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PULSE INDIA

AN INDIA PULSES AND GRAINS ASSOCIATION PUBLICATION

PIGEON PEA SPECIAL ISSUE

- Pigeon Pea Country outlook
- Pigeon Pea Research For Enhancing Crop Productivity
- African Pulses Market Update For 2017
- Canadian Peas Face Challenges, But See Opportunities

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From the Chairman's Desk

Dear friends,

India, for the first time ever, crossed the 20 million mark (22.95 million tons, to be precise) in pulses production in the year 2016-17 on the back of an excellent monsoon and high retail prices of pulses. Monsoon this year too has been favourable and as per the first advance estimates released by the Ministry of Agriculture, is expected to reach 22.90 million tons for the year 2017-18. If achieved, it will indeed be an amazing achievement for the country and a strong positive step to reach the Hon'ble Prime Minister's goal of doubling farmers incomes by the year 2022.

The Government has supported this exemplary production record by taking additional steps to ensure price support for the farmers. These have included the first ever procurement of 2 million tons of pulses, imposing quantitative restrictions on imports of Tur, Mung and Urad and most importantly, opening exports of all kinds of pulses. These steps, we also believe, will help boost the farmer's confidence, improve his earnings and incentivize him to grow more pulses. And the net effect of all this will be India gaining self-sufficiency in pulses.

Another critical factor that affects the pulses production in India is the dependency on monsoons. If two good monsoons can push the production over 22 million tons, imagine what can be achieved if the pulse producing regions are irrigated! India can change from being a net importer to a net exporter. Remember, we have over 26 million ha – the largest parcel of land under pulses cultivation in the world.

However, much more needs to be done to support this. While focusing on the farmer's well-being is important, one cannot ignore the nutritional deficiency that the nation faces. While WHO recommends 68 gms per capita consumption of pulses, India averages just around 38 gms per capita consumption.

It is important that pulses be introduced in the PDS as a Central Government initiative rather than leave it to the State Governments to decide and implement. This will not just make pulses affordable for the on-or-below-the-poverty-line population but also become a huge incentive for farmers to grow pulses in a focused manner.

In a nut-shell, IPGA's attempts are now focused on engaging with the Government to include pulses into the PDS, launch a massive irrigation drive in pulse producing states, create a pulse mills modernization fund to boost the milling sector. All these changes together will put India's agri-economy, nutritional security as well as the trade on a healthy growth path.

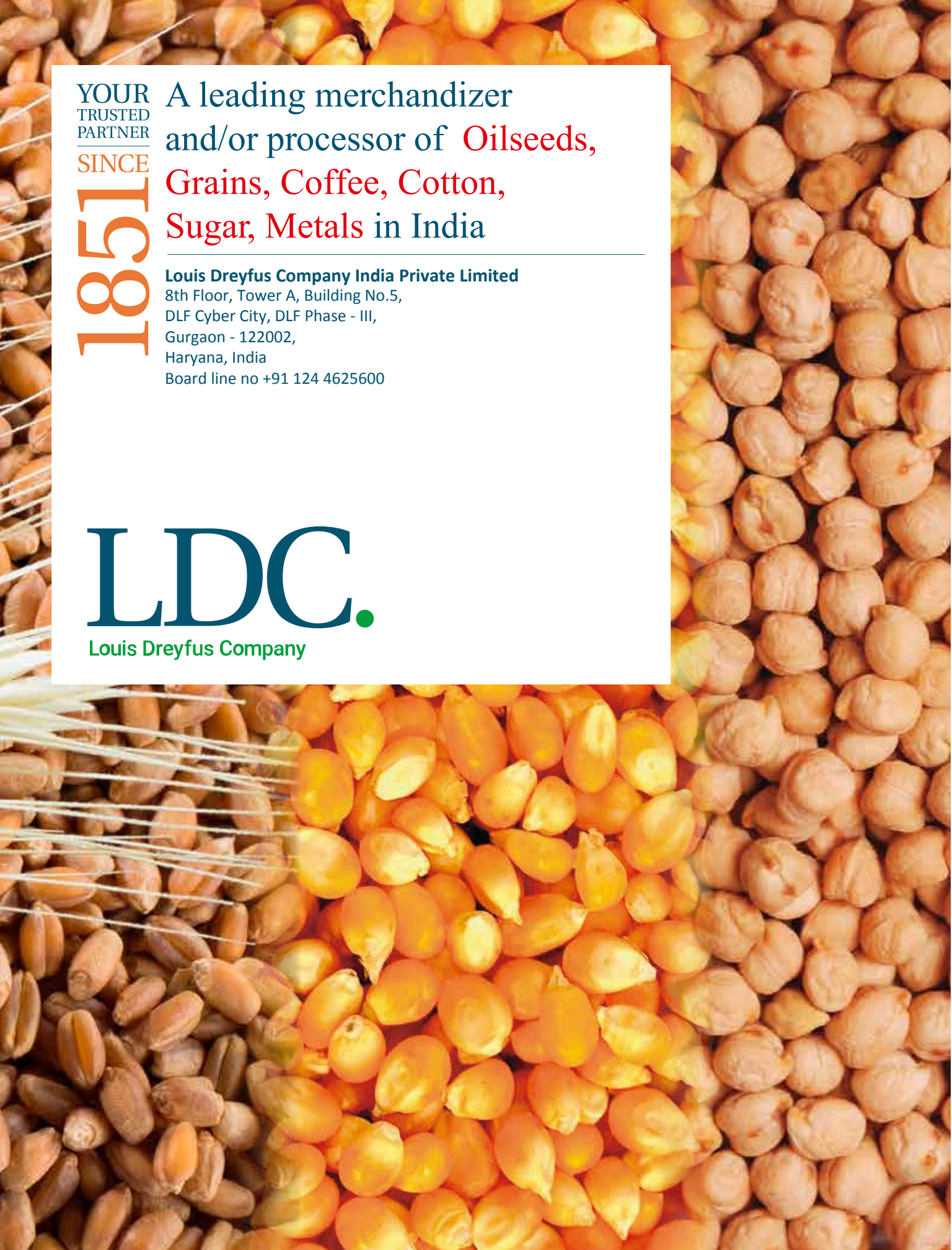
On the other hand, IPGA's preparations for THE PULSES CONCLAVE are in progress and registrations are on in full swing. We are expecting over 1500 delegates to participate in the 2018 Conclave and with exports opening, we are anticipating buyers to attend this Conclave and add a completely new dimension to the proceedings.

Visit our website www.thepulsesconclave.in and register yourselves today!

I, along with our Committee Members, look forward to welcoming you at The Pulses Conclave 2018 in New Delhi.

Warm regards.

Pravin Dongre
CHAIRMAN
India Pulses and Grains Association



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Contents

Special Section: Pigeon Peas

6 Current Scenario of Pigeon Peas and Future Prospects by Navin Nandu

7 Pigeon Peas (Toor Whole) Myanmar Outlook by Shyam Narsaria

8 Pigeon pea Research For Enhancing Crop Productivity by ICRISAT, ICAR & IIPR

11 Pigeon Pea: Technological And Nutritional Aspects by NIFTEM

16 Pigeon Pea Recipes

Country Outlook

18 African Pulses Market Update For 2017 by Bharat Kulkarni

20 Canadian Peas Face Challenges, But See Opportunities by Phil Franz Warkentin

General Article

22 Pulses – Significance and Opportunities by Azza Silotry Naik

Research

24 IPGA Pulses Import Statistics August - September 2016 - 2017

Events

26 B2B meeting session with pulse producers and seed companies from Argentina by Suhas Prabhu

Trade

28 1st Advance Estimates of Production of Food Grains for 2017-18

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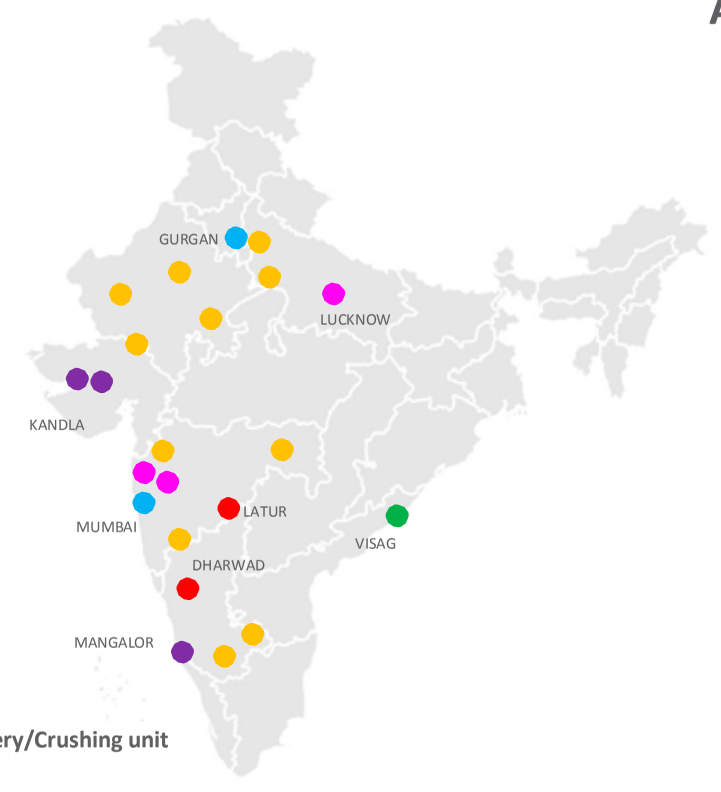

- Refinery/Crushing unit
- HO
- Tolling unit
- Depots
- Warehouse
- Flavors, mint oil, beverage solution

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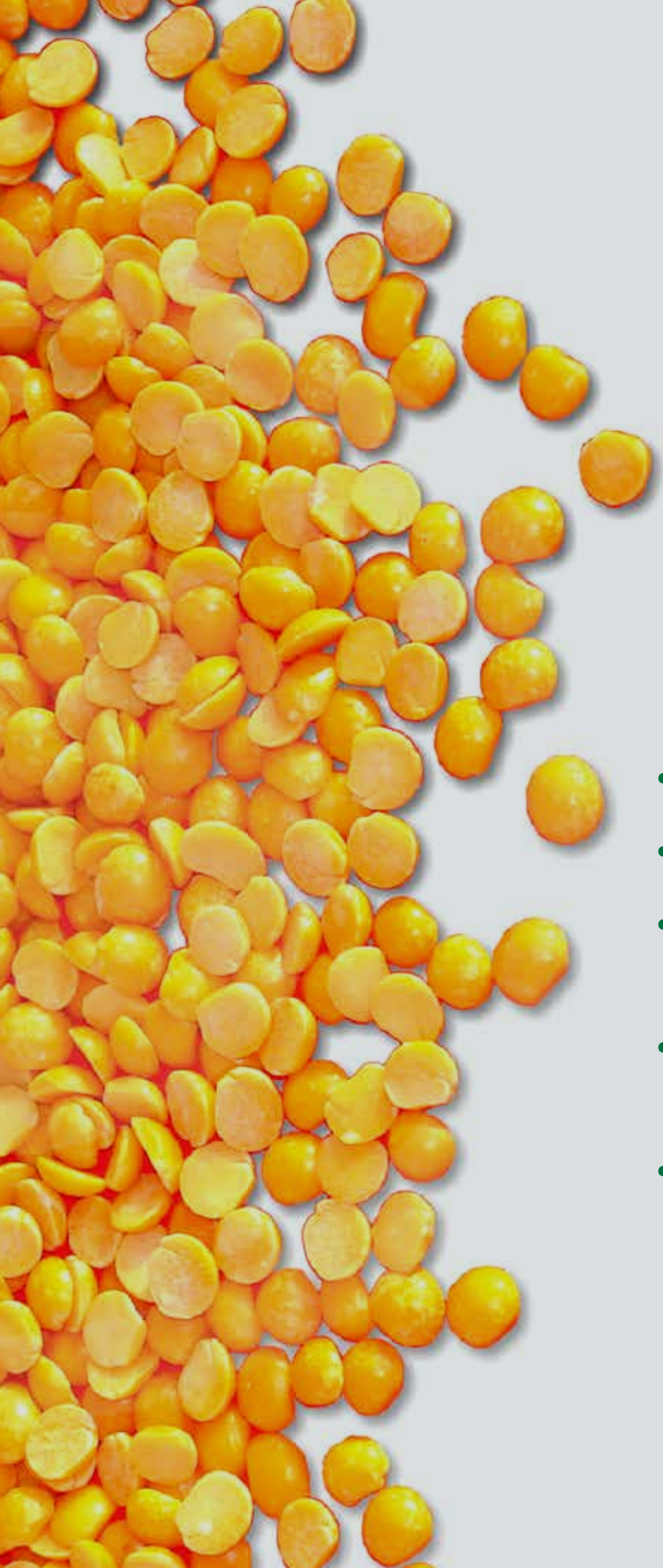

Special Section **Pigeon Peas**

- India Outlook
- Myanmar Outlook
- Pigeon pea Research For Enhancing Crop Productivity
- Pigeon Pea: Technological And Nutritional Aspects
- Pigeon Peas Recipes

Current Scenario of Pigeon Peas and Future Prospects

Navin Nandu
Lalji Hirji and Sons

Production and Consumption

Toor dal is one of the common dals in an Indian house hold and the average yearly consumption of Toor in India is estimated between 27-30 lakh tonnes. In the last year, the domestic Toor production has been between 38-40 lakh tonnes and the import has been close to 5 lakh tonnes. This year the projected production is between 30-32 lakh tonnes and the rest of the demand for this pulse will be fulfilled by the buffer stock maintained by the government for price stabilization, by utilizing approximately 7.5 to 8 Lakh tonnes in a span of 3 or 4 months.

Current Scenario

The domestically produced Desi Toor is currently priced between INR 38-40 per kg. The imported varieties of Toor available is the Burmese Lemon which is priced around INR 38 per kg and the Africa variety priced at INR 30-33 per kg. The Government as of now has acquired a stock of 12-13 lakh tonnes which includes stock with Central and State Government as well as all Government agencies like NAFED, MMTC, etc. This stock comprises Desi Toor procured during current season at MSP as well as imported Toor procured by Government agencies through tenders.

Reasons for Reduction in Pulse Prices

There are a few reasons for the reduction in pipeline inventory in the value-chain of which constant recession is one of the key reasons due to which Wholesaler, Miller and Retailer are running hand to mouth as prices are falling on a daily basis causing heavy losses in the past 2 years. There has also been some uncertainty in Government policy with respect to Import duty, Restriction on import, MOU with certain countries to facilitate import and GST implementation. These reasons seem to contribute to millers and processors putting a stop on operations or reduced production capacity which then reduces the pipeline stock. Government trying to sell buffer stocks in open market by tender at a reduced price may also put additional pressure on the market price.

Role of the Government

Government can only buy a portion of the total crop from the farmer to support the market; however majority of the crop has to be sold in the open market in order to sustain other elements of the value-chain. As per the current situation, farmers may not be ready to sell the stock to Government agencies and prefer the open market even at discounted rates due to hindrances.

Some Suggestions

As members of the trade, we suggest that the Government stop selling buffer stocks in open market which will support increase in prices in the coming months till the new crop arrives. Once the prices reach close to MSP, farmers will automatically sell in the open market putting less pressure on the government agencies. The MSP should be flexible and dependent on the yield as well as other various factors. It is essential that the procurement by the government agencies is more transparent and farmers get the prices they deserve.

Another option that can be explored is to have co-operative societies for a group of 5-7 villages where farmers can sell their produce and data for statistics can also be collected. We hope that Government should support other elements of the value chain such as Wholesalers, Retailers, Millers and Processors as they play a crucial role of supplying the goods from the farmer to the end consumer.

Pigeon Peas (Toor Whole) Myanmar Outlook

Shyam Narsaria
CEO, Arvee International Pte Ltd.

The Myanmar pulses market was sent into disarray on August 21, when the Foreign Trade Department under the Indian Ministry of Commerce and Industry said it had limited the import of black beans and mung beans into India to 300,000 tonnes per fiscal year. That came after the same department announced a 200,000-tonne import limit on pigeon peas on August 5. There have been no such restrictions in the past.

The severe restriction by India limiting the amount of Pulses products from Myanmar has quickly and adversely affected the Myanmar pulses market. The restriction would help support prices of Pulses in India but would put pressure on producers in Myanmar who rely heavily on export to India.

After that, Myanmar is examining ways to expand and re-classify Myanmar's pulses destined for export. Myanmar is also trying to solve the present problems; many ways are being sought. But the damage to the Myanmar market is done, and exposed the weaknesses of the pulses market. Now, concerns among local traders over the potential collapse of the local pulses and bean market are mounting.

> "We would like to contribute to Myanmar's development efforts as part of our 'Sabka Saath Sabka Vikas' initiative."

Because of this restriction, not only will the farmers and factory workers be affected, but also more than hundreds of thousands of people who make a living by providing services along the pulses and bean supply chain.

"The whole supply chain could break down and many businesses will suffer losses. That's why Myanmar Farmers are voicing their concerns and all the merchants are feeling nervous." Myanmar Toor Whole is being hard hit by the Quantitative Restriction in India. As almost 98% of Toor Whole exported from Myanmar is to India. On August 5 the stock of Toor Whole was around 125000 MT and the sowing for the next harvest which is expected to be

250000MT was almost finished is due in December 2017. The current price for Toor Whole is USD 250 FOB (Nov 2017) Yangon port which was USD 750 FOB (Nov 2016) Same time last year.

After the recent visit on 6th Sep 2017 by Hon Prime Minister of India Sri Narendra Modi where he said, "We would like to contribute to Myanmar's development efforts as part of our 'Sabka Saath Sabka Vikas' initiative." Myanmar farmers are still hopeful.

Now is the time for The Indian counterpart to decide whether they still consider Myanmar farmers as friends forever!

Pigeonpea Research For Enhancing Crop Productivity

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The pulses requirement for the year 2030 has been estimated at 32 million tons and by year 2050 at 50 million tons. In order to meet this requirement, additional 3 to 5 million hectares need to be brought under pulse cultivation and productivity has to be increased besides reducing post-harvest losses (Vision 2050: Indian Institute of Pulses Research, 2013, www.iipr.res.in). In this direction pigeonpea (Cajanus cajan) also known as poor man's meat holds the promise to uplift the pulse production in India if genetic yield potential of this crop fully exploited. In addition to the main use of pigeonpea as de-hulled split peas (Dhal), immature green seeds and pods are also consumed fresh as a green vegetable. It's crushed dry seeds are also serving as feed to animals while the green leaves form a quality fodder. In rural areas, dry stems of pigeonpea are used for fuel. In single cropping season, pigeonpea plants fix 40 kg ha-1 atmospheric nitrogen (Kumar Rao et al. 1983) and add valuable organic matter to the soil through fallen leaves. Its roots help in releasing soil-bound phosphorus to make it available for plant growth (Ae et al. 1990). The average yield of pigeonpea in India is currently 695 kg ha-1 significantly below its potential of around 3-4t ha-1 (Mula and Saxena 2010). The estimated globally-sown pigeonpea area now stands at over 7.03 m ha, with a production of 4.89 m t and average yield of 695 kg/ha (FAOSTAT, 2017). The crop is well adapted to rainfed areas of India (5.60 m ha), Myanmar (0.6 m ha), Kenya (0.28), and Tanzania (0.25 m ha) and is intercropped either with cereals such as sorghum (Sorghum bicolor), pearl millet (Pennisetum glaucum) and maize (Zea mays) or legumes like soybean (Glycine max), mung bean (Vigna radiata) and urd (urad) bean (Vigna mungo). Few countries in(the) South American region and Caribbean islands also have(a/the) considerable area under pigeonpea production.

The genetic improvement of pigeonpea initiated in 1919 at the University of Hawaii. This program released the fodder variety 'New Era' (Morton et al. 1982). However, this program could survive for a decade and abounded due to introduction of more efficient forage legumes. Similarly, pigeonpea breeding programs in Australia, Malaysia, and Nigeria were also short-lived and failed to create an impact on the total production and average productivity world-wide. As compared to other countries pigeonpea improvement program in India are extensive. The first structured pigeonpea breeding effort in India was made by Shaw (1933) who described morphological and agronomic traits of 86 elite field collections. Almost at the same time, Mahata and Dave (1931) identified a few elite early and late maturing high yielding types. However, these efforts were just focusing on evaluation of field collection and had no significant impact on productivity. Considering the importance of pigeonpea in India, Indian Council of Agricultural Research (ICAR) started an All India Coordinated Pigeonpea Improvement Project in 1965. Under this mega program, crop improvement activities were simultaneously launched at 31 research centres in diverse agro-ecological zones (Ramanujam and Singh 1981). In 1972, CGIAR, an international body established ICRISAT with a global mandate of crop improvement of select dryland crops. ICRISAT started working globally as well as with ICAR and other partners in India and the actual breeding program in pigeonpea at ICRISAT started in 1974. ICRISAT and ICAR have been working very closely for more than 40 years. So far from these efforts ~100 varieties have been released. The impact of these efforts has been impressive with 56% increase in area and 54% increase in total grain production, however, it could not achieve the maximum yield potential of the crop. Further ICRISAT and ICAR are working in the direction of cytoplasmic male-sterility based hybrids and could achieve >40% yield advantage over checks (Saxena 2015).

Narrow genetic base in the cultivated pigeonpea and complex nature of abiotic and biotic stresses are the main causing elements in yield stagnation of pigeonpea which is less than 1 t ha-1 for several decades. The evolution of genomics and particularly genomics-assisted breeding (GAB) in early 21st century demonstrated enhanced yields in cereals like rice by minimizing losses due to biotic and abiotic stresses (Varshney et al. 2005, 2007). However, for deploying GAB, genomic resources are required and they were not available until 2005 in the pigeonpea crop. In the last decade the concerted efforts in

consortium mode has transformed pigeonpea from "orphan crop" to "genomics resources rich crop" (please see Pazhamala et al. 2015). The development and application of genomics information particularly DNA markers and draft genome represent major achievements in recent years (Saxena et al. 2016; Varshney et al. 2012). In the draft genome, a total of 48,680 genes were predicted and also showed the potential role that certain gene families, for example, drought tolerance–related genes, have played throughout the domestication of pigeonpea and the evolution of its ancestors (Varshney et al. 2012). A number of marker systems including restriction fragment length polymorphisms (RFLPs), amplified fragment length polymorphisms (AFLPs), random amplified polymorphic DNA (RAPD), single feature polymorphism (SFP) and simple sequence repeats (SSRs) have been developed and utilized to assess genetic diversity (Saxena et al. 2010), construct genetic maps (Bohra et al. 2011) and quantitative trait loci (QTL) analysis (Gnanesh et al. 2011; Bohra et al. 2012) in pigeonpea. Recently single nucleotide polymorphisms (SNPs) have been identified in a large number of pigeonpea lines especially due to the next generation sequencing (NGS) based re-sequencing of diverse germplasm (the reference set of pigeonpea) (Varshney et al. 2017).

Comprehensive application of genomics for crop improvement begins with the availability of large amount of markers, mapping populations and draft genome sequence (Varshney et al. 2012) as mentioned above. The reference genome sequence has been the base of re-sequencing based mapping studies (Saxena et al. 2017; Singh et al. 2016), which has enabled us to develop trait-associated markers quickly which in turn is facilitating the identification of the genetic basis of agronomically important traits, and acceleration of the development of improved pigeonpea varieties.

In order to deploy available sequence information for pigeonpea improvement, Department of Agriculture Cooperation & Farmers Welfare, Ministry of Agriculture and Farmers Welfare and United States Agency for International Development (USAID)-India facilitated these efforts through funding research projects with the major emphasis on identification and delivering genetic improvements in pigeonpea. One of such projects entitled "Pigeonpea improvement using molecular breeding" was planned for three phases, phase I (generating basic information/ material to initiate molecular breeding), phase II (molecular breeding, multi-location evaluation, development and extension) and phase III (coordinated research project trials and extension). Phase I was initiated in year 2012 with the funding from USAID-India. Key accomplishments in phase I of the pigeonpea genomics project have been summarized in Figure 1. In view above, it is essential to continue and expand research efforts in pigeonpea improvement especially in use of modern approaches in India to achieve daunting task of self-sufficiency in pulses as well as international level for sustainable pigeonpea production to meet the demand of ever growing population and to ensure food and nutritional security.

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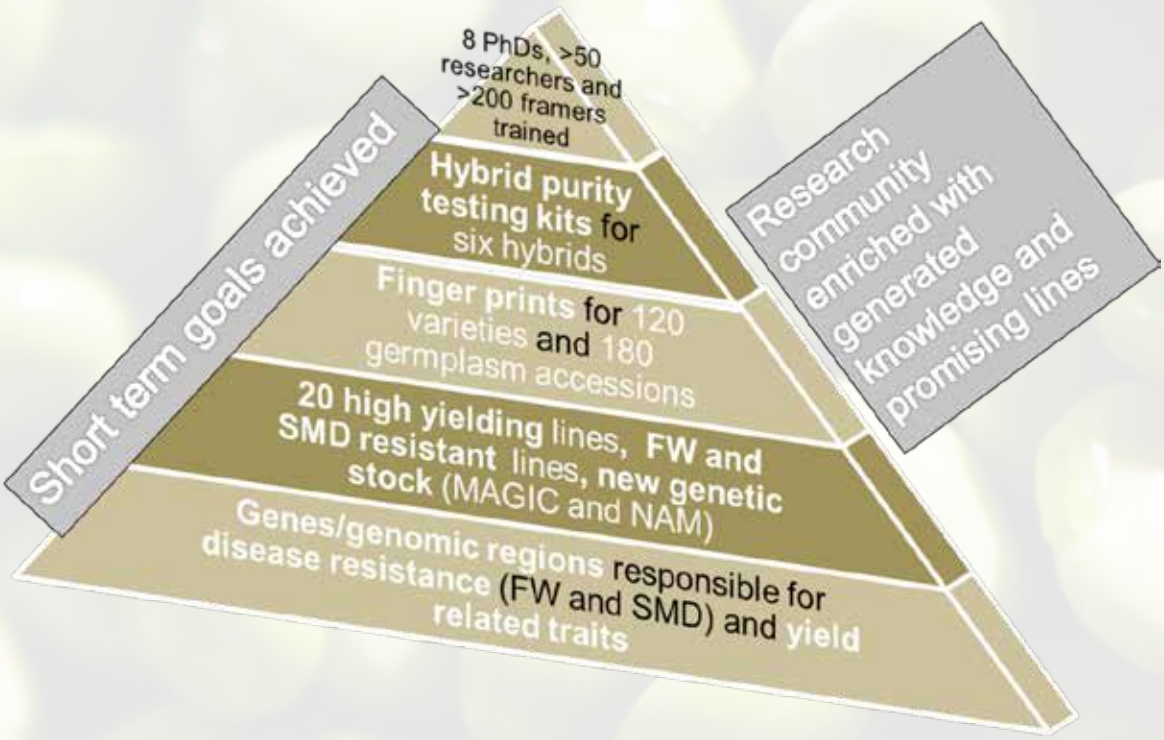

Figure 1. Key accomplishments in phase I of the pigeonpea genomics project entitled "Pigeonpea improvement using molecular breeding".

Pigeon Pea: Technological And Nutritional Aspects

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Introduction

Pigeon pea (*Cajanus cajan),* commonly known as *tur dal* in India, is a perennial legume and belongs to the family Fabaceae. It is consumed throughout the world and known by different names like congo pea, gungo pea, no eye pea etc. It got its most popular name 'pigeon pea' in Barbados where it was grown on barren lands and the seeds were fed to pigeons. In India, it is known as red gram, tur or arhar dal. Pigeon pea seeds are composed of 20-22% protein and reasonable amount of amino acids. This makes it a suitable crop for ensuring nutritional security for the poor section of society which can't afford protein from animal sources. Particularly in south Asia, it is consumed on large scale and serves as an important source of protein in the local diet. Broken seeds, skin, pod etc. are fed to animals while dry stems are used as fuel wood.

Pigeon pea is believed to be originated in India around 3000 years ago and was taken to Africa around 1000 years ago. It travelled to America along with the African slaves. India leads the world in pigeon pea production, followed by Myanmar, Malawi etc. In India particularly, Maharashtra is the leading producer followed by Uttar Pradesh. Pigeon pea is mostly cultivated as a secondary or mixed crop throughout the world. It is a tropical crop which is cultivated with the cereal grains such as maize, millet, sorghum etc. It can last for a period of 3-5 years but is generally grown as an annual crop. Tap root system makes it drought resistant and thus suitable for cultivation in semi-arid areas. Pigeon pea is also considered helpful in the nitrogen fixation process of soil.

In India, the sowing season is usually in the summers or the *khariff* season. June and July are considered as the best time for sowing. After sowing, the seeds of pigeon pea start germinating in almost two weeks' time. Flowering starts during early October and is harvested in December and January. In Africa, the harvesting period of pigeon pea crop is around June and July. Harvesting is usually done by hand picking followed by sun drying and threshing. After threshing, the remaining grain is cleaned by winnowing process.

Food and Agricultural organization (FAO) recognizes 11 primary pulses namely, dry beans, dry broad beans, dry peas, chickpeas, dry cowpeas, pigeon peas, lentils, bambara beans, vetches, lupins, and/or minor pulses. Among which, pigeon pea is a most important legume crop serves as major source of dietary protein for more than billions of people living in south asia.

What is Special about Pigeon Pea?

In India, genreally the pigeon peas are mostly consumed as decorticated split peas called as "dhal" or "Tur dhal". Other countries use whole dry seed and green vegetables in their diet. The nutritional profile of immature seeds and dhal of pigeon pea was depicted in the Table 1. In comparison to overall nutrition value of pulses, Pigeon pea would lie after chickpea (*Cicer arietinum*) and black gram (*Phaseolus mungo*) in terms of superiority, but their nutritional quality is quite outrageous. Pigeon pea not only have dietary values but also play an important role in maintaining or even improving soil fertility through their ability to fix atmospheric nitrogen.

Figure 1. Pigeon pea Green seed and Dhal

Table 1. Proximate composition of pigeon peas

Proximate	Green seeds	Dhal
Starch (%)	48.4	57.6
Protein (%)	21	24.6
Fat (%)	2.3	1.6
Crude Fiber(%)	8.2	1.2
Minerals and trace elements (mg/100g)		
Calcium	94.6	16.3
Magnesium	113.7	78.9
Copper	1.4	1.3
Iron	4.6	2.9
Zinc	2.5	3.0

Source: Saxena at al. (2010)

Why Pigeon Pea?

Pigeon pea seed is composed of 85% cotyledons, 14% seed coat and 1% embryo (pigeon pea nutrition). They are good source of starch, protein, fiber, lipids, vitamins and minerals. They contain nearly 20-22% of protein and appreciable amounts of essential amino acids, which is mainly concentrated in the embryo portion. However, the protein content depends on its genetic differences, difference in environmental conditions under which crop is grown, methods of sampling and analysis, Processing, Storage conditions and its duration, etc.

All the pulses contain protein content varying from 20-40% dry weight, with seed storage protein being adundant in them. These seed storage proteins are classified as albumin, globulin, glutelins, and prolamines. Globulins constitute 65 of total proteins in case of pigeon. The quality of protein id generally decided based on their quantity, digestibility and aminoacid content. Pigeon pea has protein digestibility of 60-65% and with biological value of 60. The nutritional evaluation of pigeon pea meal reveals that they had a very high content of potassium, high content of potassium, high content of phosphorus, moderate content of calcium and magnesium and low content of iron, zinc, copper and manganese. Average availability of minerals was 58.09%.

The green seed contains lower quantities of trypsin and amylase inhibitors and flatulence-causing sugars. The green seed cooks quickly and is also a better source of vitamin A. The protein and starch digestibility of green seed are higher than mature seed.

The levels of lysine, glutamic acid, phenyl alanine was higher in pigeon pea when compared to chick pea. The levels of methionine and cystine is around 1% and they are concentrated in cotyledons and embryo. The other essential aminoacids and their composition in pigeon pea protein is listed in Table 2. In pigeonpea seed the proportion of prolamin is low while sugars such as stachyose and verbascose are high. The carbohydrates and fats are present in significant quantities in embryo.

Table 2. Aminoacid composition and availability in pigeon pea meal

	mg/g A.A	% Availability
Aspartic acid	17.4	82.58
Threonine	6.4	84.74
Serine	8.7	84.93
Glutamic acid	34.7	87.45
Proline	8.4	51.49
Glycine	7.3	57.59
Alanine	8.1	82.95
Cystine	1.8	81.44
Valine	7.7	83.64
Methionine	1.9	77.66
Isoleucine	6.6	84.81
Leucine	13.8	85.58
Tyrosine	5.1	82.87
Phenylalanine	15.6	90.79
Histidine	8.8	78.25
Lysine	13.0	85.38
Arginine	12.2	87.77
Total	175.6	82.32

Source: Nwokolo (1987)

Pigeon peas are even rich sources of calcium and their availability is also greater when compared to other peas and they are predominantly present in seed coat and embryo portions. The content of tannic acid is also higher in cow peas and pigeon peas. Folate may be linked to anemia, birth defects, heart diseases, etc. Child-bearing women need more folate the deficiency of which can cause birth defects in infants. Around 100g of mature pigeon peas could provide 114% (76% for pregnant women) of daily requirement of folate. In addition to nutritional factors, pulses contain several heat stable and heat liable anti nutritional factors. These include enzyme inhibitors, toxic substances, factors inciting clinical disorders, factors which interfere in digestion and flatulence causing substances. These factors are to be reduced or eliminated to make pulses more acceptable as a source of

inexpensive nutritional proteins and maximize the utilization as a human food. Like most legumes, pigeon pea also contains certain amounts of anti-nutritional factors. several processing methods like soaking, germination, heat processing, steaming, etc would cause remarkable reduction in these anti-nutritional compounds. Some of the anti-nutritional factors are listed in Table 3.

Table 3. Anti-nutritional factors in pigeon pea

Factor	Range
Protease inhibitors (units/mg) Trypsin inhibitor (units mg-1) Chymotrypsin inhibitor (units mg-1)	 8.1-12.1 2.1-3.6
Phytolectins	400
Amylase inhibitor (units g-1)	22.5-34.2
Oligosaccharides (g/100g) Raffinose Stachycose Stachycose +verbascose	 0.24-1.05 0.035-0.86 1.60-2.30
Polyphenols (mg/g) Total phenols Tannins	 3.0-18.30 0-0.2
Cyanogens (glycosides)	Traces
Mycotoxins (ppb)	Traces

Source: Singh (1988)

Pigeon pea and Health

Free radicals play a major role in triggering number of chronic diseases in human beings. The phytochemicals being rich in plant cells possess several antioxidant activity, antimicrobial activity, anti cancerous activity, etc. Not only pigeon pea itself, their plant parts like leaves, root bark, stem, pod possess a number of flavanoids and phenols exhibiting antioxidant activity. Beyond their nutritional benefits, the pigeon pea has been associated with protective or therapeutic effects on chronic health conditions and for the treatment of several chronic diseases, such as diabetes, dysentery, hepatitis, measles, varicella and superficial infection and for stabilizing the menstrual period

Henceforth, pigeonpea is limiting in methionine, cystine, tryptophan and threonine whereas, lysine is limiting in rice and wheat. The correct proportion of rice and pulses would compensate the aminoacid profiles and suits to be a balanced diet for individuals.

Processing technology

Processing of pigeon pea involves primary processing which is generally the milling operation and secondary processing which involves processes like extrusion, baking for production of food products like noodles, pasta, biscuit etc.

Primary Processing

Milling of pigeon pea can be carried out by two different methods i.e. dry milling and wet milling. Dry milling is more popular and used in commercial mills. Milling process can broadly be classified into three major operations: cleaning and grading, dehusking and splitting, and polishing. Cleaning and grading along with pitting, scratching, oil treatment, conditioning and drying account for the pre-milling operations. Oil treatment and conditioning loosens the husk which is followed by dehusking and splitting using emery rollers. Finally polishing is done with small amount of oil or water.

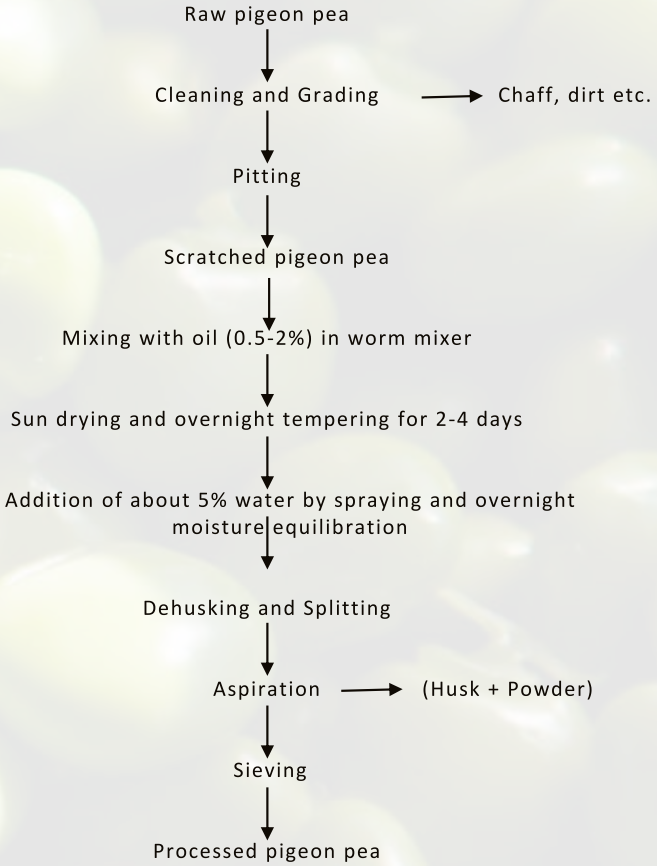

Figure 3. Flow chart of dry milling of pigeon pea (Chakraverty, 2003)

Secondary Processing

Secondary processing involves utilization of processed pigeon pea for production of processed foods like extruded snacks, noodles etc. Pigeon pea starch has been identified as second excellent material after mung bean starch for processing of starch noodles. Blending of pigeon pea starch with rice starch at levels of up to 70% has been reported to produce good quality noodles. Other processed products which can be produced using pigeon pea include pasta, chips, spreads, weaning food etc.

Indigenously developed milling techniques:

1) CFTRI Process.

Central Food Technological Research Institute has developed a process which aims to reduce weather dependency of pulse milling and enhancing yield efficiency. Instead of oil, hot air is used for loosening the husk followed by tempering. The process involves two passes through 160ºC hot air followed by tempering of 6 hours. The process replaces sun drying with mechanical drying which makes it weather independent and capable of being carried out indoors. CFTRI claims average yield of 80% which is

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significantly higher than traditional milling process (75%). But small scale millers are reluctant in adopting this method due to high capital cost and non-continuous and insufficient electricity supplies.

2) Pantnagar Process.

G. B. Pant University of Agriculture and Technology formulated a pulse milling method based on chemical treatment. Pigeon pea grains are treated with 10% sodium bicarbonate solution mixed in the ratio of 30:1. The grains are then heaped for 5 hours followed by drying in the sun. The tempered and dried grains are passed through rollers. Pantnagar process utilizes traditional milling machinery. The milled product is cleaned and graded with a blower, cyclone separator and grader. The dal recovery has been claimed as 80%. Advantage of this method is that it eliminates the use of oil.

3) Mini dal mill developed by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

PKV Akola has developed a mini dal mill which requires a low investment and an area of around 200 m^2 for operations. The unit is primarily meant for preparation of pulse splits (dal) from pigeon pea, black gram, green gram, cowpea, soybean, etc. The capacity of this mill is 100 to 125 kg/h for pigeon pea and 125- 150 kg/h for green and black gram. The respective recoveries are 72–75 % (brokens- 5.08 %) and 80–82 % (brokens – 2- 2.5 %).

4) Multipurpose grain mill developed by CIAE, Bhopal.

Central Institute of Agricultural Engineering has developed a multipurpose grain mill which is operated by 1 hp single phase electric motor. It can be used for milling of cereals, coriander and pulses to produce grits/flour powder and split respectively. The grain with 8-10(%) moisture content (wet basis) with low oil contents are most suitable. It consists of hopper, feed adjuster, vertical grinding wheel etc.

Utilization of by- products

Efficiency of commercial milling process is around 75% which means that up to 25% by-products are generated which include husk, powder, broken, shriveled and unprocessed grains. These by-products are believed to be an excellent source of functional compounds like dietary fiber, antioxidants, vitamins, minerals etc. Recovery of bioactive compounds can be done with the help of various extraction techniques. By-products can also be utilized for development of food products. Food scientists have substituted wheat flour with pigeon pea dehulled flour (PPDF) and pigeon pea by-product flour (PPBF) for production of biscuits. This resulted in a significant increase of protein content without much impact on physical and sensory quality of biscuits. It shows that pigeon pea by-products have immense potential for utilization in bakery products which not only helps in enhancing the nutritive value of bakery products but is also an effective way of waste management and enhancing economic viability of milling.

Famous Indian Receipe from Pigeon Pea

Sambar

Sambar is a south Indian delicacy made from tur dhal and with lots of spices like cumin, tumeric, curry leaves, etc. and some vegetables. It is embedded with lots of antioxidant and health promoting benefits too. A recent study carried out in Department of Pharmacology, Manipal college of pharmaceutical sciences has revealed that sambar has a preventive measure for 1,2-dimethyl hydrazine (DMH) induced Colon cancer in Wister Albino rats. Based on the physiological and histological parameters assessed, the blend of constituents in sambar has presented pro and antioxidant role in colonic tissues, thereby helps in preventing the development of colonic cancer. It is commonly consumed in southern India being served along with idlis, dosa and long grain rice.

Ingredients

Tur dal (125grams), water(4 cups), 1 teaspoon turmeric, 1 medium onion diced (5 ounces/150 grams), 2 medium tomatoes crushed in the food processor (14 ounces/400 grams), 3 potatoes cubes (1¼ pounds/565 grams), 2 zucchini (8 ounces/230 grams), cubed, 6 ounces (175 grams) green beans, cut into 1-inch pieces,1 teaspoon sambar powder, 2 teaspoons salt, 1⁄8 teaspoon pepper, 1 tablespoon sunflower or mustard oil ½ teaspoon mustard seeds, 20 curry leaves, ½ teaspoon tamarind paste , ½ teaspoon asafetida (optional).

Method of cooking

In a large pot, combine the toor dal and water. Bring to a boil over high heat, skimming off any foam. Reduce to medium high and let the dal simmer for 1 to 2 minutes, then add the turmeric. Add the onion, tomatoes, potatoes, zucchini, green beans, sambar powder, 1 teaspoon of the salt, and the pepper. Let cook until the dal and vegetables are almost soft, about 30 minutes. Heat a small skillet over high heat and add the oil. Add the mustard seeds, cover, and cook until the seeds begin to pop, about 30 seconds (not as long if the oil is very hot). Add the mustard seeds to the dal mixture, along with the curry leaves, tamarind paste, asafetida, and remaining 1 teaspoon salt; cook until it all comes together, about 5 minutes

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DAR NI PORI

Dar ni Pori's are probably as famous as Dhansak and kebabs. Served at tea-time or as a breakfast treat, Dar ni Pori is basically a pastry filled with a mixture of sweet lentils and dried fruits.

To make about 9 dar ni pori's you will need:

Ingredients:

For the Dar Filling:

2 cups toor dal | 2 cups sugar | 3 tbsp ghee | 2 tbsp blanched almonds thinly slices | 1/2 cup mixed fruits (raisins, tutti fruity)

1 tsp rose essence | 2 tsp elaichi & jaifal powder | 1 tsp charoli (optional)

For the Maan:

4 tbsp ghee | 2 tbsp all purpose flour | 2 - 3 drops rose essence | Cold water to soak the maan

For the Pastry:

1 cup fine semolina or rava | 1.5 cups all purpose flour | 1.5 tbsp ghee | 2 – 3 drops rose essence

Method:

- The first step in making the Dar ni Pori is making the filling of the dar. To do this, soak the dal overnight. In the morning, cook the dal in the pressure cooker for 2 whistles and 10 minutes on slow. Once the dal is cooked, take it off the heat and add the sugar and ghee. Using a hand blender, mix everything well. Now, add the almonds, charoli, mixed dried fruit, essence, elaichi and jaifal powder. Cook the mixture on very low heat stirring continuously until thick and well mixed.
- Once the dar mixture is ready, it is time to make the Maan. For the Maan, mix the flour and ghee with your hands until smooth and light to touch. Keep this Maan immersed in cold water to ensure it stays moist. Add 2 drops of the rose essence to the water for perfume. The sign of a well-made Maan is when it floats in the cold water.
- Once your Maan is ready, it is time to make the pastry. To do this, mix the semolina, flour and ghee to make a dough. Break this into about six big balls. Now, flour the bench that you are going to work on and knead each ball into a smooth mixture. Taking each ball at a time, roll them out into a thick roti. Set these roti's aside and cover with a damp muslin cloth.
- Once these pastry sheets are ready, spread a tablespoon of the maan on the flat pastry. Sprinkle this sheet with flour and now layer another sheet on top of this. Do this with one more sheet. Now turn the edges inwards and roll it up into a tube. Repeat these steps to form a second tube. Sprinkle the damp muslin cloth with a few drops of rose water and cover the dough tubes with the cloth for about 10 minutes. While the dough is resting, pre-heat the oven to 200 degrees celsius.
- Once the time is up, cut out 3 inch pieces from the roll. Flour your hands and twist the roll. Press down each twist and shape them into a round ball. Next, flatten this ball out and slowly stretch it to form a cup shape. Repeat these steps with each for each of the dough balls – you should get around 8 – 9 poris. Once this is done, make the same number of balls using the dar mixture that we had set aside earlier.
- Taking each cup at a time, add a ball of dar in it and start to stretch the dough around it. Seal the edges with a little water. Using floured hands, flatten the ball to form a thick cake 5 – 6 inches in diameter. Do not use the rolling pin for this step and be careful to not stuff too much of the dar mixture or the pastry will break. Keep the ones that are ready covered with a damp muslin cloth to ensure they don't dry out.
- On an oven tray covered with baking paper, place about 4 – 5 of the Dar ni Pori's and bake on both sides until golden brown – about 10 – 15 minutes each side.
- Once the Pori's are baked on both sides, take them out of the oven and let them cool on a rack. Enjoy these warm

DHANDAR
The Dal For All Seasons And All Reasons

Dhandar is the Parsi equivalent of 'chicken soup' I believe. Served to kids and to adults on weddings, navjotes, birthdays and whilst recuperating, this is one dish that all Bawi Brides must perfect!

However, in case you don't have it down pat yet, here's how you make it in 5 easy steps.

To make enough for 6 you will need:

Ingredients:

2 cups raw toor dal

2 teaspoons turmeric powder

salt to taste

4 – 5 cups water

Method:

- First, soak the toor dal in water atleast for 3 to 4 hours. This step is crucial in ensuring the grains break down effectively and will make your dal more creamier.
- Once soaked, drain out all the water. You will note that the raw dal has almost expanded by half its size – this is a good thing!
- Next, pour the dal into the pressure cooker with about 4 cups of water. Add in the turmeric and the salt.
- Cook on high until the cooker gives out 3 whistles and then another 10 minutes on low heat. Once the dal is off the heat, you will need to wait a while before opening the cooker. The dal will have soaked up the water.
- Give it a quick blend using a hand blender or if you wish to have an arm workout with a whisk and there you have it – amazing, simple, fabulous Dhandar.

Bawi Bride recommends having this just as it is and that you serve it with fluffy steamed rice. To add some zing, add green chutney or Methiu Achaar on the side works best for a weekday dinner.

For giving the Dal a 'Waghar' or a tadka, simply shallow fry some jeera and finely chopped garlic with ghee in a separate bowl. Some even add cumin seeds, slit green chillies and fried sliced onion should you wish to 'Gujarati-fy' the Dhandar. Once the waghar is ready, pour into dal for extra creaminess and zing.

Recipe Credit – Perzen Patel – www.bawibride.com

African Pulses Market Update For 2017

Bharat Kulkarni

Pulses in Africa- Pulses have been grown in East African countries like Tanzania, Kenya, Ethiopia, Uganda and Southern African countries like Malawi and Mozambique. In addition, several countries have introduced pulses recently. Driven by the Indian import, that peaked in 2015-16 and 2016-17, coupled by the Government of India's drive to encourage and support the production of pulses for export to India in the years between 2014 to 2016, several steps have been taken by African countries to increase its production. The increasing export of pulses to India in 2014 and 2015 led to traditional producers increasing their acreage and adopted new types, and also, some new entrants like Sudan and Nigeria have been seen to join the pulses bandwagon. However, the collapse of market in 2017 has led to a confused state for producing countries in Africa.

Diplomatic engagement with Africa to grow more pulses- After finding the huge shortfall in the pulses availability in 2014 and 2015, the Government on India went on a diplomatic offensive to pursue and encourage African governments to grow more pulses. Pulses remained at the center stage of India's engagement with Africa for two years- May it be the India Africa Forum Summit in 2015 or the state visit of the Prime minister to Mozambique, Tanzania, Kenya in 2016, or the visit of Vice President to Nigeria. Agreement with Mozambique was signed to procure pulses and same was offered to Tanzania, though it did not sign. This also included working with developmental partners in Africa like the ITC SITA project to promote more pulses to be produced. All in All, Indian Government did not leave any stone unturned to make pulses a preferred crop to produce in Africa. African countries also responded and 2017 saw an increase in production. India, however, stunned everyone by imposing quantitative restrictions on pulses like Pigeon Peas Black mapte and Green Moong. The market in East Africa has hit to rock bottom in terms of pulses, with hundreds of farmers and their government clueless on how to find the market for pulses.

Prior to this, production of pulses was taken up with a lot of excitement. 2017 has seen some ups and downs in the pulses sector in Africa. The country wise situation is as follows-

Kenya-

On an average, Kenya produces about 10-12 thousand tons of Pigeon peas and about 40 thousand tons of Mung beans. 2017 has been a drought year and the pulses production has gone down by about 15-20 percent. It was expected that Kenya will export 25 to 30 thousand tons of pulses this year. However, the global pulses slowdown has not helped in this. Kenya, however, has been working on developing the sector. It is working on

introducing the new varities of pigeon peas, more suitable for Indian markets. Also, the government of India has extended a line of credit for Agricultural mechanization to Kenya, a part of which will be used for Pulses value chain. Another line of credit from GoI is planned to be used to set up Processing plants (Dal processing) in Kenya.

Tanzania-

Tanzania, has been producing the pulses like Pigeon Peas and Chick Peas as the biggest producer in the region. In 2017 also, Tanzania has dominated the supplies. There was a drought that has affected the output, but not significantly. However, the collapse of prices last year made some hickups but the production sustained around the average of about 100,000 tons of Pigeon peas. In case of Chana and Moong, the production is about 30 thousand tons. This year the drought resulted in delay in sowing in both the producing areas- Dodoma/ Sindiga as well as Arusha/ babati. The crop, as a result has also arrived late. However, due to the import restrictions in India, the prices have collapsed and exports have got stagnated. The Pigeon Pease that was offered at around 500 USD per Ton last year is being offered at 180 USD per ton CIF India.

Ethiopia-

Ethiopia produces pulses like Chana, Beans (various typs) and Lentils. It is not a direct exporter to India. The major export has been of White Pea beans, Red Kidney bean, field pea, chickpea (Desi and Kabuli). Though Indian buyers are interested in red Lentils and Chickpeas in Ethiopia, export are still not prominent. Red Lentils are locally consumed aand export is restricted, where are for Chana, the size of chana is smaller than Indian preference. Most of the Chana that is exported from Ethiopia goes to Pakistan. The favorable weather conditions in Ethiopia have led the production to go up by 10 to 15 percent over the average. This year, Ethiopia has produced around 120 to 130 thousand tons of pulses this year. The harvesting season has begun in Ethiopia.

Southern Africa-

Malawi-

Apart from Tanzania, its neighbor, Malawi, also has been a major supplier of Pigeon peas to India. On an average, Malawi exports 80 thousand to one lakh tones every year. 2017 has not been a good year, with production falling between 75-80 thousand tons. There have been excessive rains in some parts and that has affected production. However, a lot of Malawian pulses has already been exported to India via Mozambique this year. As per the Industry estimates, close to 65 thousand tons have been exported to India via Mozambique and Malawi.

Mozambique-.

Mozambique is another Southern African county that has stepped up the production of pulses. Mozambique exports about 60,000 Tons of Pegion peas, 15,000 Tons of Cow peas and 12,000 Tons of Green Mung. The GoI had signed an agreement with the GoM and as a result a bilateral trade commitment to 125 thousand tons was given. As per the Bilateral agreement, India had promised to import 100,000 tonnes of pigeon peas from Mozambique in the 2016/17, rising to 125,000 tonnes in 2017/18, and to 150,000 tonnes from the 2018/19 harvest. Though the quantitative restriction on the imports has been imposed by the government in India, this bilateral trade has been kept out of the quantitative restrictions. This indicates that the channel to import from Mozambique will be open for India. Already in 2017 close to 65,000 tons have been exported from Mozambique and Malawi. The East African Giant Export Trading Group has set up two pigeon pea processing units in Mozambique. One is in Beira and second in Nacala. However, ETG has stopped its purchases from farmers as they have considerable stock in their warehouses, which they have bought from Mozambique and Malawi. This has caused a serious disappointment for farmers as well as the Government in Mozambique, who had pinned their hopes of increasing exports.

Quantitative restrictions on imports and impact of Africa-

African Pulses sector has been driven by the huge supply opportunity to India. India being world's largest producer, consumer and importer of Pulses globally is the driving force for pulses industry. With the shortfall of pulses in India in 2015, Indian government went on a diplomatic offensive to ensure they have steady supply from Africa. Several MoUs and support were offered. This also led to several donor driven projects being set up in Africa like the SITA program by ITC via support of DFID UK. UKAID, USAID and FAO also developed several projects to promote pulses production in various African countries. All was set up to supply the Indian markets. Even the private sector players have set up the investments in these value chains. For example, Export Trading Group has invested about 13 million USD in setting up pulses processing plants in Mozambique.

However, the decision of the Government of India to install quantitative restrictions has come as a shock to many of the stakeholder, especially governments. This has put them into a very difficult situation. The governments have been pushing the farmers for producing pulses and have been investing their resources towards the sector. Now as the farmers are ready with the produce, the borders for India have been closed. This has affected the industry in two ways. Directly, as the governments struggle to get their farmers' produce to the markets and sustain them financially, and indirectly, as even in the alternative markets the prices have hit rock bottom. This is snowballing into a major political challenge for the governments, like for those in Tanzania, Malawi and Mozambique. The Tanzanian minister has already voiced his disappointment at the grain summit in Dar es salaam in October. The Malawian farmers' are pressurizing their government to take Indian government to court. This has, and will continue to have serious diplomatic ramifications in the course of India's engagement with African countries. How this will affect the production pattern in coming years is yet to be seen.

Canadian Peas Face Challenges, But See Opportunities

Phil Franz Warkentin
Commodity News Service (CNS) Canada

WINNIPEG - Canada may be one of the world's largest exporters of peas and lentils, but domestic consumption of pulse crops is relatively small. That balance may be starting to see a shift, as exporters face some challenges and a number of new processors come on line in the country.

The bulk of Canada's pulse crops are grown in the three Prairie Provinces - Manitoba, Saskatchewan, and Alberta – as farmers see the benefit of including a pulse in rotations that typically focus on grains (wheat, barley, oats) and canola (rapeseed). Soybeans are an upstart in Western Canadian agriculture, accounting for more and more land usage in Manitoba especially, with some of that area coming at the expense of peas.

The United Nation's International Year of the Pulses in 2016 coincided with record pulse production in Canada, with the pea crop of 4.8 million tonnes surpassing the previous record by nearly one million tonnes. Meanwhile, the 3.2 million tonnes of lentils grown that year were about 700,000 tonnes larger than any crop grown before. The resulting downturn in prices following those large crops saw a reduction in seeded area, with about 3.9 million tonnes of peas and 2.4 million tonnes of lentils grown in Canada in 2017.

Over half of Canada's pea crop is generally exported each year, with upwards of 80 per cent leaving the country in some recent years. Chinese demand has seen some growth, but over the past 10 years India has accounted for anywhere from 46 per cent to as much as 73 per cent of Canadian pea exports.

Canada shipped 2.02 million tonnes of peas to India in 2016/17 (August/July), accounting for well over half of the 3.68 million tonne total exports. Data available for the first two months of the current crop year shows Canadian pea exports are already running behind the previous year, with a front-loading of business to India expected to drop off.

Canada's record pulse production of 2016 was a direct result of the high prices seen prior to seeding, as poor crops in India caused world prices to rise. Canadian farmers planted more peas and lentils to fill that demand, but other countries, and India itself, also upped their own pulse crops.

The old adage that "high prices cure high prices" proved true, and the increased world production saw the bids offered to Canadian farmers fall in 2017. Uncertainty over India's fumigation requirements had Canadian exporters showing some caution to begin with, but prices then took an even larger tumble on news that India was imposing a 50 per cent tariff on all pea imports in an effort to support its own farmers.

That announcement came at the beginning of November, 2017, and the already declining Canadian yellow pea prices dropped by another 20 per cent in the span of two weeks, hitting their lowest

levels in years. Exports to India are expected to be all but shut off while the tariffs are in place, and Canadian pea ending stocks could hit some rather large levels.

In its November report, released after India's tariff announcement, Agriculture and Agri-Food Canada lowered its pea export forecast for 2017/18 by 500,000 tonnes and raised its ending stocks forecast by the same amount. The government agency is now forecasting pea ending stocks for the year at a record 950,000 tonnes. That compares with the 10-year average of 400,000 tonnes, but could end up even larger as the report was compiled before the full extent of the reduction in demand from India is known.

With the possibility of a Canadian pea carryout of a million tonnes or more, new crop bids for 2018 are unlikely to generate much interest from producers when they start to become available closer to seeding time in the spring.

Apart from India and China, key export markets for Canadian pulses include Bangladesh for peas, and Turkey for lentils. Russia has become a larger player in the global export market in recent years, while Australia is another competitor for Canada that's positioned much closer to many of the key demand centres.

While Canada may be facing challenges on the export front, some new domestic demand opportunities are starting to present themselves.

In September, Academy Award-winning film director James Cameron announced he would be investing in a new multimillion-dollar pea-processing plant in Saskatchewan. A number of other projects are also in the works, which would see total pea processing/fractionation capacity in the country increase by 750,000 tonnes over the next few years.

The interest in pea processing is tied in large part to a growing North American demand for healthier food options and plant-based proteins. Fractionation separates pulses into concentrates and isolates, such as proteins, starches, and fibres. Those products are then utilized in food processing.

In addition to that growing demand for pea fractionation, that rising North American interest in healthier, meat-free, plant-based food options has also lent support to other pulses, which could provide additional outlets for the lentils, chickpeas, and other legumes grown in Western Canada.

Pulse Canada unveiled its '25 by 2025' plan in January 2017, with a stated goal of generating new demand and use categories for 25 per cent of the country's production capacity. Snack foods, breakfast cereals, and protein shakes are only a few of the areas of possible diversification.

In addition to peas and lentils, Canada also grew 75,000 tonnes of chickpeas, 100,000 tonnes of edible beans, and 110,000 tonnes of fababeans, according to government data.

However, while the efforts at promoting pulses should keep some interest in growing the crops, Canadian farmers will also be looking at their bottom line.

Soybeans offer the same nitrogen fixing benefits for Western Canadian farmers as the more traditional pulse crops grown in the Prairies, with an added benefit of better weed control. Seeded soybean area in the three Prairie Provinces grew from only 50,000 acres in 2001 to 3.1 million in 2017. Improved shorter-season varieties and consistent market demand may see that area continue to increase.

Pulses – Significance and Opportunities

Azza Silotry Naik
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With ever increasing incidences of metabolic disorders, it is high time we scrutinize our nutritional intake and engineer a corrective approach. A saturated fat laden carbohydrate rich diet in the form of fast food is the "go to" meal for most millennials these days. With plethora of traditional wisdom buried in ancient textbooks and grandma's recipes, the road map to good health is just around the corner. Dal tadka, dal makhani, punjabi kadhi, sambar, rasam etc. the dishes from the north to the south bear the common protein rich health ingredient- that is the pulses! India boasts of having the highest productivity of lentils in the world. It is the poor mans meat alternative, an inexpensive and nutritious vegetarian plant based product that is packed with essential and non-essential amino acids, minerals, dietary fiber while being low in fat. Pulses contain 18.0 to 32.0 % protein and less than 5% fat. Pulses are substantially richer in calcium than most cereals and have about 100 - 200 mg of calcium per 100 g of grain. Proven epidemiological studies have shown lower incidences of cancer and several metabolic diseases in populations that consume pulses rich diet on a daily basis.

Every region in India has its own favourite pulse variety and Maharashtra is no exception. Of the arid plains of this state is a lesser-explored variety called matki. Nutritional and morphologically similar to mung bean, it's a local favorite for its distinct sensorial traits. State research institutes have been working on studying its draught resistance and have explored application of this trait on other agronomically beneficial pulse varieties. Across India there are several popular varieties such as mung, masoor, urad, pigeon pea, black eyes peas extensively used in local culinary preparations. The health conscious urban consumer wants to derive the benefits from the pulses albeit without having to soak, pressure cook and give seasonings to their preparations.

More and more research endeavors are focused on utilizing pulses for ready to eat/ ready to cook food products. Potato wafers and vegetable wafers will soon lead to protein rich legume based wafers as alternate snacking options for those that are time pressed. Extruded products like noodles, pasta etc. already incorporate leguminous flours and these novel products will soon flood the consumer markets. Manufacturers of cold pressed juices have introduced ready to drink soups that incorporate various legumes while major national research institutes have developed dehydrated soup mixes that offer a major portion of your recommended daily allowance of proteins. Soy chunks and soy protein have long been used to develop meat analogues for the vegan or vegetarian population looking for meat like textural products. Other pulses no doubt need to be processed and developed for vegetarian meat substitutes. With a rise in lactose intolerance and cutting down of dairy based product intake, nuts, soy, cereals and pulses pose an attractive alternative to cows milk. Mung milk has been an integral part of ayurveda for

decades. Well-designed targeted research will soon deliver mung milk and other legume based variants into your morning cuppa.

Apart from RTE and RTC processed food products derived from pulses, there is a huge potential for formulating products for the sweet tooth, there are several options that lack the saturated fats of the dairy industry. From 'besan ke ladoo' to 'mung-da-halwa', there are several protein packed desserts for the weary.

Despite the innumerable benefits, digestion of plant protein is a challenge for a few. Pulses are known to contain several anti-nutritional factors, such as trypsin and chymotrypsin inhibitors, lectins, flatulence factors, lathyrogens, saponins, antihistamines and allergens. These factors are known to interact with minerals and vitamins and decrease the bioavailability of the constitutional amino acids and micronutrients. They also lead to bloating, flatulence and indigestion in some intolerant people. However simple domestic processing techniques such as milling, dehulling, soaking, germination, fermentation and cooking prevent the above-mentioned symptoms from occurring. Infact mung sprouts are commonly endorsed as nutrient dense snacking option by many nutritionists and dieticians. Thermal, barometric, chemical and several novel-processing methods can be applied industrially to scientifically address some of these critical issues.

Finally, pulses no doubt represent an ideal candidate for fortification studies to achieve our nutritional security goals. Due to its affordability and religious sentiments, majority of the Indian rural population lives on pulses and staple cereals. Thus pulses and pulse-based products can be target vehicles for delivering essential fortificants aimed at preventing life altering disabilities.

'Nutraceuticals, Functional Food and Sports Supplement' sector. Pulses are known to contain plethora of phytochemicals such as polyphenols namely tannins, phenolic acids and flavonoids. These secondary metabolites are antioxidant and are known to lower the incidence of cardio vascular problems and other inflammatory diseases. Thus nutraceutical compounds extracted from pulses can be used in targeted nutraceutical applications. Despite aggressive marketing strategies to promote high vegetarian protein diet, there are several consumers that are apprehensive. Geriatric population in general often suffers from constipation and digestive issues arising from animal protein based diet. Pulses are known to be rich in fiber content thereby acting as a laxative. Thus, isolated fiber or pulse flour based products can be used to alleviate symptoms from the elderly. This alternative will no doubt hear arguments from the meat industry about the unbalanced amino acid profiles and the quality of vegetarian protein. Scientists have developed right optimized combinations of pulses and cereals to target any such deficiencies in the product. Infact 'dal-khichdi' our 'brand India food' is a formulation based on conventional insight such that amino acids from rice and dal add up to make the final product a well balanced one. No doubt that it features in government initiatives such as mid day meal!

If the pulses offer a gamut of options to the health conscious, they do not leave the recreational eater behind. For those with a

In conclusion, vegetarian proteins epitomize a sustainable solution to the ever-exploding population.

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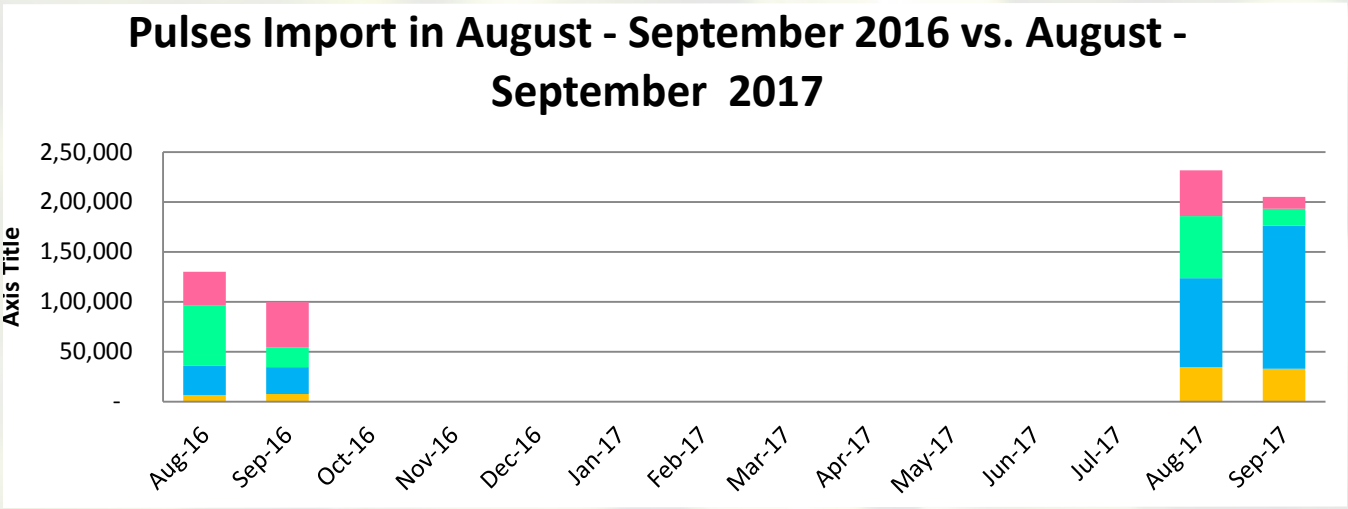
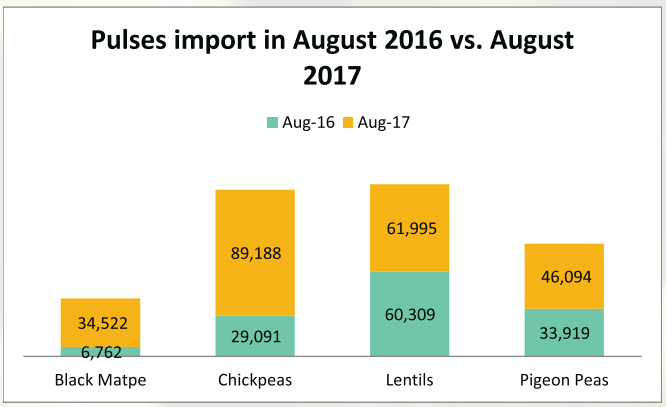
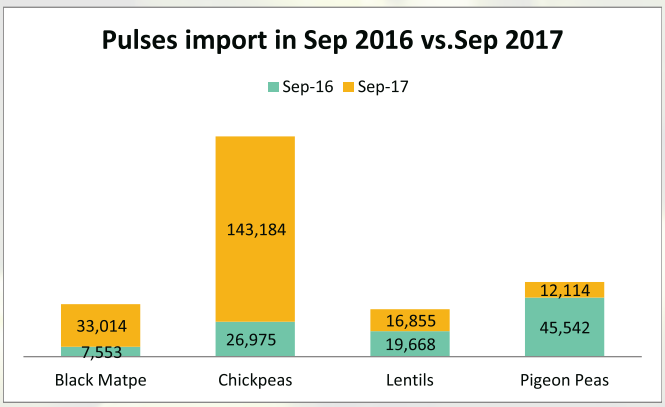
IPGA Pulses Import Statistics August - September 2016 - 2017

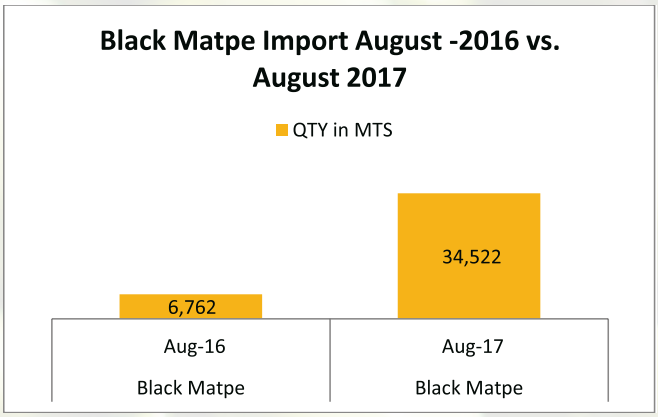


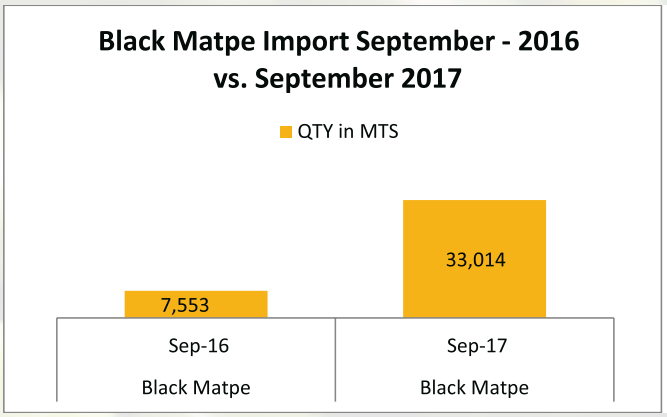


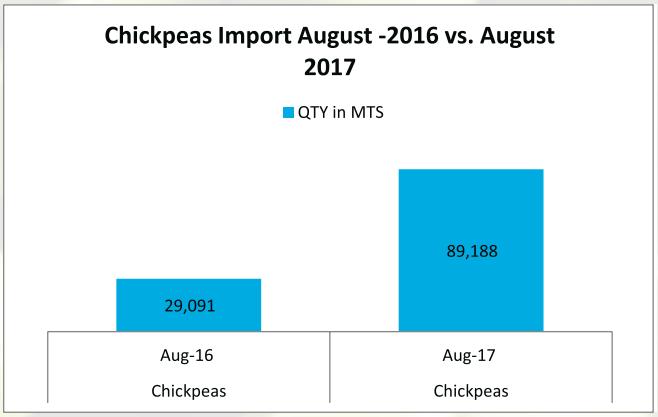


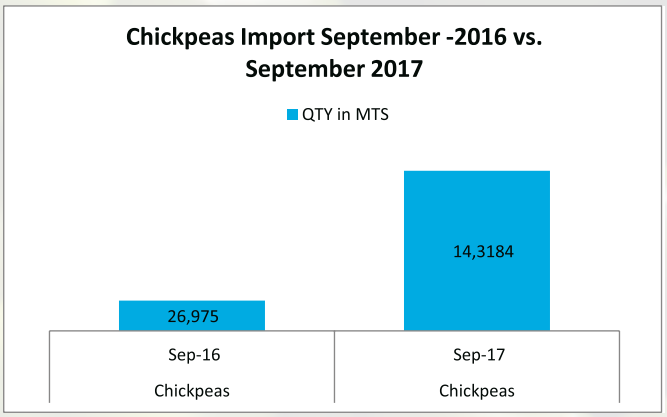
* All Qty. in MTS

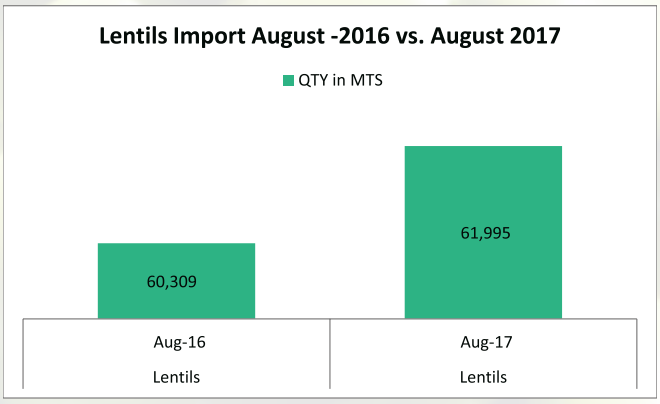
**Disclaimer-The above data is sourced from variable sources and the comments included are general in nature based on various dependable sources. The same is not to be used for monetary decisions.

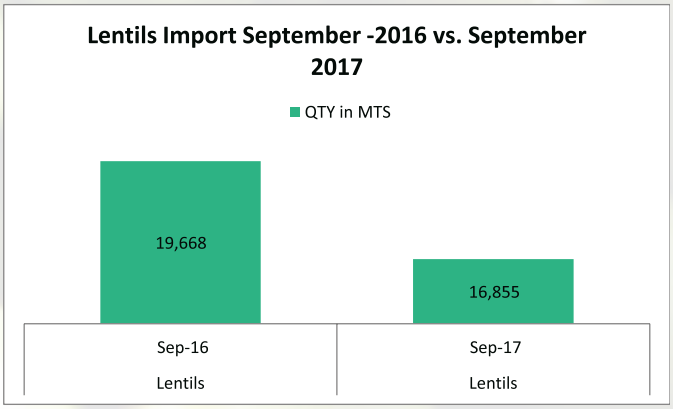

Black Matpe Import August -2016 vs. August 2017
QTY in MTS
6,762
34,522
Aug-16
Black Matpe
Aug-17
Black Matpe

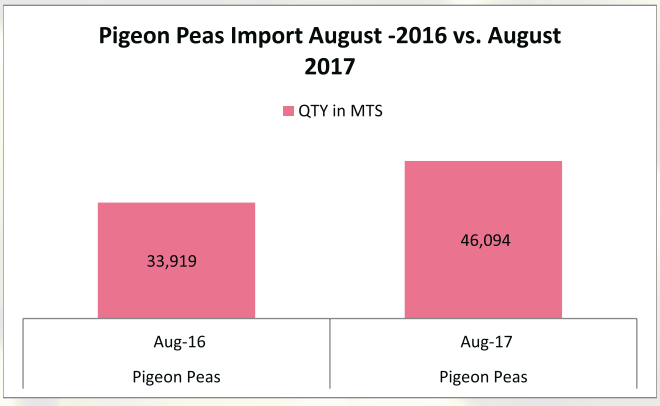

Black Matpe Import September - 2016 vs. September 2017
QTY in MTS
7,553
33,014
Sep-16
Black Matpe
Sep-17
Black Matpe

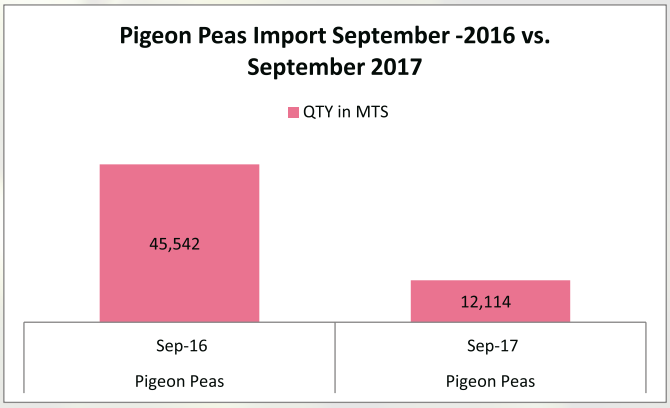

Chickpeas Import August -2016 vs. August 2017
QTY in MTS
29,091
89,188
Aug-16
Chickpeas
Aug-17
Chickpeas


Chickpeas Import September -2016 vs. September 2017
QTY in MTS
26,975
14,3184
Sep-16
Chickpeas
Sep-17
Chickpeas


Lentils Import August -2016 vs. August 2017
QTY in MTS
60,309
61,995
Aug-16
Lentils
Aug-17
Lentils


Lentils Import September -2016 vs. September 2017
QTY in MTS
19,668
16,855
Sep-16
Lentils
Sep-17
Lentils


Pigeon Peas Import August -2016 vs. August 2017
QTY in MTS
33,919
46,094
Aug-16
Pigeon Peas
Aug-17
Pigeon Peas


Pigeon Peas Import September -2016 vs. September 2017
QTY in MTS
45,542
12,114
Sep-16
Pigeon Peas
Sep-17
Pigeon Peas

B2B meeting session with pulse producers and seed companies from Argentina

Suhas Prabhu

The Consulate General & Promotion Centre of the Argentine Republic in Mumbai successfully organized a B2B seminar between Indian & Argentine companies on the 14th of September in The Trident Hotel, Mumbai. This mission is part of a series of commercial promotion activities aimed at diversifying the destination of Argentine exports to the Asian market.

The delegation was headed by Mr. Jesus Silveyra, Undersecretary of Agricultural Markets of the Ministry of Agro Industry of the Argentine Republic. The event took place within the framework of the Commercial Mission organized by the Argentine Ministry of Foreign Affairs, the Ministry of Agribusiness of the Nation and the Argentine Agency for Trade and Investment, and included 15 Argentine companies of pulses, vegetable oils, animal feed, fresh fruit and juices, wines, agricultural

machinery, corn, olives and olive oil.

The Argentine exporters met more than 120 Indian companies, with more than 350 business meetings taking place, resulting in around 200 requests for quotations from the Indian counterparts. Overall, the mission included the B2B session, Institutional Meetings and visits to local counterparts. The event was attended by representatives of India's most important trade bodies, including but not limited to the Indian Pulses & Grains Association (IPGA), the All India Association of Industries (AIAI), the Confederation of Indian Industry (CII), and the Indian Merchants Chamber (IMC).

India is one of the fastest growing markets in the world and that is reflected in the high demand for food and beverages. India is, for example, the largest importer of pulses in the world, the Indian imported

wine market grew by 16% in 2016 and it is estimated that olive oil imports increase by 20% in 2017 reaching 13,700 tons.

Over 40 member companies of the IPGA participated in the event, given the joint bilateral efforts in promoting the sourcing of pulses from Argentina over the past few years. This follows the successful delegation of the IPGA's Executive Committee to Argentina in April 2017, where they were briefed about the country's pulse producing potential.

During this same mission, the IPGA and Argentina's Ministry of Agro Industry signed a historic Letter of Understanding for cooperation in the field of production in Argentina and marketing of pulses in India. The next steps will include technology transfers of pigeon peas and black matpe seeds to Argentina, and continued complimentaries under the India-MERCOSUR Preferential Trade Agreement.

Agricultural Statistics Division
Directorate of Economics & Statistics
Department of Agriculture, Cooperation and Farmers Welfare
First Advance Estimates of Production of Foodgrains for 2017-18

As on 22.09.2017

Million Tonnes

Crop	Season	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17		2017-18	
															1st Advance Estimates	4th Advance Estimates	Targets	1st Advance Estimates
1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	20
Rice	Kharif	78.62	72.23	78.27	80.17	82.66	84.91	75.92	80.65	92.78	92.37	91.50	91.39	91.41	93.88	96.39	94.50	94.48
	Rabi	9.91	10.90	13.52	13.18	14.03	14.27	13.18	15.33	12.52	12.87	15.15	14.09	13.00		13.76	14.00	
	Total	88.53	83.13	91.79	93.36	96.69	99.18	89.09	95.98	105.30	105.24	106.65	105.48	104.41	93.88	110.15	108.50	94.48
Wheat	Rabi	72.16	68.64	69.35	75.81	78.57	80.68	80.80	86.87	94.88	93.51	95.85	86.53	92.29		98.38	97.50	
Jowar	Kharif	4.84	4.04	4.07	3.71	4.11	3.05	2.76	3.44	3.29	2.84	2.39	2.30	1.82	2.42	1.85	2.75	2.15
	Rabi	1.84	3.20	3.56	3.44	3.81	4.19	3.93	3.56	2.69	2.44	3.15	3.15	2.42		2.72	3.00	
	Total	6.68	7.24	7.63	7.15	7.93	7.25	6.70	7.00	5.98	5.28	5.54	5.45	4.24	2.42	4.57	5.75	2.15
Bajra	Kharif	12.11	7.93	7.68	8.42	9.97	8.89	6.51	10.37	10.28	8.74	9.25	9.18	8.07	8.55	9.80	9.50	8.66
Maize	Kharif	12.73	11.48	12.16	11.56	15.11	14.12	12.29	16.64	16.49	16.19	17.14	17.01	16.05	19.30	19.24	19.00	18.73
	Rabi	2.25	2.70	2.55	3.54	3.85	5.61	4.43	5.09	5.27	6.06	7.11	7.16	6.51		7.02	7.00	
	Total	14.98	14.17	14.71	15.10	18.96	19.73	16.72	21.73	21.76	22.26	24.26	24.17	22.57	19.30	26.26	26.00	18.73
Ragi	Kharif	1.97	2.43	2.35	1.44	2.15	2.04	1.89	2.19	1.93	1.57	1.98	2.06	1.82	1.85	1.40	2.00	1.61
Small Millets	Kharif	0.56	0.48	0.47	0.48	0.55	0.44	0.38	0.44	0.45	0.44	0.43	0.39	0.39	0.34	0.42	0.50	0.33
Barley	Rabi	1.30	1.21	1.22	1.33	1.20	1.69	1.35	1.66	1.62	1.75	1.83	1.61	1.44		1.74	1.90	
Coarse Cereals	Kharif	32.22	26.36	26.74	25.61	31.89	28.54	23.83	33.08	32.44	29.79	31.20	30.94	28.15	32.45	32.71	33.75	31.49
	Rabi	5.39	7.10	7.33	8.31	8.86	11.49	9.72	10.32	9.58	10.25	12.09	11.92	10.37		11.48	11.90	
	Total	37.60	33.46	34.07	33.92	40.75	40.04	33.55	43.40	42.01	40.04	43.29	42.86	38.52	32.45	44.19	45.65	31.49
Cereals	Kharif	110.84	98.59	105.01	105.78	114.55	113.45	99.75	113.73	125.22	122.16	122.70	122.34	119.56	126.33	129.10	128.25	125.96
	Rabi	87.45	86.64	90.21	97.30	101.46	106.45	103.70	112.52	116.98	116.63	123.09	112.53	115.66		123.63	123.40	
	Total	198.28	185.23	195.22	203.08	216.01	219.90	203.45	226.25	242.20	238.79	245.79	234.87	235.22	126.33	252.73	251.65	125.96
Tur	Kharif	2.36	2.35	2.74	2.31	3.08	2.27	2.46	2.86	2.65	3.02	3.17	2.81	2.56	4.29	4.78	4.25	3.99
Gram	Rabi	5.72	5.47	5.60	6.33	5.75	7.06	7.48	8.22	7.70	8.83	9.53	7.33	7.06		9.33	9.75	
Urad	Kharif	1.20	0.95	0.90	0.94	1.12	0.84	0.81	1.40	1.23	1.43	1.15	1.28	1.25	2.01	2.17	1.85	2.53
	Rabi	0.27	0.38	0.35	0.50	0.34	0.33	0.42	0.36	0.53	0.47	0.55	0.68	0.70		0.63	0.75	
	Total	1.47	1.33	1.25	1.44	1.46	1.17	1.24	1.76	1.77	1.90	1.70	1.96	1.95	2.01	2.80	2.60	2.53
Moong	Kharif	1.43	0.81	0.69	0.84	1.25	0.78	0.44	1.53	1.24	0.79	0.96	0.87	1.00	1.35	1.62	1.65	1.32
	Rabi	0.28	0.25	0.26	0.28	0.27	0.26	0.25	0.27	0.40	0.40	0.65	0.64	0.59		0.55	0.65	
	Total	1.70	1.06	0.95	1.12	1.52	1.03	0.69	1.80	1.63	1.19	1.61	1.50	1.59	1.35	2.16	2.30	1.32
Other Kharif Pulses	Kharif	1.18	0.61	0.54	0.70	0.96	0.80	0.49	1.33	0.93	0.62	0.71	0.77	0.72	1.06	0.86	1.00	0.86
Other Rabi Pulses	Rabi	2.48	2.32	2.31	2.29	2.00	2.23	2.31	2.27	2.40	2.73	2.53	2.77	2.47		3.02	3.00	
Total Pulses	Kharif	6.16	4.72	4.86	4.80	6.40	4.69	4.20	7.12	6.06	5.91	5.99	5.73	5.53	8.70	9.42	8.75	8.71
	Rabi	8.74	8.41	8.52	9.40	8.36	9.88	10.46	11.12	11.03	12.43	13.25	11.42	10.82		13.53	14.15	
	Total	14.91	13.13	13.38	14.20	14.76	14.57	14.66	18.24	17.09	18.34	19.25	17.15	16.35	8.70	22.95	22.90	8.71
Total Foodgrains	Kharif	117.00	103.31	109.87	110.58	120.96	118.14	103.95	120.85	131.27	128.07	128.69	128.06	125.09	135.03	138.52	137.00	134.67
	Rabi	96.19	95.05	98.73	106.71	109.82	116.33	114.15	123.64	128.01	129.06	136.35	123.96	126.47		137.16	137.55	
	Total	213.19	198.36	208.60	217.28	230.78	234.47	218.11	244.49	259.29	257.13	265.04	252.02	251.57	135.03	275.68	274.55	134.67

Tinna Trade Limited (TTL) is part of well diversified TINNA GROUP, established over four decades ago. Tinna is one of the leading Agri Trading company and is engaged in trading of Agri Commodities in the Indian and International Markets.

The Company's commodity basket includes Yellow Peas, Chick Peas, Green Peas, Lentils, Pigeon Peas, Wheat, Maize, Soya Oil, Mustard, Soya bean, Sunflower meal etc.

TTL'S primary focus is in bringing agriculture produce directly from producers of Canada, Australia and Black Sea Region.

TTL also acts as exclusive agent of Lansing in India , Lansing founded in 1922, is a leading independent commodity merchandising company. Lansing's headquarters is in Kansas, USA and have offices across the United States, in Brazil, China, Canada and the United Kingdom. Lansing trades Whole Grains, Feed Ingredients and Energy products via all modes of transportation in North America and Internationally.

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