of pulses. During the previous five years, global exports averaged just under 17.12 million metric tons per year. An estimated 16.23 million metric tons was exported last year and movement could reach 16.92 million metric tons in 2020.

A key change has been the trade tensions between China and the United States. Reduced purchases of U.S. origin soybeans prompted livestock feed manufacturers in the country to look for alternate products, resulting in a surge in demand for field peas.

After averaging around 860,000 metric tons per year, Canadian exports jumped to 1.89 million during the 2017-18 marketing campaign and 1.79 million last season, and are on pace to exceed last season's totals during its 2019-20 marketing campaign. Shipments to China between August and November topped one million metric tons, with product going to feed manufacturers, noodle makers, and fractionation plants.

A lot of attention was focussed on the spread of African swine fever in China and the steep reduction in hog numbers in the country. However, it appears most of the reduction was borne by small producers, while commercial operations faced fewer issues with the disease.

Unlike large scale, commercial hog operations, small producers do not generally use manufactured feed. As a result there has not been a significant change in demand for feed ingredients. This has helped sustain China's field pea imports, with feed manufacturers taking advantage of the fact peas contribute energy, protein and lysine.

Overall demand for lentils has also started the North American 2019-20 marketing year on a strong note. Worries about the kharif crop resulted in increased movement of lentils to India, where some millers using green lentils as a substitute for tur or pigeon pea.

Purchases by resellers in Turkey and the United Arab Emirates are also higher than was the case last year. Much of the product is destined for regional buyers, many of whom find it hard to buy directly from exporters in Canada or the United States.

Sanctions are a problem for some. Local economic problems are a problem in some countries, while widespread civil unrest and wars has reduced pulse production in many countries in northern Africa and the Middle East. Overall consumption is likely down from what was seen 10 to 15 years ago, but underlying import demand remains relatively strong.

Demand fundamentals are being helped by the fact there were significant problems with crop quality in Canada, the United States, and parts of Europe. A wet growing season delayed both seeding and harvest operations in many areas, resulted in problems with plant diseases and weathering.

Exporters do not seem to be having problems buying good quality product from farmers, though the prices they need to pay have been trending upward since the start of the marketing year. The reason is a lot of pulses were carried over from the 2018-19 marketing year.

In North America, residual stocks of lentils and chickpeas were well above the previous five year average. At the same time, the average quality of old crop lentils and chickpeas is better

than new crop, making it easier for exporters to fulfil sales contracts.

Quality issues are less obvious in peas because the industry is seeing good demand from both animal and human consumption markets. On the other hand, it is becoming more obvious in dry edible bean markets. Prices offered to farmers for most classes are trending upward as processors and exporters work to cover outstanding shipping commitments.

Dry edible bean markets are being helped by an ongoing fundamental shortage of domestic production in Mexico. Opening season exports from the United States to Mexico are up over last year, with processors confident demand will remain relatively strong through the balance of the 2019-20 marketing campaign.

One by-product of quality issues with the 2019 harvest is domestic disappearance could be higher than initially expected for most pulses. Farmers may divert the worst product into domestic livestock feed markets, But, the amount fed to livestock can only be inferred from stocks in all positions estimates because there is no statistical reporting in Canada or the United States.

Quantities of pulses used by the domestic food industry are also hard to estimate. Usage appears to be growing significantly. There has been a recent expansion in the fractionation capacity based on the market potential for protein from peas and other pulses. However, further expansion of that sector may be limited by difficulty developing demand for starch. Modern facilities are expensive and face significant challenges. Demand for pea fibre and starch is not growing as the same pace as pea protein. There is a belief global demand for pea protein isolates will quadruple by 2025, creating a bigger marketing challenge for starch and fiber.

This seems to be constraining expansion in Canada because it affects return-on-investment calculations and projected profitability. Modern plants easily cost $100 million or more, giving an advantage to global companies which also produce compound feeds. Plants breeders are trying to help by developing varieties with an average 28% protein and some companies are trying to drive farmers to focus on protein by offering premiums.

Fractionation demand is not significant relative to the quantity of pulses produced, but it increases competition for product from farmers. As competition to buy from farmers increases, the average price paid to farmers tends to also increase, ultimately affecting export asking prices.

Improved demand is expected to result in an overall reduction is residual stocks of pulses prior to the next harvest. The question is whether farmers will respond by increasing how much they plant this year.

Though trending upward, the average gross potential income from pulses is not as competitive with other crops as it has been in the past. This could change if farmers continue to see an upward trend in bids through February and March. Most already know how much land they will dedicate to pulses based on crop rotations. Depending on market signals in February and March, the amount of land used and how much of each type of pulse sown will be adjusted.

At the moment, it seems likely land in lentils will be little changed, while farmers could reduce land in peas and kabuli chickpeas, while planting more dry edible beans. Even so, supply and demand outlooks for the 2020-21 marketing campaigns in net exporting countries suggest prices for pulses could resume their upward trend after setting their harvest lows.

North-American Pulses							
Area (acres)	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**5-year aver**
Lentils	45,29,000	65,02,000	55,10,000	45,48,000	42,67,000	43,21,000	50,71,000
Peas	49,85,000	56,97,000	52,44,000	44,85,000	55,38,000	50,54,000	51,90,000
White Beans	4,02,000	3,41,000	4,01,000	3,56,000	3,75,000	4,03,000	3,75,000
Colored Beans	14,34,000	13,43,000	14,77,000	12,76,000	13,62,000	14,63,000	13,78,000
Chickpeas	3,31,000	4,87,000	8,35,000	13,06,000	8,43,000	5,30,000	7,60,000
Total	1,16,81,000	1,43,70,000	1,34,67,000	1,19,71,000	1,23,85,000	1,17,71,000	1,27,75,000
Production (MT)	2015	2016	2017	2018	2019	2020	5-year aver
Lentils	34,15,000	44,58,000	32,03,000	28,15,000	31,85,000	29,67,000	34,15,000
Peas	40,82,000	61,17,000	47,59,000	43,07,000	52,54,000	47,99,000	49,04,000
White Beans	3,52,000	2,95,000	3,77,000	3,67,000	2,99,000	3,63,000	3,38,000
Colored Beans	11,40,000	10,60,000	13,36,000	11,73,000	10,03,000	12,10,000	11,42,000
Chickpeas	2,04,000	3,43,000	4,41,000	8,92,000	5,35,000	3,47,000	4,83,000
Total	91,93,000	1,22,73,000	1,01,16,000	95,54,000	1,02,76,000	96,86,000	1,02,82,000
Carry In (MT)	2015	2016	2017	2018	2019	2020	5-year aver
Lentils	6,22,000	6,48,000	7,38,000	13,93,000	11,23,000	6,45,000	9,05,000
Peas	7,54,000	2,29,000	5,05,000	8,14,000	5,27,000	9,43,000	5,66,000
White Beans	60,000	40,000	30,000	63,000	82,000	45,000	55,000
Colored Beans	2,39,000	2,24,000	1,40,000	2,23,000	1,77,000	51,000	2,01,000
Chickpeas	2,06,000	73,999	38,000	72,300	4,30,000	4,60,000	1,64,000
Total	18,81,000	12,15,000	14,51,000	25,65,000	23,39,000	21,44,000	18,90,000
Supply (MT)	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**5-year aver**
Lentils	40,37,000	51,06,000	39,41,000	42,08,000	43,08,000	36,12,000	43,20,000
Peas	48,36,000	63,46,000	52,64,000	51,21,000	57,81,000	57,42,000	54,70,000
White Beans	4,12,000	3,35,000	4,07,000	4,30,000	3,81,000	4,08,000	3,93,000
Colored Beans	13,79,000	12,84,000	14,76,000	13,96,000	11,80,000	12,61,000	13,43,000
Chickpeas	4,10,000	4,16,999	4,79,000	9,64,300	9,65,000	8,07,000	6,47,000
Total	1,10,74,000	1,34,87,999	1,15,67,000	1,21,19,300	1,26,15,000	1,18,30,000	1,21,73,000
BASED on data from Statistics Canada and USDA.							

Global-Pulses							
Production	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	2,26,39,000	2,15,20,000	2,32,38,000	2,12,62,000	2,13,13,000	2,18,40,000	2,19,94,400
Chickpeas	1,06,51,095	1,11,09,323	1,35,56,102	1,62,89,000	1,38,08,800	1,43,20,800	1,30,82,864
Lentils	62,04,000	82,91,000	68,13,000	57,43,000	55,56,000	63,72,000	65,21,400
Peas	1,06,58,000	1,38,49,000	1,41,76,000	1,23,44,000	1,30,96,000	1,24,00,000	1,28,24,600
Total	5,01,52,095	5,47,69,323	5,77,83,102	5,56,38,000	5,37,73,800	5,49,32,800	5,44,23,264
Total Supply	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	2,37,41,000	2,23,01,000	2,44,72,000	2,29,25,000	2,23,93,000	2,32,31,000	2,31,66,400
Chickpeas	1,12,38,095	1,15,73,323	1,36,89,102	1,76,97,000	1,63,82,800	1,67,67,800	1,41,16,064
Lentils	67,80,000	86,39,000	73,63,000	69,54,000	64,63,000	67,82,000	72,39,800
Peas	1,15,08,000	1,41,19,000	1,47,56,000	1,33,04,000	1,37,26,000	1,35,10,000	1,34,82,600
Total	5,32,67,095	5,66,32,323	6,02,80,102	6,08,80,000	5,89,64,800	6,02,90,800	5,80,04,864
Trade	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	49,40,000	53,36,000	52,89,000	52,86,000	44,46,000	46,85,000	50,59,400
Chickpeas	24,46,000	25,02,000	31,53,000	20,43,000	18,85,000	23,20,000	24,05,800
Lentils	35,68,000	32,12,000	35,62,000	31,44,000	30,95,000	32,85,000	33,16,200
Peas	52,80,000	62,00,000	69,00,000	64,50,000	68,00,000	66,30,000	63,26,000
Total	1,62,34,000	1,72,50,000	1,89,04,000	1,69,23,000	1,62,26,000	1,69,20,000	1,71,07,400
Inferred Use	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	2,29,60,000	2,10,67,000	2,28,09,000	2,18,45,000	2,10,02,000	2,19,67,000	2,19,36,600
Chickpeas	1,07,74,095	1,14,40,323	1,22,81,102	1,51,23,000	1,39,35,800	1,49,92,800	1,27,10,864
Lentils	64,32,000	80,89,000	61,52,000	60,47,000	60,53,000	65,76,000	65,54,600
Peas	1,12,38,000	1,35,39,000	1,37,96,000	1,26,74,000	1,26,16,000	1,26,20,000	1,27,72,600
Total	5,14,04,095	5,41,35,323	5,50,38,102	5,56,89,000	5,36,06,800	5,61,55,800	5,39,74,664
Ending Stocks	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	7,81,000	12,34,000	16,63,000	10,80,000	13,91,000	12,64,000	12,29,800
Chickpeas	4,64,000	1,33,000	14,08,000	25,74,000	24,47,000	17,75,000	14,05,200
Lentils	3,48,000	5,50,000	12,11,000	9,07,000	4,10,000	2,06,000	6,85,200
Peas	2,70,000	5,80,000	9,60,000	6,30,000	11,10,000	8,90,000	7,10,000
Total	18,63,000	24,97,000	52,42,000	51,91,000	53,58,000	41,35,000	40,30,200
Stocks to Use	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Beans	3%	6%	7%	5%	7%	6%	5%
Chickpeas	4%	1%	11%	17%	18%	12%	8%
Lentils	5%	7%	20%	15%	7%	3%	11%
Peas	2%	4%	7%	5%	9%	7%	5%
Total	4%	5%	10%	9%	10%	7%	7%

NEED to Eliminate Pulses Import & Export Restrictions

Rahul Chauhan
IGrain India Pvt. Ltd.

As we all are well aware of the fact that India is the leading producer and consumer as well as importer of pulses in the world. India has vast land for the production of pulses but majority of land lies in rain-fed areas. Due to use of old traditional farming pulses productivity is lesser than the world average. Although, recently domestic production of pulses has improved significantly and at one stage self-sufficiency was attained, but due to vagaries of weather, production of pulses remains uneven. As a result, supply of the legumes with respect to requirement dis-balanced and a need of import rose.

India plays a vital role in pulses international market for many years. Earlier Indian government was not interfering import because domestic production was not enough to fulfil demand. But export of pulses from India was subject to government's prior approval. Now, scenario changed completely. Union government is amending the import-export policy for agri-products and particularly for pulses on regular basis to control prices.

No doubt, consumption of protein rich pulses is the easiest way to stop mal-nutrition among children and women. Therefore, in rural areas pulses must be provided at cheaper rate as well as in sufficient quantity. When domestic production doesn't seem to be enough, we must raise import with in time. Further if production is enough and prices are down, India should not hesitate to open the export platform. India needs a consistent import-export policy for pulses without any quantative as well as duty related restriction.

India imported 22.51 lakh tonne of pulses in first eight months of the financial year 2019-20 (April-November) which is 47.12% more than the corresponding period of previous year's import of 15.30 lakh tonne. Import was on higher side as kharif productions considered being on lower side as compare to consumption. Currently, Government has restricted import of pulses. Import quantity fixed for financial year (April-March) seems unmatchable. Restriction on Pulses should be raised immediately along with enhanced time period. This is the need of the hour.

Sowing of Rabi pulses is almost over. Total area under Rabi pulses has increased to 157.33 lakh hectare which is 7.80 lakh hectare above from 149.53 lakh hectare recorded in the corresponding period last year. Sowing report indicated that the most important Rabi pulses-Gram (Chana) has a major chunk in planting area. Total coverage of Gram went up to 105.35 lakh hectare from the last year's figure of 95.44 lakh hectare.

Though sowing of lentil (Masur), fieldpea (Matar) and green gram (Mung) has decreased from last year but black matpe (Urad) sowing has increased. Higher sowing area reported from Maharashtra, Rajasthan, Gujarat and Chhatisgarh, but other state like Madhy Pradesh, Andhra Pradesh and Karnataka are reduced or noticeable.

According to government estimates, area of lentil has come down to 15.95 lakh hectare last year. Likewise, coverage of fieldpea decreased 9.55 lakh hectare from 10.40 lakh hectare, Kulthi 5.10 lakh hectare from 5.35 lakh hectare

and moong 5.35 lakh hectare from 5.55 lakh hectare. On the other hand, area of urad has increased from 6.95 lakh hectare to 7.10 lakh hectare. More importantly, climatic conditions are favourable for the crop due to rains on December and January. Favourable weather raises hope of a better production, especially for chana and urad.

In kharif season, urad crop was severely affected on large scale in leading productive state-Madhya Pradesh. Other states too reported loss in urad as well as moong production due to unfavourable weather. South West monsoon Rains were well above average and continued on standing crops ready to harvest. More rains caused flood in many area and farmers were unable to enter in field to harvest srops. Urad production is expected less than half and Mung 30% of previous kharif season.

The loss in production resulted supply crunch in domestic market and prices started surging. Government initially fixed only 1.50 lakh tonne import quota each for Tur, Urad, Peas & Mung for entire financial year till 31 Oct 2019 with condition that only Dal Millers and processors can apply for imports. Later Tur and Urad import quota increased. The restriction on Pulses import did not provide much relief to consumers. Higher demand and less availability of pulses particularly urad the prices rose remarkably. The Government was unable to realise actual conditions well in time and somehow when new decision to import additional 2.5 lakh ton by 31.03.2020 was made-it was too late. Presently stock of the pulses in main exporting country i.e. Myanmar is not enough to finish India's pulses appetite.

Import of pulses does harm farmers but government raises minimum support price (MSP) gives some relief every year. When prices go below MSP Government steps in and reprocured directly from farmers. On the other hand, if government allows free export of pulses it will certainly beneficial for farmers and they may get remunerative returns. No doubt, government should have rules and policies which should be changed as per market need so that producers can be benefitted. The global pulse market scenario is changing dramatically and more frequently. Government should amend trade policies accordingly. There are other pulses consuming countries in Asia and world which can import pulses from India. Why we are not catering these markets?

Indian farmers are known for hard labour and low income. When they lose crops their financially conditions get worsen. Domestic consumption of pulses is rising every year but productivity is unstable. A free import-export policy may provide some stability in the market and consumers too.

For a healthy market/business, government responsibility is to maintain a balance between the interest of produces & consumers. India imports pulses from many countries like Canada, Myanmar, Australia, Ukraine, Russia and some African countries. India can export pulses to many countries too like Nepal, Bangladesh, Sri Lanka, Gulf countries.

India's per hector productivity is least in world and we need to increase pulses production at par with world. This would open the door for export. Farmers should be encouraged for higher production and government needs to step in by providing latest high yield seeds, new technologies, increasing area under irrigation, conservation of ground water.

Import is also essential to maintain balance between demand and supply. India's protein requirement is mostly fulfilled by pulses. There should be enough stock in the country to use if the crops gets damage but it should be sold at attractive/affordable price.

For win-win situations government should eliminate import-export restrictions and should focus on improving production.

East Africa - Emerging Source of Pulses

Dharmendra Rao Pothuri
Head, Agri- Business, Supporting India's Trade Preferences for Africa - SITA

Growing importance of pulses positions them towards achieving three developmental goals – reducing poverty, improving human health and nutrition and enhancing ecosystem resilience. The United Nations General Assembly passed and adopted a resolution during its 68th session, declaring 2016 as the International Year of the Pulse. This was to heighten public awareness on the nutritional benefits of pulses; and to include it in sustainable food production systems. This action has resulted in boosting the Pulses sector globally and enhanced interest across stakeholder groups.

Opportunities in Pulses Trade

As per 2017 estimates, around 96 Million 1 MT of pulses are produced globally. Nearly 84% of the pulses produced are used/ consumed in origin markets, while the remaining 16% is exported. International trade in pulses has grown significantly, from US$ 3.4 billion in 2001 to US$ 13.4 billion in 2017 2

Top 6 Exporting Countries in the World (*MMT*)	
Canada	5.0
Australia	1.4
Myanmar	1.3
USA	1.1
China	0.8
Africa (6 Countries) **#**	**0.7**
Top 6 Importing Countries in the World *(MMT)*	
India	3.8
China	1.1
Bangladesh	0.8
Pakistan	0.4
Egypt	0.4
UAE	0.4

Table 1: Top Pulses Exporting and Importing Countries in the world
Source:https://www.millermagazine.com/english/world-grain-and-pulses-market-2/.html
6 Countries include Ethiopia, Uganda, Kenya, Tanzania, Mozambique and Malawi
MMT: Million Metric Tons

India Domestic Pulses Production and Trade *(MMT)*			
Fiscal Year	**Production**	**Imports**	**Exports**
2007-08	14.80	2.00	0.34
2008-09	14.60	2.90	0.22
2009-10	14.70	3.60	0.26
2010-11	18.20	2.60	0.21
2011-12	17.20	3.30	0.17
2012-13	18.30	3.80	0.20
2013-14	19.80	3.70	0.35
2014-15	17.20	4.60	0.22
2015-16	16.50	5.80	0.26
2016-17	23.13	6.60	0.14
2017-18	23.95	5.65	0.18
2018-19	24.02	2.53	0.29

Table 2: India domestic pulses production, import and export data
Source: 1. Directorate of Economics and Statistics (DES), Government of India
2. Agricultural & Processed Food Products Export Development Authority, Ministry of Commerce & Industry, Government of India
MMT: Million Metric Tons

Pulses production in India, which was stagnant until 2010, started growing as a result of interventions from the country's Ministry of Agriculture. As there was huge shortfall in the supply of pulses in the domestic Indian market, between 2007 and 2010 (Refer Table 2), Government of India encouraged the imports from various countries which turned the focus of African traders and farmers on pulses exports to India. Exports from Africa that were insignificant prior to 2010 started increasing and touched 360,000 MT in 2011-12; and continued its growth trajectory (Refer Table 3). India's source markets for pulses are currently largely concentrated in Eastern and Southern Africa with Tanzania and Mozambique, accounting for over 60 percent of Africa's exports to India. Other suppliers include Ethiopia, Malawi, South Africa and Madagascar. The export potential for African origin pulses to India is estimated at over US$538 million, currently dominated by Eastern African suppliers providing US$522 million of product3. Global financial crisis in 2008 led to gloomy situation in international trade and opening up of pulses trade was a boon for many developing African countries. The traditional pattern of international trade and exports which is generally skewed towards developed economies, has shifted to a growing South–South trade relationship. African pulses exports to India has added to the rapidly expanding trade and investment relationship between India and Africa which attests to this dynamic change 3

Export of Pulses from East Africa to India *(MT)*

Pulses	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Pigeon Peas	189,000	235,900	282,360	312,900	394,521	231,800	185,800	217,640
Mung Beans	47,800	98,700	90,800	99,700	158,700	95,238	87,800	94,200
Chick Peas	49,500	39,960	41,580	66,060	76,520	57,500	68,200	75,600
Other Beans	74,800	134,320	119,090	58,630	54,050	81,535	81,000	105,500
Total	361,100	508,880	533,830	537,290	683,791	466,073	422,800	492,940

Table 3: Export of Pulses from 6 African Countries to India (6 African countries are Tanzania, Kenya, Uganda, Ethiopia, Malawi and Mozambique)
Other Beans include different forms of Kidney beans, Special beans and Cowpeas
Source: https://www.theigc.org/wp-content/uploads/2018/08/Jorrit-and-da-Cruz-2017-final-paper.pdf
Ethiopian Revenue and Customs Authority
Pulses industry Stakeholder interviews
MT: Metric Tons

East African countries that have tried pulses trade with India, projected Pulses as lucrative alternative to other existing commercial crops and started developing and adopting best practices with the help of various governmental and non-governmental organizations. Many Governments started pushing farmers and even promoted special programmes like "Ndengu Revolution" 4&5 (Green gram Revolution), in Kitui County of Kenya, declaring pulses as Elixir – Solution for all farmers' problems. On the back of encouraging results from exports to India, African pulses exporters have ventured in to other destinations including Pakistan, China, UAE, USA and Europe. East African countries opened export of kidney beans, sugar beans and green gram to Pakistan, UAE and China. Processed Pigeon Peas (Tur Dal) is being exported to some European Countries and USA. All these export markets provide relatively stable and reliable opportunities for African pulses.

Uncertainties

Indian imports increased from 2.0 Million MT is 2008 to peak at 6.6 Million MT in 2016-17 (Refer Table No2). The African exports to India steadily increased to a peak of 683,000 MT in 2015-16 (Refer Table No3) before Indian Government imposed quantity restrictions on imports in the same year.

In 2016-17, India harvested a record crop of 23.13 Million MT, but the policy of unrestricted duty-free import continued until August 2017 by which time traders had already imported nearly 4 Million MT. This led to a glut resulting in domestic prices crashing. Some of the other interventions from Indian Government like imposition of stock limits and seizure of excess pulses stocks from trade channels triggered uncertainty in the Indian pulses industry. Domestic price collapse and agitation by Indian farmers forced the Indian government to impose controls on imports through trade route and tariff route from 2017-18. This led to uncertainty in global pulses demand and many exporting countries like Canada, Australia, Myanmar, Tanzania and Mozambique had to scramble for alternate markets which does not exist and these countries had to re-assess their short term and long-term pulses strategy.

Indian government's sudden decision to restrict pulse imports came at the point when Pigeon Pea and Chick peas farmers in Tanzania were ready to harvest their crop and Mozambique farmers were busy accessing the crop size and ready to sign the commercial forward contracts with Indian buyers. Farmgate prices nosedived and reached historical low of 10 years as there was no alternate buyer for these products. Some of the countries tried to put diplomatic pressure on India to remove the import restrictions and some countries even contemplated pulling India to WTO and International courts.

The Future

Positive side of so-called obstacles and uncertainty in pulses sector are: A) higher pulses consumption in Eastern Africa, B) increase in Intra-African Pulses Trade and C) investments in local processing facilities that can cater to buyer requirements in Europe and America.

Mozambique emerged as the biggest gainer

through an Inter-Governmental contract with India for supply of pigeon peas. Similar MOUs with other East African countries like Tanzania, Uganda, Kenya and Ethiopia can boost the pulses sector and can provide India with buffer stocks. This would be possible only if East African pulses sector competitiveness is increased through planned and structured interventions.

While India has resorted to protectionism, it is important to understand that pulses production is vulnerable to rainfall pattern and setback in pulses crop can come any time soon. If a setback happens and the so-called buffer stock of pulses is exhausted then India should be in a position to entice the east African trade partners to fulfill the shortfall. East African trade partners are not only prepared and looking forward for any long-term trade agreements with India, but also are gearing up for next pulses revolution by developing the competitiveness of sector.

Supporting Indian Trade and Investment for Africa (SITA) 6, an initiative of the International Trade Centre (ITC), funded by the United Kingdom, is working with the East African pulses sector. SITA focuses on increasing and diversifying exports from Africa; and attracting investments as a vehicle to promote value addition among producers and processors in Ethiopia, Kenya, Tanzania and Uganda. SITA also helped training producers and processors on enhancing quality standards. The results thus far have been trade worth more than Usd 30 million between East African exporters and Indian buyers.

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