PULSES HANDBOOK 2016

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Foretell
Business Solutions

2016
INTERNATIONAL
YEAR OF PULSES

Celebrating the International Year of Pulses 2016

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<tr>
<th>Pressure</th>
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<tr>
<td>Consumption</td>
<td>15-50 Ltr/sec (32-110 cfm) approximate, depending upon the rejection rate.</td>
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**ELECTRICAL REQUIREMENT**

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<th>Voltage</th>
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<td>Frequency</td>
<td>50 Hz</td>
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<td>Power</td>
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Dear Readers,
Greetings and best wishes!
We are truly delighted to bring out the "Pulses Handbook 2016" on the momentous occasion of the "International Year of Pulses 2016". We are thankful to the Global Pulse Confederation (GPC) for permitting us to launch this Handbook at their annual conference in Cesme, Turkey.

The Handbook has two sections. Dominant is the section on research articles and interviews. The section comprises a broad selection of research themes ranging from production, productivity improvement, processing, warehousing and logistics, nutrition, innovation and marketing, awareness creation and so on. While the contribution from India dominates, there is an impressive list of contributors from the rest of the world as well. For me two key messages emerge from these articles (1) there is a need to increase investment in R&D in pulses by ten folds and (2) the growth momentum in pulses demand is sustainable in a world increasingly conscious of health, environment and sustainability issues. I thank all the contributors for their passionate efforts and am sure you would appreciate it as well. The second section of the handbook is the data section. I thank the teams at Foretell for their efforts.

Every edition of the printed Handbook reaches out to over 3000 companies across the world. Besides, we reach out to over 25000 users through digital versions (pdf, e-book etc). This year, we also plan to bring out a Hindi-version of the Handbook for the first time. All these would not be possible without the support of our sponsors and advertisers. We look forward to their support in continuing the efforts for the development of the pulses industry.

A couple of pointers to the pulses industry stakeholders. Stable prices are fundamental to stable growth in demand. Steep price increase as well as high price volatility in pulses seen in recent times could pose a challenge to sustainable demand growth. The industry must address this issue on a top priority. Second, for an industry of this size and diversity, there needs to be institutional market mechanisms including exchange traded products for transparent price setting and efficient price risk management.

We wish all the efforts and programmes initiated during IYP2016 create enough impact that would sustain and develop the pulses industry in the years to come. Once again wishing all the pulses stakeholders a very promising year ahead filled with inclusive development and growth agenda.

Best wishes

G Srivatsava

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World is Racing to Copy the Success of India’s Packaged Food Segment

Ms. Robynne Anderson, President, Emerging Ag Inc, Secretariat to GPC IYP, is of the opinion that we need to ignite the passion for pulses around the world to increase the consumption of pulses. Pulses are healthy and great on fibre, and can help manage diseases like cancer and diabetes. Excerpts...

Congratulations for grand launch of IYP. IYP ship has sailed smoothly under your leadership. Brief us your IYP experience so far.

IYP has been the project co-ordinated by United Nations and supported by GPC since its inception. We had 38 different countries engaged in activities around the year. We have reached 250 million people via twitter & other social media about the importance of pulses.

We have seen Government like India take a really hard look at what is needed to support the pulse sector and better produce pulses.

We have examined the issue of pulses in Africa and what is needed to kick start the productivity question issues there.

New York academy of sciences dedicated entire day to the focus on how we can better articulate the nutritional benefits of pulses and the nutrition research that is needed to happen to further our understanding of just how beneficial they are for things like health, protein and iron deficiency.

Your contribution to agriculture and food sector is outstanding. How do you see the future of this sector?

The Agriculture sector is very vital in the sense of being absolutely necessary to feed, clothe and house people. It is also vital in the sense it is continuing to change and adapt.

Agriculture has a disproportionate number of the world’s poor. As we know, about one third of world’s population are farmers and about half of the world’s poor are farmers. So we bear in agriculture and food too much of the proportion of poverty in the world.

I think there has been very concerted attention over past 5 years to look at what is needed to change that cycle. And to make sure that the people who are producing food have the means, tools, the research knowledge to be able to produce food successfully and produce in a manner it gets some dignity, which is alarming and provide food that people want.

We need another 5-10 years of absolutely continuous global focus on this issue. My biggest worry is that people begin to take their minds off the needs of agriculture and we are going to see agriculture sector fall back off the priority agenda, when we need to keep on it.

Pulses health benefits are limitless. But the consumption of pulses remained still below recommended doses, across globe. What is your view on this issue? What measures are needed to be taken to increase pulses consumption?

In terms of increasing pulses consumption, one of practical things needed is for pulses to be sexy and appealing again.

It is too easy to fall into notion that pulses are your grandmother’s food, old fashioned food, but in fact it is modern food. They are ancient food which meets every modern need. They are more sustainable, they produce protein to meet the vegetarian diet, they increase fibre in our diet and they are the exact solution we need at this time.
So what we need to do is to ignite the passion for pulses around the world to increase the consumption of pulses. In some cases, like in India, we need to address the systemic issues that are making their accessibility, the challenge via price and production issues.

International Year of Pulses has selected four core themes like creating awareness, food security, nutrition & innovation, market access & stability, productivity & environmental sustainability. How do you want to see their impact on pulses industry in the long run?

The four themes are really meant to reflect the life cycle of pulses. So starting with food security, nutrition and innovation, we need to make sure that we have the ability to feed people effectively. To understand the nutrition benefits of those pulses, we are expecting the designated committee to help in identifying innovative new products that will increase the use of pulses. For instance, India just conducted its competition for innovative new pulse products with university teams from around the country competing. In Jaipur, we saw successful winner selected. Bansal, and Saurabh Agarwal used adzuki beans, red split lentils, black gram and other ingredients to create “Adzuki Coins” – a wonderful new snack. “The depth of the innovation and creativity was striking,” said Pravin Dongre, Chairman of the IPGA. “It was an honour to recognise the team from Bangalore among the 36 entries initially received. This is one step on the nutrition side of food security and IPGA will also be working to increase productivity in pulses in India – a vital issue to national and international food security.” It was an honour to be there.

This kind of completion is happening in 8 countries around the world. We hope to see great ideas that can get marketed for wonderfully raised pulses.

In terms of creating awareness, there is a focus on the ways the people can use pulses, there benefits in their diets. That includes things like recipes, practical advice on how to cook them effectively and addressing the time factor sometime involved in cooking the pulses.

Productivity & environmental sustainability is really about creating a virtuous, continuous cycle with pulses. So increasing productivity, and making sure that pulses are produced in a way that it supports environment to the maximum extent possible, is really part of continuing to feed the world in the most sustainable manner we can achieve.
During Earth Hour, World Wildlife Federation people were asked to shut off their lights and they were encouraged to have a candle light meal with a wonderful pulse dish this year. The recipe was developed by Jenny Chandler. We think it is a perfect client to see energy consumption and sustainable food put together into constructive hour around the world.

How individual or group from particular country can involve in IYP?
We have about 38 countries where there are national committees. So if you are interested in being involved in IYP, we would certainly connect you to your national committee. If you are in country where national committee doesn’t exist, we can help you get started in your country. You can just drop us a note at IYP@emergingag.com.

66 pulses great dishes are chosen around the world, including 34 Indian dishes. Explain us about the National Signature Dishes.
This was great opportunity for everyone to feature the diversity of pulse dishes around the world. A wonderful range of dishes in India exists and we wanted to recognise the diversity in India, which is the biggest consumer of pulses in world. It was agreed that India should have one per state while all the rest of the world have submitted on National Dishes. They cover everything from Greek Lentil Soup to very modern Taco dishes from United States, that diversity shows just how exciting pulses can be.

If you go on to pulses.org, the website, you will find videos, pictures and in fact many hundreds of other pulses recipes online available to you, to make good use of pulses in your daily diet.

Brief our readers about low-carbon recipe prepared with Red lentil, tomato & rosemary soup with goat’s cheese toastie at WWF’s “Earth Hour”.
During Earth Hour, World Wildlife Federation people were asked to shut off their lights and they were encouraged to have a candle light meal with a wonderful pulse dish this year. The recipe was developed by Jenny Chandler. We think it is a perfect client to see energy consumption and sustainable food put together into constructive hour around the world.

IYP is very popular and active trough several social media tools under #PulseFeast, #LovePulses, #IYP2016, #PulsePledge, etc. Kindly explain our readers about the impact created on social media along with its importance?
Social media response has been tremendous over the course of 2016. We have already reached 250 million people via social media and we couldn’t be more pleased with that level of engagement.

We are also seeing that engagement through specific projects like the Facebook page, the Pulse Pledge initiative, and through more than 1100 media stories.
What is your view on pulses research funding?

Pulses research funding is just simply too low. When you look at the funding that other major crops get - like corn is probably getting more than a billion dollars a year, pulses are nowhere near that. All 13 pulse crops together get approximately $175 million dollar a year. So we effectively need 10-fold increase in pulse research funding.

Developed countries like Canada, Australia, US have seen significant growth in food sector. How do you see their growth in pulses domain?

Those countries are working very hard to increase their per capita consumption of pulses. There is some early indication that the efforts are paying off, but we have to look at it as a 5-10 year project. As we know pulses are healthy and great on fibre, and can help manage diseases like cancer and diabetes. So we hope that 2016 will be rocketing their success forward in this area.

Pulses are consumed for its health benefits, which is part of regular diet. What is the progress made in making pulses as innovative food products, particularly in the packed food segment?

Pulses are great way to add protein into a number of packaged foods. We are seeing few trends: we certainly are seeing some pulses added into products like pasta and also in Canada here we had a launch of cookies that have beans in it.

There are some very large food ingredient companies that are working on extrusion of pulse products that allow them to be incorporated them easily into snack food. They are reporting very good update in their work. We are also seeing some interesting discussions about pulses as a way to deliver flavourings and taste sensations; those are all very new initiatives. The place we were seeing most success in the packaged food segment, particularly in India where pulses are a common snack food. The rest of the world is racing to copy the success of India’s sector in this area.

We wish IYP to bring prosperity to you and pulses sector. What is your message to our readers?

GPC and IPGA had so much foresight to engage with International Year of Pulses (IYP). I hope this year is the launching pad for the pulses sector to be out there, proactively engaging with scientists, consumers, and government officials, to talk about ways to make pulses a more successful part of diet.

I hope echo of 2016 lasts for many many years and fosters the great fortune, success and good health for everyone involved in pulses.

---

Upcoming Events of IYOP 2016

- **Global Pulse Convention**
  From May 19, 2016 until May 22, 2016 at Sheraton Hotel Cesme, Izmir

- **Sustainable and Self Sufficiency in Production of Pulses through an Integrated Approach**
  From May 21, 2016 until May 22, 2016 at UAS Bangaluru, Karnataka, India

- **Beans Beans, Chelsea Flower Show, Discovery Stand**
  From May 23, 2016 until May 28, 2016 at London, England

- **Haricots & Co competition**
  On May 25, 2016 at University of Geneva, Geneva, Switzerland

- **Pojtie Cook-Off**
  On May 27, 2016 at AGT Foods Africa, Krugersdorp, South Africa

- **INRA Meeting on Grain Legumes (Francophone)**
  From May 31, 2016 until June 01, 2016 at Dijon, France

- **IFPRI Pulse Event**
  From May 31, 2016 until June 01, 2016 at New Delhi, India

- **IV Congresso Nacional de Feijão-caupi (4th National Congress of Cowpea)**
  From June 07, 2016 until June 10, 2016 at Sorriso-MT, Brazil

- **Germinating Pulses and sharing a warm lentil stew**
  On June 21, 2016 at Montevideo, Uruguay

- **NSTF Awards**
  On June 30, 2016 at South Africa

- **Plant & Animal Genome Conference**
  On July 01, 2016 at Asia

- **“Ospria Festum 2k16” - Carnival of Pulses**
  From July 01, 2016 until July 02, 2016 at RBVRR College for Women, Hyderabad, India

- **Lithuanian pulses event**
  On July 05, 2016 at Kedainiai, Lithuania
We See our Role as being Complementary to that of Government’s NAM Programme

Mr. Samir Shah, Managing Director and CEO, NCDEX, has revealed how ReMS Ltd, a joint venture between NCDEX e-Markets Limited and Government of Karnataka has become instrumental to implementing agriculture marketing reforms in the state and bring in efficiency and transparency in price discovery to benefit farmers and other market participants. The adoption of FSSAI standards by NCDEX helped to improve the quality of all other commodities including pulses in the physical market significantly. Excerpts...

NCDEX is India’s premier agri-commodity exchange. It is the only platform that has been successful in running the chana futures contract. How has chana futures contract helped the stakeholders, including farmers? How closely is the chana futures market linked to spot markets, especially to the spot markets in the production centres?

Chana is the only pulse trading on the futures platform and has attracted wide and active participation from all segments of the value chain participants including processors and importers. In absence of tur, urad or other pulses on the futures platform, the price of Chana has become the bellwether parameter for the entire pulses basket in the country. This is largely due to the fact that the price discovery of chana happens in a regulated, transparent and national platform like NCDEX. The price signals from NCDEX help the entire pulse community including farmers, who are able to negotiate better with their local buyers. The resultant impact has been an increase in holding capacity of farmers and reduction of distress sale.

Another big impact of futures trading has been the reduction in price volatility. If we compare the price rise and volatility in chana to that of non-exchange traded pulses, it is evident that chana has showed higher price stability. During Sept/Oct 2015, the price rise in Chana was almost half as compared to the price rise in other pulses like Tur & Urad. So futures mechanism acts as a shock absorber of sorts and helps stabilise prices.

Further, being delivery based contracts; it is completely anchored to the underlying spot markets which is evident from the convergence of futures and spot prices at expiry.

NCDEX through its spot exchange has done exceptional work on Tur in Gulbarga. Could you briefly highlight the work done and lessons learnt? Is there a potential opportunity to replicate the
AGRICULTURE AND FOOD
DELIVERING VALUE ALONG THE SUPPLY CHAIN

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WHEN YOU NEED TO BE SURE
success of Tur in other agro-commodities?
NCDEX does not have a spot exchange anymore. The erstwhile NCDEX Spot Exchange is now NCDEX e Markets Ltd.

The Gulbarga project was a pilot that we initiated in 2010-11 to modernise the tur mandi which has now taken the shape of a full fledge programme which is a very strategic priority of Karnataka state government.

The initial learning’s from the Gulbarga project gave birth to a new organisation, namely Rashtriya e Market Services Private Ltd. (ReMS). Rashtriya e Market Services Private Limited (ReMS) a joint venture of Karnataka Government and NCDEX e Markets Limited has taken the successful learning’s from Gulbarga across 105 markets spread across 27 districts in Karnataka which are linked by the United Market Platform (UMP). Before the end of the year, all 157 markets in the state will be operational under the UMP.

The initial indicators of the reforms process have shown enhanced transparency in the price-discovery mechanism — farmers are getting computerised bills and SMS with their trade details. Arrivals to the markets have increased from within and outside the State. Quality and price awareness among farmers has increased. There is a better price realisation for farmers compared to the prices prevailing in earlier years. Due to complete tracking & transparency, revenue for the state coming out of APMC cess has gone up, allowing the state to re-invest the earnings for further development of APMC capabilities.

Due to its inclusive nature, all the stakeholders have significantly benefited from this transformation project. It has not only earned accolades from the Central government but has also inspired other states. We are also helping Andhra Pradesh and Gujarat to reform their agricultural marketing infrastructure. Some of these reforms will help remove supply chain bottlenecks. So what began with Tur in Gulbarga is reaching markets across different states and commodities.

Quality management of agri commodities is the highest priority of food sector. NCDEX has put in a lot of efforts in standardising quality parameters? Could you elaborate the initiatives on standardisation of quality in pulses?
Standardised nature of futures contracts and the NCDEX thrust on quality has helped alleviate the quality of produce arriving in the markets. Over the years, NCDEX quality has become a well-accepted benchmark for various commodities, with variants to this quality being priced at a discount / premium to NCDEX. Increased awareness among farmers that produce meeting NCDEX specifications will fetch better prices has resulted in them taking efforts to align their produce to NCDEX specification. Cleaning & sorting of produce at farm gates is now helping them fetch better prices.

Another, major thing is the adoption of FSSAI standards for all the agriculture commodities including pulses. With NCDEX adopting these standards in 2013; the quality of all commodities in the physical market including pulses has seen significant improvement. The ripple effect was seen across the entire chain; farmers began to align themselves to FSSAI standards, storage infrastructures were scaled up, the whole market began to conform itself.

So, I think the quality standards of NCDEX combined with the efforts to align its standards to FSSAI standards, has brought a big paradigm shift in quality of produce.

NCDEX is spearheading Rashtriya e-market services. Brief our readers about Rashtriya e-market.
ReMS Ltd is a joint venture between NCDEX e-Markets Limited (NeML, a 100 percent subsidiary of NCDEX) and the Government of Karnataka where both NeML and state government, having equal shareholding. The Chief Secretary of Karnataka is the Chairman of the company. The company is responsible for
implementing agriculture marketing reforms in the state and bring in efficiency and transparency in price discovery to benefit farmers and other market participants.

ReMS offers automated auction and post auction process (weighing, invoicing, market fee collection, accounting, payment of sale proceeds directly to farmers), assaying facilities in markets, facilitate warehouse-based sale of produce, facilitate commodity funding, price dissemination, bring about secondary market development and capacity building for stakeholders.

ReMS has already roped in more than eighteen lakh farmers on its electronic platform, who usually sell their produce through APMCs. More than 1800 lakh quintals of commodities valued at more than Rs 19000 crore have been transacted on Karnataka’s electronic platform.

Assaying services have been started in 10 markets as a pilot and will be taken up in other markets in a phased manner. Automated cleaning and grading machinery will also be installed in these APMC markets, where the farmers’ produce will be machine cleaned and packed before sale. Warehouse-based sale will also be taken up this year. This will provide the farmer the option of storing his produce in CWC and Karnataka State Warehousing Corporation for few months instead of selling it within a few days of getting it to the mandi. So, farmers no longer need to sell out of distress.

Introduction of warehouse based sales, grading and assaying; direct payments to the farmer’s bank account are some of the big initiatives of ReMS that have shown immense transformative effect on agriculture marketing in Karnataka.

Hon. Prime minister of India has chartered plan for Unified National Market for Agriculture Commodities. What will be the role of NCDEX in this programme?

The National Agriculture Market (NAM) is a policy initiative of the Hon. Narendra Modi government, aimed at creating a transparent unified national market for agri produce, giving greater security to farmers and offering better returns for their produce.

Having its learning’s in the Karnataka model, as documented in the Economic Survey 2014, the foundation of NAM was laid down and the technology platform was launched on April 14, 2016. The electronic platform under NAM is being created through special software developed by the agriculture ministry and the same is provided to each mandi—which agrees to come on board—free of cost. There are some basic criteria for a state to integrate into NAM. For instance, the concerned state must amend its APMC Acts by bringing in provision for electronic trading. Besides, states must provide a single licence to anyone willing to trade through NAM in a local mandi. The central government is offering a subsidy of Rs.30 lakh per market to the State governments to implement NAM.

Karnataka continues to be the leaders and pioneer in creating robust, transparent electronic platform for agricultural markets. After Karnataka, we are also working with Andhra Pradesh and Gujarat state governments on similar objectives. I am sure, Karnataka, AP and Gujarat models will be guiding factors for NAM in terms of best practices.

With states being critical to the success of NAM, we see ourselves playing the role of helping the state governments transform their markets to align with the requirement of the Prime Ministers’ project. With our learning’s in Karnataka, Andhra Pradesh and Gujarat, which are ahead of the transformational curve, we will be able to extend the best practices therein to other states as well.

So we see our role as being complementary to that of the government, where we continue to focus at the state level.

2016 has been declared as International Year of Pulses (IYP) by the UN. What is your message to the pulses community at this time?

The pulse trade has seen significant amount of volatility in the last 18 months, from the days when the pulses were quoting below MSP, almost at Rs. 2600-2700/quintal in case of Chana to Rs. 5500/quintal at present. The pulses community needs to be deal with the resultant price risk.

Hedging the exposure on exchange platform is the best way to insulate against price volatility in pulses. With their high correlation to the underlying spot prices, NCDEX Chana futures are an extremely effective tool to reduce physical market risks. Hedging will help reduce and eliminate price risk, ensuring stable cash flows for their businesses.

Hence inculcating a culture and discipline of hedging in their business is extremely important for the pulses industry.

Union Budget 2016-17 has advised SEBI to look into the possibility of launching new products. Should we expect options and Index futures in commodities?

There is surely a need to deepen this market and to increase liquidity therein through new products and participants. SEBI has formed the Commodity Derivatives Market Advisory Committee (CDAC) and we are part of this group. We are working very closely with the committee to help SEBI evolve the recommendation and the frameworks for the new products. We look forward to new products being introduced which will help in the robust development of the commodity markets.
GAFTA is Made for Trade

Ms. Jaine Chisholm Caunt, Director General, GAFTA, shared GAFTA’s role in international trade. Excerpts...

What led to the formation of GAFTA?
The origins of Gafta go back to 1878 with the creation of the London Cattle Trade Association and the London Corn Trade association. Both organizations were established with the primary purpose of establishing common trade rules to facilitate trade. Gafta was created in 1978 when the two organizations merged. For those interested in finding out more about the early history of Gafta, I recommend they read Food for Man and Beast – the story of the London Corn Trade association, the London Cattle Food Trade Association and the Grain and Feed Trade Association 1878-1978, by Hugh Barty-King Hutchinson Benham Ltd 1978.

What are the services offered by GAFTA?
Gafta provides six key services for members:
• Contracts
• Arbitration
• Trade Policy
• Education and Training

Pulses are shipped to India from various source countries from Canada, US, East Africa, China, Malaysia, etc. There are multiple parameters like trade regulations, quality standards, shipping period, Exporters-Importer payment disputes, GMO and non-GMO issues, etc. How has GAFTA managed to deal with such complexities?
Gafta has established a number of committees such as the International Contracts Policy Committee, which the Indian Pulse & Grain Association is a member of and Gafta’s International Pulse Committee, where we can consult with members on key issues to the Trade. Gafta then makes representations to policymakers through its trade policy service. Gafta also works as a member of international coalitions such as the International Grain Trade Coalition and the International Agri-Food Network on cross-cutting issues that affect the trade such as GM, LLP, Codex and MRLs and e-documents.

We came to know that 80% of world’s Grain such as Rice, Wheat etc. shipment happens under GAFTA contract design. How has GAFTA managed to achieve this?
Gafta has 138 years of experience of designing standard forms of contract and trade rules, and establishing arbitration principles for trade disputes. This and working closely with our members has stood us in good stead throughout changing times.

What are the new challenges faced in terms of Contracts, Arbitrage, Trade Assurance and Trade Policy?
Lots! To name just a few:
• Increased role of regulators affecting many aspects of trade and supply chains plus role of international sanctions
• Geo-political tensions in key regions
• Market volatility and increased financial regulation for markets
• Growing world population and changing patterns of demand for food
• Labelling requirements on food, increased pressures for traceability throughout the supply chain
• Public perception of technologies such as GM
• Climate change and adaptability
• Increasingly complex and legalised environment for arbitration Gafta needs to be increasingly nimble and responsive to adapt its services to meet these challenges.
Market Insights on Chana/Peas, Tur, Urad, Lentils, Moong

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Kabuli Chickpeas Scenario

Mr. Bhavin Mehta Kunvarji, Director at Kunvarji Group

• Top Producers: India, Mexico, Australia and Canada.
• Top Buyers from India: Pakistan, Algeria, Sri Lanka, Turkey and UAE.
• Lower production during this Rabi season, significant decline in carry-in stocks (5,000 tonnes Vs last year’s 45,000-50,000 tonnes) and continuing good demand remained supportive for the prices besides the peak export month.
• This Rabi Kabuli production is estimated lower at around 3.8 – 4.0 lakh tonnes as against 4.5 lakh tonnes last year amid decline in sown area in Malwa region of Madhya Pradesh.
• Overall the exports of Kabuli during the fiscal 2015-16 would remain lower by 5-6 percent to around 1.8 lakh tonnes as against previous year’s 1.9 lakh tonnes due to shortage of inventory stocks.
• Spread between both variant of Chickpea has expanded towards 66.7 percent versus 11.8 percent of February. Indian government’s efforts to prevent rising prices of Desi Chana by higher imports, also to be blamed for higher spread between these variants.
• Mexican Kabuli is quoted at premium of USD 120 than Indian origin which would further attract buyers to switch to Indian origin. Overall, the prices of Kabuli to remain firm in medium to long term this season due to tight supply in India.

• Basically, export trend of chickpea in India will be strong in the coming year, supported largely by depreciating rupee and overall festive season.
• Indian currency faces threat of weakening against dollar if FED changes their stance on rate decision; will push up landed cost of import; together with tight supplies can be factors for positive trend of pulses.

Major participants of the KABULI CHANA:

<table>
<thead>
<tr>
<th>Producing Belts</th>
<th>Importers</th>
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<tbody>
<tr>
<td>India</td>
<td>Pakistan</td>
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<tr>
<td>Mexico</td>
<td>Algeria</td>
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<td>Australia</td>
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<td>Iraq</td>
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<td>UAE</td>
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</table>

India’s Major Producing States:

Crop calendar:

- Global chickpea production calendar
- Source: ICAR, MAE, GoI
Factors affecting Prices
- Rainfall level and level of moisture in the soil
- Festival demand
- Weather conditions in India, Australia and Canada
- Crop situation in the countries from where India imports the crop
- Prices of the other competitive pulses
- Ending stocks available at Warehouses
- Production data from India, Mexico and Australia

Kabuli Chana Balance Sheet
India is the largest producer of Chickpea followed by Australia, Pakistan, Turkey and Canada. Australia surpassed Pakistan and Turkey to become the second largest Chickpea producing nation within a short period. The effect of weakening rupee on this industry is fairly obvious, especially on imports and exports. Some of the countries that India exports chickpea to are the US, the UK, Saudi Arabia, UAE, Sri Lanka and Malaysia. Nevertheless, it should be noted that the government has limited export of kabuli chana.

Since Indian households are major consumers of this pulse, the export demand for chickpea increases leading up to Islamic and Hindu festivals as does the domestic demand. With Dussehra in October month and Diwali in November, local demand is expected to improve. However, prices are to remain stable as sowing is likely to be good on account of ample rains. It is believed that concerns over spoilage of the crop due to unseasonal rains will support prices, though some transactions may be traded at lower end. Basically, export trend of chickpea in India will be strong in the coming year, supported largely by depreciating rupee and overall festive season.

Kabuli Chana Balance Sheet (Metric tonnes): India and Mexico

<table>
<thead>
<tr>
<th>Kabuli Chana Balance Sheet</th>
<th>India</th>
<th>Australia</th>
<th>Mexico</th>
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<tbody>
<tr>
<td>2014/15 Opening Stock</td>
<td>2.5</td>
<td>1.1</td>
<td>0.05</td>
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<td>2015/16 Opening Stock</td>
<td>1.0</td>
<td>0.05</td>
<td>0.05</td>
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<tr>
<td>2014/15 Production</td>
<td>63.0</td>
<td>50.3</td>
<td>4.5</td>
</tr>
<tr>
<td>2015/16 Production</td>
<td>4.5</td>
<td>3.8-4.00</td>
<td>4.05</td>
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<tr>
<td>2014/15 Import</td>
<td>7.0</td>
<td>13.9</td>
<td>5.5</td>
</tr>
<tr>
<td>2015/16 Import</td>
<td>5.5</td>
<td>4.05</td>
<td>4.05</td>
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<tr>
<td>2014/15 Total Supply</td>
<td>72.5</td>
<td>65.0</td>
<td>10.05</td>
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<td>6.5</td>
<td>4.05</td>
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<tr>
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<td>71.4</td>
<td>64.6</td>
<td>2.70</td>
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<td>6.46</td>
<td>2.70</td>
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(Ref: Trade estimates, Fig in Lakh tonnes)
This Rabi Kabuli production is estimated lower at around 3.8 – 4.0 lakh tonnes as against 4.5 lakh tonnes last year amid decline in sown area in Malwa region of Madhya Pradesh. Besides, demand from stockiest/traders also reported well amid ongoing peak export month and anticipation of higher exports due to decline in Mexican Kabuli production. Kabuli chana exports which was behind against last year has increased during Apr- Dec period, which is almost at par with last year’s around 1.56 lakh tonnes and is expected that the overall exports would surpass last year’s total export of around 1.9 lakh tonnes this season to over 2.1 lakh tonnes mark.

Kabuli Balance Sheet (Metric tonnes): India and Mexico

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(Ref: Stat pub)

Mexico is the key competitor of Kabuli for India, but this season the production of Mexican Kabuli is estimated much lower at around 80,000 – 85,000 tonnes as compared to last year’s around 1,25,000 tonnes due to which demand is expected to switch for Indian origin, which may remain supportive for the prices.

As per sources, currently the Mexican Kabuli is quoted at premium of USD 120 than Indian origin which would further attract buyers to switch to Indian origin. The exports of Kabuli during April-Nov. 2015-16 stood at 1.34 lakh tonnes, down 7.3% from same period last year. Slowdown in export is mainly attributed to higher availability internationally and mainly in Australia (the leading chickpeas exporter) due to which the overseas demand has shifted from India to Australia. The trade is anticipating that overall the exports of Kabuli during the fiscal 2015-16 would remain lower by 5-6% to around 1.8 lakh tonnes as against previous year’s 1.9 lakh tonnes.

Prices that Mexican farmers see (in pesos) are favorable and should encourage planting. The only hitch is that areas in the far northwest of the country where garbanzos are grown have seen below average rainfall this fall, and that could limit acreage. Even if the 2016 Indian and Mexican Kabuli crops turn out okay, they won’t arrive on the market until the harvest around March. With limited supplies of old-crop Kabulis available until then, there’s little chance of a drop in prices in the short-term.

India Kabuli Chana Balance Sheet (Lakh tonne):
Kabuli chana gained sharply by around 55 percent at the benchmark Indore market of Madhya Pradesh during current month amid lower production estimates and good domestic and exports demand. The commodity was priced at INR 9300/100kg on April 20, 2016 as against INR 6,000 on February 29. Lower production estimate this Rabi season, significant decline in carry-in stocks (5,000 tonnes Vs last year’s 45,000-50,000 tonnes) and continuing good demand remained supportive for the prices besides the peak export month.
Indian March month export seen at highest levels since January 2014, as Indian Kabuli export demand seen rising trend. Also Indian prices remained comparative at lower levels than major peer Mexico. Pakistan is the largest buyer of Kabuli chana accounting for exports worth USD 103,150,526 followed by United States and Sri Lanka which imported Kabuli chana worth USD 50,016,714 and USD 30,924,652 respectively. Nhava Sheva Sea accounted for 74.6% of exports followed by Mundra and Pithampur which account for 23.9% and 0.8% of exports respectively. Kabuli chickpeas on the other hand, are not as widely consumed as Desi chickpeas and its consumption is restricted mostly to northern India and that too within certain sections of the population.

Meanwhile, currently the average total arrival in Madhya Pradesh is around 30,000 tonnes, down from the same period last year’s 40,000 tonnes. According to the third advance estimate, Rajasthan agriculture Department lowers down Chana production estimate to 9.99 Lakh tonnes which is 17% lower than targeted estimate. Targeted estimate was 12.07 Lakh tonnes. India’s import prices of Chana likely to remain at discount levels versus export prices, as India only exports Kabuli variant of Chana. Import prices likely to remain stable at current level. While the export prices likely to remain at premium levels.

Spread between Desi Chickpea and Kabuli Chickpea

Spread between Desi Chana prices and Kabuli Chana prices have expanded to the highest levels due to fear of stock shortage. Kabuli demand across the world seen rising, while stock to use ration also improved faster pace than Desi Chana prices. Spread between both variant of Chickpea have expanded towards 67 percent versus 11.8 percent of February. Government of India’s measures to prevent rising prices of Desi Chana by higher imports are also to be blamed for higher spread between these variants.

As per the sources, Kabuli area in Shajapur, Sheore and Dewas districts declined as farmers shifted the Kabuli area towards Desi Chana and wheat sowing this Rabi. That will affect both Kharif and Rabi season production prospects on the Indian subcontinent, as well as weather during growing and harvest periods in North America and Europe. So considering all these factors, we expect Chana to be Long-term Bullish in both Futures and Spot market.

Outlook:
Overall, the prices of Kabuli to remain firm in medium to long term this season due to tight supply in India and in Mexico as well as anticipation of higher exports from India. Moving ahead export demand during the Mar-Apr would remain crucial for prices, so, need to be closely observed. Kabuli Chana production of India during the ongoing season 2015-16 is expected to remain lower due to decreased sowing area in some key growing districts of Madhya Pradesh. The farmers have shifted back to other remunerative crops from Kabuli due to year-on-year dwindling exports and higher carry-in stocks led to lower realization to farmers.

According to trade estimate, overall the crop would drop around 15% at 3.82 lakh tonnes as compared to last year’s 4.50 lakh tonnes. Opening stocks are also fell significantly this year to around 5,000 tonnes as compared to 45,000 – 50,000 tonnes a year ago as traders liquidated their stocks locally due to growing export demand as well as longer holding of the stuff. Strong dollar and weak Indian rupee likely to remain supportive factor for Indian Kabuli export prices. Another concern is the evolution of the weather, including the decline of the current strong El Nino event and emergence of a La Nina event, as the next most important factor in deciding the size of harvests during the last half of the year.
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In 2016, the ‘International Year of Pulses’, the Australian pulse crop area could reach record levels. Australian growers have strong confidence in pulse grain production and are increasing the sown area to take advantage of the strong demand in international markets.

Market conditions are generally good for all pulses, with exceptional market support for chickpeas and lentils likely to extend through to the 2016 harvest. Additionally, cereal markets are currently soft, making pulses relatively more profitable on Australian farms.

Pulse production has increased dramatically in Australia in the last 5 years in all major pulse crops grown. Chickpea remains the dominant crop however significant production gains have also been recorded in faba bean, lentil, field pea, mungbean and lupin. [See graph] The vast majority of all pulse grain grown in Australia continues to be exported.

Australian pulse area, production and value

Soil moisture conditions from April through to June will determine the final sown area in each region and for each commodity for the coming season. The favourable market will encourage pulse seeding even if soil moisture is less than desired as a below average yield will still be a profitable result.

Interest in chickpea production is very high in Queensland and northern New South Wales in response to the solid to high pricing, and expected lower returns from the traditional barley and wheat crops. However, soil moisture in many paddocks in the region is 50 per cent or less the required starting soil moisture for reliable chickpea production.

Significant areas on the Darling Downs and Western Downs experienced soaking rain in late April that will support chickpea sowing in May–June.

Crop prospects in southern New South Wales are reasonable after some good rainfall at the end of January (70–80 mm) and in early March (40–60 mm).

Most famers have been vigilant with weed spraying over summer to retain sub-soil moisture and there are indications that everything is on schedule for a good season. Bureau of Meteorology (BOM) predictions are still for above average autumn rainfall and temperatures, which should encourage a full cropping program for the region.
As wheat and canola prices are only average, there has been a heightened level of enquiry about the prospect of pulses, especially chickpea, faba bean and lentil. It is likely that there will be increases in the area sown to these crops. Prospects are also good for lupins (albus lupin and Australian sweet lupin) with good local markets for fish and dairy pellets, but the area is likely to be similar to recent years.

Very hot, dry conditions across southern NSW in early April may influence sowing intentions for early sown crops such as lupins and faba beans. After significant droughts in recent years many farmers are likely to opt for lower risk crops such as wheat and canola, where they have options for grazing or baling if the prospects for harvest are compromised. Stock prices (sheep, cattle) and wool are all excellent, while cropping is the higher risk at present and pulses are at the high end of that production risk.

In Victoria, the timing and intensity of the opening rains will dictate the 2016 area sown to pulses. With subsoil moisture well below what is required and very dry conditions over summer for Victoria’s Wimmera and the North Central and in the South East of South Australia, growers are looking for a strong seasonal break to commence the cropping season with confidence. Subsoil moisture and confidence is higher in other South Australian districts.

Pulse production will fluctuate across the states depending on the usual factors of rainfall timing and amount, cash flow and sensitivity to risk.

- Lupin area could increase if it is a dry start, however in a wet start, the lupin area will be similar to 2015.
- Lentil has the greatest growth potential across both states and this is primarily driven by the forecast price.
- Chickpea area could experience the greatest setback if it remains dry.
- Faba bean could further expand across Victoria’s North East and South West regions (higher rainfall and lower alkaline to acid soil regions).
- Field pea area is steady but potential could decline with a switch by growers to vetch and vetch/hay.

In Western Australia, extensive rain in late March has saturated paddocks in the lower Geraldton, Kwinana, Albany and Esperance port zones. The northern Geraldton zone, north of Three Springs to Ajana and east to Mullewa, has recorded falls of around 25 mm in the first week of April but the moisture at depth is low due to a total lack of summer rain.

While not guaranteeing anything concerning the production potential, this situation effectively removes the risk of wide-scale crop failure and lays the foundation for average season potential. Strong market support will see a rise in the area sown to field pea and lupin. It is expected that the entire lupin area would be sown by the end of April, mostly into damp soil but with dry sowing likely in the northern Geraldton zone.

The early and extensive rainfall also brings risks to cropping this season. Extensive rain was recorded in the lower Albany and Esperance zones in January, which has created a ‘green bridge’ for insects and has heightened the possibility of aphid borne viruses posing a production and grain quality risk.

In the lower Albany zone, soils are generally saturated. The risk of prolonged water logging and delays to seeding and weed spraying is also a significant risk to ultimate yield potential.

Aside from the northern region of the Geraldton zone, the break to season need only provide around 15 mm of rain for growers to be confident of at least average yield potential for the 2016 season.

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Taking Pulse Production to a Higher Level

Ms. Robynne M. Anderson, Secretariat to the Global Pulse Confederation IYP 2016

The United Nations International Year of Pulses (IYP) has demonstrated pulses require a lot more attention. During the opening ceremony of the IYP signature event in Morocco this April, Margret Thalwitz, Chair of Board of ICARDA set the scene, noting that pulses are the critical staple food for over 1 billion people and are recognised as replacement for animal protein, yet pulses remain a neglected ‘Orphan Crop’, under-utilised with rather meagre funding for research.

Whilst average pulse yields have increased 35% in the past 40 years, this is still inadequate as demand for pulses outstrips supply (in same period, cereal yields increased 300%).

This view is reflected in the discussions at all the signature events, including the Pulses Conclave in Jaipur in February. There speakers highlighted that pulse trade has been of increased importance to India as two years of poor harvests have reduced domestic production. India produced 17 million tonnes of pulses in the past 2 years – a drop of 2 million tonnes from normal, due to poor harvests. The challenges in pulse production have been an ongoing issue as pulse crops have received less support and engagement.

To increase pulse production, pulses will need 10 times more research funding, said Huseyin Arslan, Chairman of GPC. India plans to move from 18.25 million tonnes of pulse production to 21 million tonnes in 2017-18 and 24 million tonnes in 2020-21, said Dr. J.S. Sandhu of the Indian Council of Agricultural Research. The government’s goal is to achieve nutritional security, not just food security.

According to Dr. David Bergvinson, head of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) other changes also need to be made to reach this goal. He stated that there is a “strong need to bring rice-fallow land into pulses production, add 4 million acres to Indian production.”

Dr. Mahmoud Sohl, head of the International Center for Agricultural Research in the Dry Area (ICARDA) reiterated these messages. There will be sustainable productivity intensification gains if RICE FALLOW is double or treble cropped. Indian Rice is grown July-Oct and fallow can be avoided if pulses are grown Nov-Feb and Sesame March-May. This potentially brings 11 million hectares in India into increased productivity, potentially increasing farmer revenues at current market prices by Rupee 30,000/ha ($450/ha), as well as pulse nitrogen fixation boosting yield of subsequent rice crop. Bangladesh has 1.2 million hectares of Rice Fallow where bio-fortified Lentils are being grown to counter anemia in children and reversing arsenic poisoning from contaminated ground waters. In Nepal, ‘no till drill’ techniques have been adopted, where 800,000 farmers are drilling seed directly into rice fallow stubble which gains time and increases the soil’s bio-mass, benefiting follow-on cereal crops.

Bergvinson also noted pulse storage needs to be closer to farmers and pulse processing should be improved to reduce losses.
Taking up these calls to action, the Indian Pulse and Grain Association signed an agreement with ICRISAT to further pulse productivity in India.

The laudable plans to increase production will still require significant trade in the foreseeable future. At this time, it is important to keep the trade rules predictable. Trade has not been able to keep pace with the production drops according to Mr. G. Chandrashekhar at the Pulses Conclave. Strong statements about the importance of the trade and its commitment to furthering the pulse sector are needed around the world.

The Government of India has sent a strong signal with its commitments to domestic production. Now we need to see others step up their engagement. Many important national initiatives and international centres of excellence like CGIAR, a global research partnership, and ‘stalwart’ funders such as USAID and the Gates Foundation are engaged, but the need is great.

“Even with the limited funding supporting pulses research, several CGIAR Centers including ICARDA, ICRISAT, CIAT and IITA have developed many improved varieties and technologies to promote pulses production but these need to find their way to farmers’ fields,” said Solh. “Part of the reason for the limited expansion of pulses production is the high subsidies given by Governments to cereals at the expense of pulses. Thus, farmers prefer to grow cereals although pulses are becoming now cash crops in developing countries. India should be commended for being the first country giving subsidies now to pulses also which is expected to change the picture”.

The global pulse research survey also highlights the geographical areas of decline, such as Europe, where despite a long tradition of pulse crop consumption and a ‘good general knowledge of the benefits of pulse crops to rotation’, there has been ‘increasing concern in the European agricultural community over the decrease in agricultural interest in pulse crops’ and a decline in research funding.

The survey shows a broad consensus on what research priorities should be. “With investment in crop improvement and agronomy research, pulses can be made resilient to climate change as well as diversify income sources for farmers. Focused research efforts creating expanded value-added marketplace for pulses will generate new market opportunities for farmers to make farmers prosperous as well as modernize our food system to become more sustainable, equitable and nutritious,” says ICRISAT’s Bergvinson.

“In addition to governments and funders stepping up their commitments to research, we need a 10 year strategy on pulse research to ensure there is sharp focus in the spending of these dollars,” adds Arslan.

We have got to get pulses to a higher level of investment as a long term impact of the International Year of Pulses.

END
Endnote: Join the conversation @LovePulses #LovePulses #iyp2016 and visit www.pulses.org www.iyp2016.org
Saskatchewan - Home To A Vibrant and Growing Agriculture Industry

Mr. Mortoza Tarafder, Director - Agri-value
Saskatchewan Trade and Export Partnership (STEP)

The Province of Saskatchewan is located in the central prairie region of Canada. One third of the province is comprised of farmland (217,000+ sq km) representing 44% of Canada’s arable land. With this land capacity and over 100,000 lakes, Saskatchewan is a major player in the world’s food supply.

Agriculture is the root of Saskatchewan’s economy and accounts for over one-third of the province’s total exports. Home to 36,000+ farm operations and employing 50,000+ people in the industry, Saskatchewan is Canada’s largest producer of grains and oilseeds. From producers to food manufacturers, dealers to millers, Saskatchewan’s agricultural sector is vibrant and strong for the following reasons:

• Saskatchewan is the world’s leading exporter of: dry peas, lentils, wheat, canola seed, canola oil, flax seed, mastered, canary seed and oats

• Saskatchewan is Canada’s leading agri-food exporter with international sales reaching over $13 billion in 2015.

• Saskatchewan exports in the province’s key sectors (cereal grains, oilseeds, pulses and edible oils) total more than $1 billion each.

• Saskatchewan agri-food markets are highly diversified with exports of more than $200 million to each of 14 different countries including the United States, China, Japan, Turkey, Mexico, Bangladesh and India.

In 2014, Saskatchewan producers were responsible for exporting:

• 98 per cent of Canada’s lentil exports
• 93 per cent of Canada’s pea exports
• 90 per cent of Canada’s canary seed exports
• 87 per cent of Canada’s durum exports
• 83 per cent of Canada’s flaxseed exports
• 70 per cent of Canada’s chickpea exports
• 62 per cent of Canada’s oat exports
• 57 per cent of Canada’s mustard exports
• 56 per cent of Canada’s canola meal exports
• 52 per cent of Canada’s canola oil exports
• 49 per cent of Canada’s canola seed exports
• 47 per cent of Canada’s barley exports
• 38 per cent of Canada’s non-durum wheat exports

In 2014, Saskatchewan producers were responsible for exporting:

• 71 per cent of the world’s canary seed exports
• 65 per cent of the world’s lentil exports
• 55 per cent of the world’s pea exports
• 39 per cent of the world’s durum exports
• 36 per cent of the world’s oat exports
• 36 per cent of the world’s flaxseed exports
• 25 per cent of the world’s mustard seed exports
• 24 per cent of the world’s canola meal exports
• 21 per cent of the world’s canola seed exports
• 17 per cent of the world’s canola oil exports
5 per cent of the world’s non-durum wheat exports
3 per cent of the world’s rye exports
3 per cent of the world’s barley exports

Source: World Trade Statistics (subject to revisions)

Agriculture and Agri-Food Canada’s (AAFC) outlook report suggests that for 2016 - 2017, the area seeded to grains is forecast to decrease slightly compared to 2015 - 2016 while the area seeded to both oilseeds and pulse crops increases. In Western Canada, the area in summer fallow is forecast to continue its downward trend which will open up some area for seeding with crops. For all crops, average or trend yields have been assumed. Total crop production is forecast to increase slightly although total crop supply is anticipated to decrease marginally due to lower carry-in stocks. The production and supply of grains and oilseeds (G&O) in Canada is forecast to decrease slightly while the production of pulses and special crops (P&SC) is expected to increase significantly. For G&O, carry-out stocks are expected to decrease to a level which is about 20 percent below the 10-year average. For P&SC, carry-out stocks are forecast to increase and be about 40 percent above the 10-year average. In general, world grain prices are expected to be pressured downward by abundant supplies of grain at the global level. The impact on grain prices in Canada, however, will be mitigated by the low value of the Canadian dollar which is forecast at about C$1.33 per US dollar.

For 2016 -2017, the Chickpeas area seeded is forecast to rise from 2015 - 2016 because of lower carry-in stocks and the potential for good returns relative to other crops. As a result, production is expected to increase to 100 kt. However, supply is forecast to decrease sharply from last year due to the lower carry-in stocks. Exports are forecast to fall this year and carry-out stocks are expected to decrease sharply. Lentil area seeded in Canada is expected to increase slightly while the production of pulses and special crops (P&SC) is expected to increase significantly. For G&O, carry-out stocks are expected to decrease to a level which is about 20 percent below the 10-year average. For P&SC, carry-out stocks are forecast to increase and be about 40 percent above the 10-year average. In general, world grain prices are expected to be pressured downward by abundant supplies of grain at the global level. The impact on grain prices in Canada, however, will be mitigated by the low value of the Canadian dollar which is forecast at about C$1.33 per US dollar.

Increasing global demand for food, feed, and fuel will require a growing value-added agriculture industry. This is achieved by processing primary agricultural products and increasing the value of the primary products. Producers have successfully produced more organic products, extracted new products out of the raw commodity, revised the packaging and thereby added value to the raw commodities. The positive results show an increase in the economic value of the products and result in a higher return to exporting companies. Saskatchewan is currently home to 300+ food processing companies and 1,000+ certified organic producers. The world class Food Industry Development Center

Inc., located in Saskatoon, Saskatchewan is a non-profit organization offering full service assistance to food processors wanting to add value to their products for domestic and/or international markets. Their services include food processing, innovative food development, extrusion technology, industry training, and pathfinding resources. The Center also plays a key role in food development, technology transfer, and process technology. With an expected move to a larger facility in 2017, the Center will continue to play a strong role in the development of Saskatchewan’s value-added sector.

Saskatchewan Trade and Export Partnership (STEP) exists to increase Saskatchewan’s exports to existing markets and new markets by initiating sales, contracts and projects for Saskatchewan exporters. Operating as a government/industry partnership, the non-profit, membership based organization champions Saskatchewan’s export industry, assists businesses realize global marketing opportunities and provides tailored services/programs. One third of the STEP membership is from the agriculture industry and approximately 20% of those STEP members represent the value-added agriculture sector. This vibrant sector includes members conducting international business with a cross section of products including flour, protein, starches, nutraceuticals, functional foods, organic cereals, meat, fruit/fruit based products and specialty foods. STEP continues to work with these members to help grow their international markets.
The past year has been an incredibly dynamic period for pulse markets, as strong demand and tight supplies have driven prices to record levels. Multiple events have led to this, with perhaps the most important being consecutive disappointing pulse crops in India. Canada tried to do its part in 2015 with the largest lentil seeded area ever seen on the Prairies, while pea area was big as well. But dry conditions through the first half of the year trimmed yields from what had initially been hoped for. Total pea production was below average and was confirmed by Statistics Canada’s April 21st seeding intentions report.

All of this sets the stage for the 2016 growing season in Canada. Pricing opportunities for farmers are below what they were selling much of their 2015 crop for, but were still offering very attractive returns. This is particularly the case given the somewhat marginal outlook for other planting alternatives, most particularly cereals. Growers will respond by planting more Prairie acres to pulse crops than one would have thought imaginable just a few years ago. This had been expected by the industry over the past few months, and was confirmed by Statistics Canada’s April 21st seeding intentions report.

The government projected that 5.14 million acres of lentils will get planted in 2016. There was a wide range of trade estimates going into the report, but the figure was roughly in-line with expectations. This will be a record by a wide margin. For comparison, 2015 plantings of 3.95 million acres were already a record and this is an additional 30% increase. The five year average for lentil plantings is just below 3 million acres.

### Table 1. Canadian Lentil and Pea Production

<table>
<thead>
<tr>
<th></th>
<th>Seeded Area (million acres)</th>
<th>Production (million metric tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016 (est)</td>
<td>2015</td>
</tr>
<tr>
<td>Lentils (total)</td>
<td>5.14</td>
<td>3.95</td>
</tr>
<tr>
<td>Reds</td>
<td>3.65</td>
<td>2.89</td>
</tr>
<tr>
<td>Large Green</td>
<td>1.05</td>
<td>0.73</td>
</tr>
<tr>
<td>Small Green</td>
<td>0.38</td>
<td>0.26</td>
</tr>
<tr>
<td>Peas (total)</td>
<td>4.25</td>
<td>3.68</td>
</tr>
<tr>
<td>Yellow</td>
<td>3.75</td>
<td>3.13</td>
</tr>
<tr>
<td>Green</td>
<td>0.56</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Assuming an average yield of 24.8 bushels per acre (bu/acre), this would extrapolate to a total lentil crop of 3.34 million metric tonnes (MMT). This would result in a total increase of production of 40% when considering the higher seeded area and an improvement in yield from last year’s below-average outcome of 22.2 bushels per acre (bu/acre).

Statistics Canada doesn’t provide a breakdown of the various types of lentils until their June report. But our own estimates are for 3.65 million acres of red lentils, which is over 70% of the total lentil area. This compares to 2.89 million acres of red lentils in 2015 and a five-year average of 1.71 million acres. Depending on yields, we are anticipating red lentil production to reach 2.473 MMT, compared to 1.764 MMT in 2015 and more than double the longer term average of close to 1.1 MMT.

There are several reasons why red lentil acres will see a relatively larger increase in plantings than other types of lentils. First, red lentils can be grown in a wider range of areas in Western Canada than large or small green lentils. Considering that lentil acres were already very heavy in the core growing region, much of the growth in seeded area is coming from the more peripheral areas. In most cases this means that reds are the only viable option if farms want to plant lentils.

Second, growers tend to have a lower risk of quality problems with red lentils relative to large and small green lentils. In cases where farmers are planting lentils in marginal areas are inexperienced in lentil production and are growing them for the first time in several years are pushing the crop rotation in an effort to maximize acres due to frothy prices, the lower quality risk in red lentils is an important consideration.

However, these same reasons are also why we may see some risks to yield and quality with this summer’s crop. When looking across all types of lentils, the long term average is for approximately 75% of the crop to grade as #1 or #2. However, this will vary from one year to the next. For example, 2010 and 2014 saw less than 40% of the crop make the top two grades. This has caused us to slightly reduce our yield expectations from what they would have been if plantings were restricted to the more traditional areas. Weather, of course, is by far the biggest determinant for yield and quality, but the ripple effects of such an aggressive increase in area need to be considered.

Large green lentils should grow to 1.05 million acres, compared to 750,000 acres last year and a longer term average of 942,000 acres. We project this will translate into 624,000 tonnes of production, an increase of 45%. While a sizeable increase year-over-year, Canada planted over a million acres of large green lentils each year from 2010 to 2012, meaning the 2016 crop won’t be unusually...
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large from a historical standpoint. With essentially no inventory remaining going into harvest, we don’t believe that large green lentil supplies will be burdensome in the 2016/17 marketing year.

Small green lentils will also see a sizeable increase to 380,000 acres, compared to 260,000 acres in 2015. An anticipated production level of 238,000 tonnes is above the normal core demand, but a lack of old crop carryin and an anticipated strong shipping window until the end of the 2016 calendar year will help to support prices.

Pea production is also poised to increase substantially in 2016, although not in quite as dramatic a fashion as lentils. Total seeded area is set to hit 4.25 million acres. This is a 15% increase from 2015, and a new record. But Prairie seeded area came in just below 4 million acres in 2008 and 2014, so plantings are not far above what we have seen before in the past.

However, a rebound in yield from 2015’s dryness reduced levels means we are anticipating a bigger jump in total production. Our estimate is for a total crop size of 4.3 MMT, 34% above the 3.2 MMT grown last year, and comparing to a five-year average production level of 3.36 MMT.

As with the lentils, Statistics Canada did not provide a breakdown between yellow and green peas. Our own projections are for all of the increase and more, to be in yellow pea acres. Expectations are for 3.75 million acres of yellow peas, compared to 3.1 million acres last year. Production could hit 3.8 MMT, compared to 2.63 MMT in 2015.

Green peas, on the other hand, are the one pulse crop that will see a reduction in seeded area in Canada in 2016. Massive overproduction in 2014 carried over into the 2015 season, leaving green pea bids lagging those of yellow peas by a significant margin. In turn, farmers are reducing the acres committed to green peas. Our projection is for 500,000 acres, compared to 580,000 acres grown in 2015 and the record-large 825,000 acres planted in 2014 that led to the oversupply. The smaller production will allow the excess inventories to get worked down over the course of the 2016/17 marketing year.

As we consider the expectations for seeded area and potential production outcomes, farmers and traders are contemplating some important factors that are uncertain today, but will ultimately be critical drivers for values going forward.

First, obviously, is the weather. Analysts typically go into the growing season projecting trend line yields, but of course the end result can vary widely. Even a modest swing in yields will have a much larger impact than any minor changes to seeded acres in future official reports. It’s still very early, but there are parts of the Prairies that are concerned about early season dryness and other areas that have had too much rain. There is time for conditions to improve, but this will be watched closely. Barring a weather disaster, the huge increase in plantings will all but assure a production increase, but questions about what the final totals will be won’t be known until harvest. And the fact that the old crop carryin is very small for nearly all pulses means that there is no cushion to offset any yield shortfalls.

Weather in other countries is important as well. Canada may be the world’s largest exporter of peas and lentils, but countries such as France, Australia, the former Soviet Union, and others are also increasing their production and export presence and will impact the market dynamics moving forward.

Demand will also play a huge role in how well these additional supplies will be absorbed by the market. There have already been major export commitments that have been made for the post-harvest shipping window, with more business likely to be done between now and then. The result is a period through the final months of the 2016 calendar year where huge supplies intersect with big demand and record-large volumes of product change hands. This may help keep prices reasonably well supported in the period immediately after harvest, although how exactly this all unfolds remains to be seen.

Whether this strong pace of demand can continue into early 2017 relates closely to the size of production in other regions. India is such a critically important export market for Canadian pulses. What will the import demand be like as we move into the winter months, particularly if the monsoon rains improve as expected? If Canadian shipments to India fall off sharply into January and February, will other important export destinations pick up the slack? Green lentils and green peas have a more diverse export destination mix, but red lentils and yellow peas may be somewhat more vulnerable to Indian buying interest, specifically.

The 2016 growing season and marketing year is setting up to be another exciting one for pulses. Production will increase and demand will be strong, creating a dynamic marketplace overall. In some ways perhaps this is fitting in the context of the UN declaring 2016 the International Year of Pulses.

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Are Pulses the real “Superfoods”?  
A Relook at the Nutritive and Economic Values of Pulses in Processed Foods  

Mr. Raghavan Sampathkumar

Globally, pulses are important sources of protein for vegetarians and non-vegetarians alike and are essential ingredients in everyday food. Beyond consumed in traditional forms (whole, split or flour), pulses play an important role in the food processing sector as easily available and economic sources of protein, dietary fiber and starch. Though numerous studies worldwide proved superiority of pulses over other competing sources for the above nutrient components, utilization of pulses in processed foods remains relatively limited. Reasons that may perhaps be holding the major food processing companies from investing in R & D to bring new and innovative products to the market include varied preferences from consumers in different markets, technology available for milling and fractionation of components, its costs vs benefits and importantly, the estimated market potential for novel products made incorporating pulse fractions.

This article attempts to briefly highlight some of the emerging portends in global health and consequent changes in dietary patterns along with the opportunities for the food processing companies through better utilization of pulses to augment their product portfolio. It is important to note that 2016 is being celebrated as the International Year of Pulses (IYOP).

Portends in global health and changing dietary patterns

Many technological breakthroughs fueled primarily by the industrial revolution resulted in enormous growth in incomes, economic prosperity and population longevity across the globe. But as a report by WHO points out, non-communicable diseases (NCD) have taken over the communicable diseases (e.g. malaria) as the major cause of deaths in this century. Cardio-vascular diseases (CVD) including stroke emerged at the top among the deadliest. Both developing and developed countries face huge challenges of varying degrees from more non-obvious but dangerous health related conditions leading to coronary diseases particularly diabetes. Up to 80% of heart disease, stroke, and type 2 diabetes and over a third of cancers could be prevented by eliminating risk factors, such as unhealthy diets and promoting better eating habits, of which pulses are an essential component, according to WHO. Others include sedentary lifestyle, physical and mental stress, lack of physical activity, malnutrition, obesity etc. As these diseases started conquering the world, people started their quest for solutions through medicines that paved way for huge growth in global pharmaceutical sector. As incomes grew, so did the share of consumption of processed foods across the world. However, as years passed, governments worldwide especially in developed countries, started realizing the true hidden cost of public health risks such as obesity and diabetes and their dangerous consequences in demographic, economical and public health fronts. Similarly, as medical and nutritional experts started emphasizing on prevention than cure, the world’s quest for “health through food” presented greater opportunities that are not only attractive in terms of return on investments but invaluable good image and reputation for the companies such as Nestle, Danone, HJ Heinz and DSM etc.

Global Business of Healthy Foods

In line with the emergences of the life-style related problems globally, leading companies fine-tuned their products to fulfill the needs of the consumers. Diet beverages having less calories, foods containing low fat, low-Sodium, low-sugar and foods rich
in fiber, minerals, vitamins and protein are best examples for this. Worldwide trends in all the markets show greater prospects for healthy foods as about 68% of Canadian and American consumers consider nutrition an important factor while purchasing food products. A report on food processing sector in Middle-East reveals that almost a third of all new product introductions had health or nutritional claims of some sort. New products with “low fat/reduced fat” claims out of the total new products released in 2010 accounted for about 5% in UAE, 4.5% in Saudi Arabia and 4% in Egypt. One must note that there are numerous other health propositions that can be included in the processed foods. A similar trend is shown in the Indian baby food market by Datamonitor that products with “high protein” and “No Transfat” claims accounted for nearly 11% each out of the total new product launches in 2008. These numbers prove that awareness about health and wellness among majority of the global middle-class and above socio-economic categories mostly living in the urban areas (consuming a higher proportion of processed foods than their rural counterparts) is definitely growing. There are opportunities waiting to be capitalized by innovative products and solutions for the companies worldwide.

Using Pulse fractions to enrich and differentiate traditional food products
Enhancing the protein profile of foods that are typically rich in carbohydrates (e.g. noodles, pasta and a wide variety of grain-based breads) presents enormous opportunities particularly in countries that not only face huge protein malnutrition problem but a sizeable health-conscious population. China is moving well ahead in using pulse fractions particularly starch, in making traditional noodles and vermicelli. These kinds of variants are suitable for markets where consumers are typically calorie-conscious but less willing to make any compromise in taste, texture and appeal of their traditional foods. Developing countries (e.g. India and Indonesia) with their huge middle-class population and impressive economic growth are very attractive markets at present and in future as consumption of processed foods is directly correlated to income growth. Products that are customized to these large markets can become instant success and help any company gain a strong foothold in these markets. The Canadian International Grains Institute (CIGI) is a pioneer institution involved in utilizing pulse fractions into making reformulated pastas, noodles and vermicelli without affecting their original traditional taste, texture and importantly optimizing cost of production with value and premium it would derive in the marketplace. For example, the reformulated pasta with 25% lentil flour qualifies to be labeled “Good source of protein” under the health laws in Canada, which traditional pasta made of 100% durum wheat cannot claim in the marketplace.

Health, Pulses and Associated Business Opportunities
Numerous research projects across the world prove that pulses are to be included to make any food healthy. Some of the properties of pulses that can be claimed on the labels of food products are given below.

<table>
<thead>
<tr>
<th>Value Propositions</th>
<th>Description / Properties</th>
<th>Target consumer segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesome and nutritious</td>
<td>Pulses rich in protein (about 23%), dietary fibre (at least 15g per cup) and essential elements needed for humans such as folate, amino acids, vitamins, minerals such as potassium and iron and are less in fat (1%).</td>
<td>Generally health conscious consumers incl. adults, children homemakers, nutritional experts etc; Niche segments such as sportsmen, athletes etc</td>
</tr>
<tr>
<td>Help in weight management</td>
<td>Clinical research over four decades prove that pulses moderate appetite and increase feeling of fullness and hence help in weight loss and maintenance.</td>
<td>Obese, overweight people; Niche segments such as sportsmen, athletes etc and people with special needs (e.g. diabetic)</td>
</tr>
<tr>
<td>Protein-rich</td>
<td>Protein content in different pulses range from 17 – 35% with several important amino acids.</td>
<td>Generally health-conscious consumers; People with special needs (e.g. body builders)</td>
</tr>
</tbody>
</table>
Global Link Between Producers & Consumers

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<table>
<thead>
<tr>
<th>Benefits</th>
<th>Description</th>
<th>Target Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help prevent chronic diseases</td>
<td>The US Dietary guidelines recommend 3 cups of dry beans per week (as meat alternatives) to prevent diabetes, heart diseases and cancer.</td>
<td>Generally health-conscious consumers; People with special needs (e.g. diabetes, obesity)</td>
</tr>
<tr>
<td>Diabetes control (or) Heart-healthy</td>
<td>Pulses have low glycemic index (GI) which makes them perfect foods for preventing and controlling serum cholesterol and other blood lipids.</td>
<td>Primarily diabetics; People with and those who have a high likelihood of having chronic heart diseases</td>
</tr>
<tr>
<td>Gluten-free</td>
<td>Pulses are typically gluten free so they are suitable for those allergic to gluten.</td>
<td>Gluten allergic</td>
</tr>
<tr>
<td>High-dietary fiber</td>
<td>Prevents Celiac diseases that affect the digestive system as pulses have 14-31 g of fiber per 100g of which 55-88% is insoluble which helps result in greater satiety and thus reduce energy consumption.</td>
<td>Generally health-conscious consumers; People with special needs (e.g. Celiac and other digestive diseases)</td>
</tr>
<tr>
<td>Anti-carcinogenic</td>
<td>Research in the US proved that consumption of pulses as a part of the diet help reduce the risk of cancer as pulses anti-cancer components such as selenium, saponins, isoflavones, protease inhibitors, lectins, phytases and zinc.</td>
<td>Generally health-conscious consumers; People with special needs (e.g. cancer incl. colon)</td>
</tr>
</tbody>
</table>

**Taste buds rule the world: Consumers Have the Last Word**

One must look at the above facts not simply as claims but valuable opportunities for innovation and product differentiation as health is becoming an indispensable factor influencing consumer purchase decision making w.r.t. processed foods across the world. Multinational companies are increasingly customizing their offerings according to the specific cultural, habitual, social and economic needs and preferences of the key markets and differentiating their offerings from their competitors through health claims. For example, in 2006, Nestle launched a variant of noodles in India enriched with pulses and whole wheat (dal atta) to enhance the protein profile of the typically carbohydrate dense food. However, the same company witnessed decline in sales when it tweaked its noodles in 1997 to a new formula, which the consumers did not like forcing it to revert to the old style again in two years. Similarly, Dupont Nutrition introduced its High-Fibre variant of bread with high emphasize on consumer sensory qualities. It is critical to match their preferences in taste, nutrition and importantly cost because changing consumer behavior is not easy and takes huge amounts of time, money and efforts and of course without any guarantee of a change. Hence success or failure of a product depends on the consumers’ acceptance.

While there are differences in the scope, value, size and prospects for each segment mentioned above in different markets, taking a customized approach for each market and sub-segments therein will be the key to success for any processed food product and company. Pulses, by their virtue of being wholesome, nutritious and healthy, make perfect ingredients waiting to be taken full benefit of.

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Protein Food Consumption Pattern of India, with Special Focus on Pulses Protein

Prof. Jagadish Pai, Executive Director, PFNDAI

Legumes are plants whose fruits are enclosed in a pod. There are a large number of legumes of different types. Legumes have the ability to fix nitrogen from air symbiotically with nitrogen-fixing bacteria and have high amount of proteins in their seeds. Some of the well-known legumes are masoor (lentils), toor (pigeon peas), green beans, peas, soya beans, groundnuts (peanuts) and chickpeas (chana). The term pulse is commonly used for legumes that are grown for the dry seeds so it does not include green beans and tender peas which are considered as vegetables. It also excludes soybeans and peanuts which are grown mainly for their oil.

Importance of Proteins

Proteins have many functions. They are used in building tissues for growth and are also used in replacing worn out or damaged tissue. Muscles, skin, hair etc. contain large proportions of proteins. Cellular structures contain proteins. As children grow new cells and tissues are formed that need proteins, so proteins are so important for children. Enzymes are partly or wholly proteins and they are present in cells catalysing various metabolic processes. Many hormones such as insulin have proteins and they regulate body composition. Antibodies are proteins important in immunity. Proteins are also needed for transporting O2, fat etc. Proteins are involved in clotting of blood and finally proteins are also source of energy. Thus proteins are important for all especially for growing children.

There are many sources of proteins including milk, meat, meat, fish, poultry, egg, cereals and important for Indians the legumes especially the pulses. Some of the dietary sources of proteins and their protein contents are given below

<table>
<thead>
<tr>
<th>Food</th>
<th>gm Protein/100g</th>
<th>Food</th>
<th>gm Protein/100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bajra</td>
<td>11.6</td>
<td>Soyabeans</td>
<td>43.2</td>
</tr>
<tr>
<td>Jowar</td>
<td>10.4</td>
<td>Almonds</td>
<td>20.8</td>
</tr>
<tr>
<td>Rice, milled</td>
<td>6.8</td>
<td>Cashew nuts</td>
<td>21.2</td>
</tr>
</tbody>
</table>

Whole wheat flour 12.1 Groundnut 25.3
Refined wheat flour 11 Groundnut cake 40.9
Bengal gram dal 20.8 Mackerel 18.9
Black gram (udad) dal 24 Pomfrets, white 17
Cow pea (chowli) 24.1 Prawn 19.1
Lentil 25.1 Chicken 25.9
Peas green 7.2 Mutton (lean) 21.4
Peas dry 19.7 Milk (buffalo) 4.3
Rajmah (kidney bean) 22.9 Milk (cow) 3.2

Source: Nutritive Value of Indian Foods, Gopalan & others, 1989

As can be seen non-vegetarian sources contain good amounts of proteins but as India has a large proportion of vegetarian population they must derive proteins from pulses & legumes, milk and their products, dry fruits and grains. Pulses contain mostly over 20% proteins can be excellent sources of proteins in our diets. Thus traditionally Indians have pulses especially dals as important part of their daily diets.

Consumption Pattern in India

In spite of such an eminent position of pulses in Indian dietary, according to an article in Hindu Business Line, pulses in India recorded less than 40% growth in production in the past 40 years while its per capita availability declined from 60g a day in the 1950s to 35g a day in the 2000s. Our production is around 18.5 million tonnes while our consumption is around 22 million tonnes, so in spite of being the largest producer of pulses in the world at about 24% of world production, we need to import about 3.5 to 4 million tonnes. This probably has increased the prices of pulses so poor people find it very difficult to meet their protein requirements.

Why are Pulses so Important to Indians

Pulses are to Indians as meats are to western world as we are mostly vegetarian and we derive most of our protein requirements from pulses. Pulses also have many other benefits. Since our tremendous economic growth in the past decade it has also brought in many of our new diseases which may be called non-communicable diseases such as hypertension, cardiovascular disease, diabetes etc. Although...
we are still far behind US, many western countries and China, we are rapidly catching up. One WHO study showed that 27% of Indians have raised cholesterol while 33% have raised blood pressure and 10% have raised blood glucose. These figures are growing every year.

Legumes especially pulses have been traditionally consumed by Indians and they have been shown to have beneficial effects on blood cholesterol as well as blood sugar. The proteins and dietary fibre in pulses have these effects. They also contribute to satiety so people do not overeat which may lead to obesity. Since we have been consuming less of pulses, more of refined grains and more of fat, overweight category of Indians have increased which also contributes to non-communicable diseases.

According to National Sample Survey Office’s (NSSO) 2011-12 data, although our per capita total calorific intake is lower than 2100 calories per day, our urban per capita protein intake has gone down from over to 60g to less than 56g while our per capita fat intake has gone up from 42g to over 52.5g. According to Indian Market Research Bureau (IMRB) survey conducted in seven major cities has found that over 80% of respondents were protein deficient. Of the respondents, 59% were non-vegetarian and deficiency was over 91% in vegetarians. The reason for this is changes in our eating habits due to our lifestyle changes and tremendous increase in pulse prices contributing to a significant level to this deficiency.

As per another report, Indian Consumer Market 2020, Indians have been having greater incomes in the last decade and they spent on five broad food categories namely, cereals, proteins food, fruits & vegetables, beverages & processed foods, edible oils and other foods. They spent one third on protein food of which over half (52%) is spent on milk but just 19% on pulses.

Since most Indians, consume a large amounts of cereals along with pulses e.g. roti and dal or rice with sambar or dal etc., combination of the two has an effect on the improving quality of the two. Both cereals and pulses have lower amino acid score or biological value, the mixture has an improvement as what is limiting in one is partly supplied by the other. Following figure gives idea of how yellow pea flour improves the quality of cereals such as wheat, oats, corn and rice.

Sweets are prepared using pulses including halva, laddoo, jalebi, mysore pak, pural poli, karanji, soan papdi and many more. However, people are now getting hooked to newer types of sweets which are becoming more popular which are based on cereals and cocoa as well as milk. Thus pulse consumption may decrease even more when pulse based sweets are substituted by others. However, there are many new ways of incorporating pulses so the sweets become healthier and these are becoming popular world over.

World Pulse Foods

Many products have been made and new products are appearing in the world market which are becoming popular because not only they are high in protein, high in fibre, also high in sustainability with much less water needed than any other agricultural produce. There are breads, cereals and baking products made with pulses, pasta and sauces, meat and dairy alternatives or extenders, snacks as well as beverages made with pulses.

Chick pea, lentils, pea and other bean flours have been mixed with wheat flour to prepare high protein and fibre breads, muffins, pancakes, and brownies. Similar ingredients have also gone into making sauces, pasta products etc. Batter and breading have been used for coating chicken nuggets, fish nuggets and many meat preparations. Several frozen desserts also use pulse flour and protein. A large number of tasty and nutritious food preparations recipe are available on popular websites as more people are interested in consuming pulses to reduce meats and to increase the fibres without sacrificing the amount of proteins.

Future

UN has declared 2016 as the International Year of Pulses (IYOP) to increase public awareness of the nutritional benefits of pulses. This allows us to focus on various ways to increase our pulse consumption together with our protein intake. Our intakes of fat and refined carbohydrates have gone up and out fibre and protein intake has come down. To solve this problem we need to use pulses in innovative ways as elsewhere in the world. If we do not want the scourge of heart diseases and diabetes we need to increase our pulse consumption. Government should also support efforts of farmers in increasing the production of pulses so we need not depend on imports and our domestic prices will be stabilised.
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Lupin: From Stockfeed to Superfood?
Australian Perspectives

Grain Industry Association of Western Australia Pulse Council

Lupin grain has been consumed by Mediterranean cultures for thousands of years, most notably the Romans, but today it is a largely unknown member of the legume family. Grown almost exclusively in Australia, with small production areas in Europe and South America, its uses are principally for animal feed.

Lupin was first introduced into Australia in the 1960’s to help crop rotation cycles by reducing cereal crop diseases and delivering nitrogen to the soil. Lupin grain was found to be an excellent stock feed due to its high protein content and low carbohydrate.

Larissa Taylor, Chief Executive Officer at the Grain Industry Association of Western Australia says “Australian growers are innovative in the way they manage nitrogen in their production cycle and lupins are currently providing strong agronomic benefits as well as attractive market options. Western Australian growers and exporters are fortunate to have access to a fantastic pulse and lupin research, development and extension, RD&E community based in Perth and Northam.”

Western Australia grows 85 per cent of the world’s lupin crop (over 500,000 tonnes in 2015) with most of the grain still going to feed for sheep and cattle. Western Australia also produces other pulses and specialty crops such as chickpeas (6000+ tonnes 2015), field peas (30,000+ tonnes 2015), faba beans (5000+ tonnes 2015), quinoa, chia, and red lentils in small amounts.

Health experts say it is the lupin, high in protein and fibre, with a low Glycemic Index (GI), which shows the most promise as a functional food.

The nutritional profile of lupins is different to other pulses, with the highest combined source of protein and fibre of any known grain. Lupin kernel is 40 to 45 per cent protein, 25 to 30 per cent dietary fibre with little or no starch and is low in oil.

Researchers from around the world are discovering thenutritional uses and functional properties of lupins.

Dr. Shyamala Vishnumohan has a PhD in Food Science and Technology from the University of New South Wales, Sydney. Shyamala moved to Perth, Western Australia, discovered lupins and was intrigued about how to convert them from a feed grain to a food grain. Originally from Tamil Nadu, Shyamala is accustomed to dhal being served at family meals. Shyamala has found lupin to be a versatile ingredient which behaves similarly to chickpea or lentil flour. Her research has shown lupins can be used to make noodles, pasta, cakes, breads, muffins, biscuits, sausages, tofu, flat breads and pizza bases.

Mark Anthony, PhD, an adjunct professor of nutrition science at St. Edwards University, Austin, Texas, has concluded that lupin has a future as a food ingredient that can improve human health. Popular as a snack food in Egypt, the large, golden yellow, high-protein beans known as Lupini bean are commonly cooked and preserved in a briny solution.

Older lupini bean varieties require repeated rinsing to dissolve and remove the bitter alkaloids that can cause allergic or in rare cases even toxic reactions. Lupin falls into the nut family, which means consumers should be wary of possible allergies when trying lupin enriched foods and products should carry an allergy warning.

However, newer sweet cultivars such as the variety PBA Jurien (Australian Sweet Lupin) only contain trace amounts of alkaloids which require little to no processing. Like soybean, the Australian sweet lupin is high in protein (30-35%) but is significantly higher in dietary fibre (30%) and lower in oil (6%), while containing minimal starch.
Consequently, Australian sweet lupin has a low glycaemic index or GI, which has positive implications for nutritional strategies to manage obesity, diabetes and cardiovascular disease. Australian sweet lupin and the European white lupin have the lowest GI of all commonly consumed grains.

The Australian sweet lupin (Lupinus angustifolius and Lupinus albus) can be split, flaked or ground to flour, which is used to create protein-rich ‘hummus’, curries, breadcrumbs, baked products or used like soy to create a variety of vegetarian or non-dairy products including milk substitutes, tofu and tempe. And as a member of the legume family, the lupin bean is a naturally gluten-free food.

So how does lupin nutrition compare to other grains?

<table>
<thead>
<tr>
<th>Per 100g</th>
<th>Kilo joules</th>
<th>Protein (g)</th>
<th>Carbs (g)</th>
<th>Fibre (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lupin Flakes</td>
<td>1350</td>
<td>40</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>Chickpeas (dried uncooked)</td>
<td>1530</td>
<td>19</td>
<td>43</td>
<td>17</td>
</tr>
<tr>
<td>Yellow Split Peas (dried uncooked)</td>
<td>1320</td>
<td>23</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>Quinoa (dried uncooked)</td>
<td>1540</td>
<td>14</td>
<td>57</td>
<td>7</td>
</tr>
</tbody>
</table>


Maria Packard, a spokeswoman for the Dietitians’ Association of Australia, agrees that lupin appears to be a naturally healthy food similar to other high-fibre, low-GI carbohydrates such as wholegrain flour and brown rice.

“The research is promising. The problem is that lupin is not readily available or appreciated at the moment,” Packard says.

Dr. Regina Belski, a lecturer in dietetics and human nutrition at La Trobe University in Melbourne says “Research suggests lupin has real potential for being a functional food”. Belski is pursuing research and discussions with commercial food producers regarding lupin-enriched foods. She says consumer demand is a key driver to seeing lupin products in supermarkets.

“Unless people demand these products, it is going to be a challenge to get them on shelves,” she says. “We have most of the world’s lupin produced in Australia and it’s a very under-utilized crop that is showing huge potential health benefits.”

It’s a view shared by the Western Australian Department of Agriculture and Food (DAFWA), which was the driving force behind the development of lupin as a viable grain crop for Australian farmers for the past 30 years. This lupin breeding program was recently acquired by Australian Grain Technologies (AGT), the breeders of the internationally recognized Australian hard wheat variety Mace. DAFWA continues to advise AGT on the lupin breeding program and Western Australian growers expect to reap the benefits of proximity to Asian markets with a private sector plant breeder supporting the lupin nutrition research community based in their backyard.

Brian Pover, Chair of the Grain Industry Association of WA’s Pulse Council said “We’re excited by market development opportunities for the Australian sweet lupin and other West Australian pulses and specialty crops in the Middle East, Indian and Southeast Asian markets and actively looking for commercial partners to help us grow these industries. We use the Australian Trade office (Aus trade) and Agri-food Managers of the West Australian Trade Offices in Mumbai, Jakarta, Dubai, Singapore and Hong Kong to support our export development activities.”

Lupins as food will be featured as part of the 2016 International Year of the Pulse promotions by the Grain Industry Association of WA in Perth and Northam Western Australia from 7-8 September 2016, and the Australian Pulse Conference held by Pulse Australia and Pulse Breeding Australia in Tamworth, New South Wales from 12-14 September 2016.

For further information:
- Grain Industry Association of Western Australia http://www.giwa.org.au/
- West Australian Trade Office Mumbaihttp://www.watoindia.in


END
The World Embraces Pulses

Buhler - International Year of the Pulses: Supporting consumer health, food security, and the environment

Pulses are gaining ground: in Europe alone, more than 3500 pulse-based products have been launched since 2010 – and this continues to grow. This is good news for the environment as these dry edible seeds of legume crops are an extremely sustainable source of protein. To further raise awareness of pulses, which are both climate-friendly and healthy, the UN has proclaimed 2016 the “International Year of Pulses” (IYOP). Beatrice Conde-Petit, food scientist and technologist for Bühler adds: "The growing interest from the food industry in including pulses in new food formulations is opening up a vast range of processing opportunities for this valuable crop. As consumer awareness of this food group increases, the up-take of pulses within food products will grow rapidly, supported by pioneering processing technology." For Bühler, solutions for the cleaning, sorting, and processing of pulses, are an important market with high growth opportunities.

On a worldwide scale, some 72 million tonnes of different pulse varieties, which include peas, beans, lentils and chickpeas, are produced. Pulses are a staple food in some regions of the world and many people in developing countries owe at least 10 percent of their daily energy intake to pulses. On the Indian subcontinent pulses have always been a cornerstone ingredient of food culture, with India sitting high on the league table – growing and processing more than 17 million tonnes a year, nearly a quarter of the global harvest. The Indian government actually recommends a daily consumption of 40 grams of pulses. Yet in western societies pulses are just being rediscovered – on the dinner table as well as in the fields.

Equally in the West pulses are having a huge resurgence due to their health properties. Not only do they rank highly on the satiety index, satisfying hunger for a longer period of time but nutritionally they are rich in fibre and protein, low in fat and contain high levels of minerals such as iron, zinc, and phosphorous as well as folate and other B-vitamins.

Pulses also contribute to sustainable agro-food value chains: just 50 litres of water are needed to grow 1kg of pulses, whereas almost 13000 litres are needed to rear 1kg of beef. When it comes to providing a growing world population with plant protein, pulses come top of the list. Moreover, pulse cultivation preserves soil fertility, thanks to its ability to biologically fix nitrogen in the soil.

Pulse crops enter into a symbiotic relationship with soil bacteria binding the nitrogen within their root systems. This reduces the requirement for hydrocarbon-based nitrogen fertilizers. This protein-rich ingredient is also highly valued in gluten-free and vegan foods. Flour, made from ground pulses, is increasingly finding its way into a variety of foods such as pasta, bread, and tortillas, as well as in Textured Vegetable Proteins (TVP) for example. Snacks, both sweet and savory, are also benefiting from novel pulse applications, which boost their health appeal to consumers.

Requests for such applications had an initial spike at the beginning of the Millennium, but in the past few years they have become more frequent. In North America, more than 2000 pulse-based products were launched between 2003 and 2013 and more than 3500 in the EU alone since 2010. These food trends are set to expand further in 2016, particularly driven by greater pressure on pulse processors to provide added-value products to meet demand, created by the increasing attractiveness of pulses as healthy foods.

Bühler bridges the gap

For Bühler, the cleaning, sorting, and processing of pulses is an important growth market. Pulse processing within Bühler’s Pulses, Spices & Sesame division has generated a business volume in excess of CHF 200 million – the Indian market has been especially vibrant. “In the past, pulse processing, particularly in North America, was often restricted to cleaning and then exporting”, explains Surojit Basu, Global Product Manager at Bühler. Also, the rice and grain technologies that have been commonly employed for pulse hulling have not met the quality and quantity requirements of modern, large scale EU and US pulse processors. The processing requirements for all the different pulse varieties are very diverse and complex but Bühler is bridging these gaps in the value chain – helping processors around the globe to adopt complete post-harvest stabilization, cleaning, dehulling, sorting, grinding, and further processing to generate greater value from pulses.

To do this, Bühler’s global pulse experts are designing technology to suit different regional processing needs, including customized processes, plant capacities and equipment compliant with global operational safety standards. One such example is Bühler’s dedicated pulse hulling solution PULSROLL™, which removes the hull from pulses efficiently, hygienically, and cost effectively. The in-
web.: www.sabahagri.com  E-mail.: sabah@sabahagri.com
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industry’s only certified pulse huller now enables processors in the EU and US to operate in today’s increasingly regulated and highly automated industry. Since its launch in October last year, Bühler has already had multiple orders, highlighting how it has created the next level of quality benchmark for pulses through process excellence and cutting-edge technology across the value chain. Bühler will continue to develop new pulse processing technologies to meet the growing demand from processors and consumers alike. Innovation focuses on delivering increased efficiency, productivity, and yields, as well as hygienic processing for maximum food safety. By being at the forefront of the pulses industry, Bühler is doing its bit to support consumer health, food security, and the environment. “From a global perspective, pulses are still under-exploited and the industry involved in the agro-food conversion of pulses plays a decisive role in increasing consumption, as part of a healthy diet worldwide,” says Prasad Jaripatke, Head of Pulses, Spices, and Sesame Seeds.

**International Year of Pulses – Pulses as an environmentally sustainable source of protein**
The aim of the “International Year of Pulses” is to raise awareness of the benefits pulses provide for health, food security, and the world climate. The Food and Agriculture Organization of the United Nations (FAO) is collaborating with governments and relevant organizations to underline that pulses can form the backbone of sustainable food production. The year also creates a unique opportunity to encourage collaboration throughout the food chain to better utilize pulse-based proteins, encourage further global production of pulses, better utilize crop rotations, and address the challenges in the trade of pulses.

**Bühler Networking Days 2016**
From August 22nd to August 24th, 2016 the Bühler Networking Days will take place in Uzwil, Switzerland. This event brings together CEOs and opinion makers from the international food industry, with Bühler presenting its latest innovative solutions. This press release covers one of the topics that will be discussed at the event.

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**About Bühler**
Every day, billions of people come into contact with Bühler technologies, to cover their basic needs for food and mobility. With our industrial process technologies and solutions, we contribute significantly to feeding the world’s population, setting a focus on food security and safety as well as reducing carbon emissions of cars and buildings. In 2015, its roughly 10,800 employees in more than 140 countries generated a turnover of CHF 2.4 billion. The global Swiss family-owned company Bühler is particularly committed to sustainability.
Indian Rabi Pulses (Lentils, Desi and Kabuli chana)

Scenario

Ms. Harsha Rai, Global Sales Head, Mayur Global Corporation

Sure, good lentils prices resulted in lentils seeding little higher than last year in major growing areas of Madhya Pradesh. Though at the time of seeding weather conditions were very dry but few showers later in January (few areas only) bought some relief to growers as that was needed for growing crops. Expecting a crop at least like last year until in late February/March when again rain and hailstorms brought some damage to the crop. Yields were affected and hence production looks lower than last year for lentils even though seeding was little higher. Another growing area for lentils that is Uttar Pradesh faced same weather change issues and yield was very much affected. Uttar Pradesh mainly grows smaller size lentils.

Govt issued the advance production estimates in February mid which said 8.1 million ton Desi chickpeas production is expected. Important to note that harvest completes in March end and thus it was seen that yields were quite lower than expected and possible that above mentioned number could be lowered once post harvest numbers are issued. Less arrival from farmers even at current higher price tells us that rain deficit and then warm growing season has resulted in low yield for lentils and chickpeas.

Madhya Pradesh is the major growing area for kabuli chickpeas in India especially larger caliber kabuli chickpeas and said to give 90% of India’s kabuli production. This region produces high percentage of 10-12 mm caliber. Maharashtra and Andhra Pradesh mainly grow 7-8mm caliber. Maharashtra has reported a fall in productivity by more than 40%. This year’s final production of kabuli is expected to be lowest in four years. It is difficult to get separate number for kabuli production but looks like production for same would be no more than 350,000mt due to weather adversity. Poor weather resulted in short crop and has damaged the country’s crop to some extent. This is very much evident from the local mandis (market) arrivals which are down as compared to last few years. Current market prices are high and still no arrivals from growers’ shows that they hardly have stocks to bring to the market.
According to data available, India has imported almost 700,000mt of red lentils and 600,000mt of chickpeas in last five months i.e. from September to January. These arrivals along with Rabi crop size anticipation at that time was putting pressure on local prices. This was coupled with Govt imposing stock limits and confiscation of goods by rationing department created panic and forced selling in the local market.

These all factors dragged prices towards south and thus lot of diversions and washout were seen for pending overseas trades. Overseas market prices on the other side maintained firm tone as farmers hardly bought anything to market for sale. Currency was also one of the important factors which made Indian imports expensive and hence no new trade took place for current crop imports for coming month going forward from Feb to August.

As per the monthly consumption pattern for lentils and chickpeas in India, import stocks looked sufficient for next few months and then again inventory could be down April end/ May. Thus market has to again depend on Indian crop arrivals by farmers or import arrivals. Note: we don’t see import business for coming months due reasons mentioned before. With no arrivals seen from Indian growers and import stocks going into consumption every month, it is seen that price is moving towards north again for both lentils and chickpeas. As and when demand for processed pulses increases, manufacturers start buying from local market. Stock limit restricts them to have buffer stock at their plants and thus at regular interval demand is seen. This gives us an idea on how demand curve has resulted into price volatility. We have been seeing and very much possible that government induced selling could be seen time to time. Like recently price hike resulted in state cabinet approving the draft of the Maharashtra Pulses Price Regulatory Act, which upon becoming law will make it mandatory for traders to sell pulses at fixed prices.

Overseas market are trading at higher range for current crop at 1060$ for Canadian red lentils and at 1050$ for Australian Desi chickpeas. At these prices Indian market sees no parity and hence looking at new crop offers from both origins to match Indian local prices. Important to note that new crop import arrivals will only be seen in India in November for lentils and Late November/early December for Desi chickpeas. Between that we could see supply gap for both commodities subject to Indian crop arrivals is not seen in the market. This gives an idea that there could be good demand for earliest shipment (sept/oct) for new crop lentils from Canada /USA and Desi chickpeas from Australia.

Canadian growers are expected to be planting record acres for both peas and lentils this spring. March seeding intentions report released on 21st April 2016 states 30% seeding area to be increased in lentils this spring and is expecting to be 5.140 million as compared to 3.9 million last year. Also note kabuli chickpeas acreage is expected to be lower by 13% this spring as compared to last year.

International kabuli chickpeas market continues their upward trend due to tight supply in India and other growing origins. Mexico faced weather issues like frost just before harvest and production is expected to be very less with only 70000mt exportable quantity expected. Argentina also faced weather adversity at the time of harvest which has resulted in crop damage. Australia had less seeding this year for kabuli chickpeas and production was expected to be just 35000mt which is said to be exported already by now or has gone into domestic consumption. USA and Canada is virtually sold out on kabuli chickpeas stock. Empty world pipeline will not let prices to come down until market sees new crop production from USA / Canada in sept out for 2016 harvest.

To sum up, pulses production in India has been hit by two consecutive droughts at the time of seeding and unseasonal rain and hailstorm at the time of harvest. Exporting countries have increased their seeding intention as growers in those countries have seen increasing demand from India which is a major producer and consumer of pulses in world. Met dept prediction of an above average monsoon this year and hence good weather should result in higher seeding and production in India for next Kharif and Rabi crop. Few factors will always affect market, like, currency change, weather change in growing countries at the time of seeding and harvest, government policies at destination and most important one is Indian monsoon, this year.
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India is the largest producer as well as the consumer of pulses in the world. Rising population and increasing income levels have resulted in creating protein deficit situation, especially since large population in India continues to remain vegetarian. Globally, India is the largest importers of pulses. Pulses like Chickpea (Chana), Pea (Matar), Pigeon pea (Tur), Lentils (Masoor), Black Matpe (Urad), Green Gram (Moong), Kidney Beans (Rajama), etc. are some of the widely grown and consumed pulses in India. Currently pulses have remained the centre stage of discussion for two consecutive years. Prices of the key pulses like Chickpea, Lentils, Pigeon Pea, Black Matpe and Green Gram made a new record due to lower production in India. Pulses production in India is facing a setback due to lower than normal rainfall which caused drought like scenarios in many parts of India, as an aftermath of El Nino. Spiralling rise in prices of these pulses was further heightened by lower production in the sourcing nation especially Burma. This restricted the possibility of imports to improve the supply pipelines in India.

As per the Government of India (GOI), the total Indian pulses production is 17.5 million tons for 2015-16. The average annual consumption of pulses in India is estimated to be 23-24 million tons. As 2015-16 was a low production year, India ended up importing record pulses of little over 5 million tonnes. Hence, imports play a significant role in balancing the supply and demand scenario. Large variety of pulses, that India consumes, need to be sourced from various parts of the world. A brief introduction to these sourcing nations is given below.

The World of Pulses

As per the latest figures by FAO Stat which are updated as on 2012, the world pulses production is 70 million tons. Production has been stagnating between 68-70 million tons during the years 2010-2012 due to stagnancy in acreage under pulses. This is bound to be changed in recent years due to the higher prices.

Chickpea is the largest produced pulse in India and still we import almost 15-20% of total annual requirement. Australia is the largest exporting nation to India followed by Russia, Tanzania and United States. Australia begins new planting in the month of May and harvests by September and new crop offers begin for September-October shipments. As a result bulk imports from Australia hit India during the period of October-January, while during the rest of the year small quantities continue to arrive from the other nations.

Pea and Lentils are the two pulses which are sown in the Rabi season in India and are the most dependent on imports. India imports 80% of its annual pea requirement and 70% of its annual lentil requirement from Canada. Bulk imports of both these crops arrive during the months of September-January when Canada harvests its new crop. Hence, the prices of these commodities are largely governed by the sentiments in the world market and by the supply and demand scenario in the sourcing nation. As far as pea imports are concerned the Baltic nations have been the new entrant in the Indian markets. Since the month of November’15 there has been a gradual rise in the import share of these nations namely Lithuania and Latvia. From the month of January’16, the share of these nations has gone up by close to 10% of total monthly imports.

Pigeon Pea production is a six month crop in India and harvested in December. Because of this, it is at a higher risk of extreme weather irregularities. Despite pigeon pea being a drought resistant crop, due to its long roots, India is facing lower production of this pulse for the second consecutive year. This is mainly due to extremely poor rainfall which reduced water availability as well as drained the soil of its moisture. 80% of the total Pigeon Pea imports are sourced from Myanmar and the balance 20% is imported from the African nations like Mozambique, Tanzania, Malawi and Sudan. Generally the African Pigeon Pea is less preferred in India owing to its peculiar taste as well as due to difficulty in milling it. However, last year was exceptional and record high prices saw higher imports from Africa to compensate the shortfall from Myanmar. Imports from Myanmar are at its peak during the

Ms. Prerana Desai, Vice President - Research & Service, Edelweiss Agri Value Chain Limited
period March-May while African imports arrive during the period of July-October.

Black Matpe and Green Gram are grown in India during both Kharif and Rabi planting season with Kharif contributing 65% of the domestic production. Despite this India is dependent on imports for both Black Matpe and Green Gram. Indian imports of Black Matpe are solely sourced from Myanmar while Green Gram is sourced from various nations like Myanmar, Tanzania, Australia and Kenya to name a few. Imports of Black Matpe are at peak during the months of March-May while Green Gram arrives throughout the year owing to the various destinations it is imported from.

The first chart below show the import seasonality in India calculated based on the five year monthly imports of major pulses. The other chart is constructed based on five year monthly import seasonality pattern for each pulse.

The Nuts and Bolts of the Trade

As seen in the first chart, total imports tend to rise from the month of April and tend to peak in the month of December. The seller in the exporting nation, Custom House Agent (CHA) and the importer are three main parties involved in the trade. The seller quotes prices for its goods in CIF or CNF denomination depending on its terms with the importer. Cost Insurance & Freight (CIF) requires the seller to pay the costs, freight and insurance necessary to transport goods to the named port of destination. Risk responsibility for lost and damaged goods as well as any additional costs gets transferred from the seller to the buyer once the goods pass the ships rail in the port of shipment. CNF rates are similar to CIF except insurance is not included. Post the loading of the goods, the exporter sends the documents to the importer/ Banks of the party concerned. The set of documents include the following-Invoice, Packing List, and Bill of Lading, Phytosanitary Certificate, Certificate of Origin and Insurance Certificate etc. A Phytosanitary Certificate is an official document issued by the plant protection organization of the exporting country to the plant protection organization of the importing country. It certifies that the plants or plant products covered by the certificate have been inspected according to appropriate procedures and are considered to be free from quarantine pests and practically free from other injurious pests and that they are considered to confirm with the current phytosanitary regulations of the importing country.

There are three methods of payment which the importer can adopt. Letter of Credit (LC), Cash Against Documents (CAD) and Document Presentation (DP). Of these, LC is the most common method of payment adopted as the risk of default is the least. Once the payment is done to the exporter, the importer is in receipt of the documents from the Banks which are then handed over to the CHA for clearing the goods from the ports and delivering them to the designated location. The CHA charges commission from the importers. Total cost, the importer has to pay to the CHA includes various costs like that of unloading the goods at the port to the clearing and transporting the goods to the desired location. To name a few costs involved by the importer are Custom Clearance Charges, Shipping line Charges, Plant Quarantine Charges, Fumigation, Inspection, FSSAI Charges per container, Labour and Transportation Charges. Thus the import chain is completed once the goods are delivered to importers warehouse.

Port Wise Import Pattern

In India the major ports which handle the imports of pulses from the various sources are Mumbai, Mundra, Hazira, Kandla, Chennai, Tuticorin, Vishakhapatnam and Kolkata.

The table above shows port wise imports of major pulses during the Jan-Dec 2015. Nhava Sheva in Mumbai witnesses the largest
influx of pulses. Mumbai is centrally located and caters to the demand from the states of Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Haryana and Punjab. Kolkata being on eastern side of the country caters to the demand of the eastern states, pea being the widely consumed pulse of this region. While imports of Black Matpe is concentrated in Chennai due to the preference in consumption

**Reaction to Record High Prices**

**In World**

Canada and Australia will begin planting their 2016 crop from the coming month. Chickpea acreage is expected to rise to surpass the record last year. However, weather will remain a crucial factor. As per the Australian Weather Bureau, there is a higher probability of La Nina to peak during the months of August and September which will coincide with Chickpea harvesting. La Nina is known to bring heavy rains in Australia and could pose a risk to the crop. Seeding Intentions report on Canada's pea and lentil acreage is also encouraging. As per Statistics Canada, acreage intentions for 2016 versus actual area seeded in 2015 suggests that pea acreage is expected to rise by 16% while lentil acreage is expected to expand by 30%. Higher prices in Canada have encouraged new entrants in this trade. The market participants were of the view that the expansion would be higher in pea as compared to lentils, as lentils is a very sensitive crop and hence becomes difficult for new growers to get the optimum yields. The last major expansion under lentils in Canada was in 2009-10 when area expanded by one million acres. While the average yields of the crops that year were up by 2%, lentil yields were down by 9%. However, the expected acreage expansion is double in lentils as compared to peas and participants will closely monitor the yields. Experts believe that lentil being a sensitive crop, does not give efficient yields to farmers. As discussed above crop like pea is seeing acreage increase in the Baltic countries also.

**In India**

After two discouraging years for the Indian farmers, hopefully this year will reap benefits for them! A higher than normal rainfall prediction by the Indian Meteorological Department has come as a much needed respite. The normal monsoon rains is likely to bring more land under pulses coverage owing to higher price. Yields are also expected to be much higher which were beaten down because of harsh climate and lower soil moisture levels. It is also in our interest to increase the acreage of pulses in India to make India more self-sufficient. To promote higher acreage under pulses, the Government of India (GOI) has continued to increase the Minimum Support Price (MSP) over the last few years. In the last six years the GOI has increased the MSP of Kharif pulses by over 45% while it increased MSP for the Rabi pulses by 50-60%. So far, even though the government used to announce MSP, there was no mechanism to support the prices, if the prices dipped below the MSP, but now the government has decided to build buffer stocks of pulses to be able to influence the prices. This initiative would also govern the farmers' sentiments to allocate larger area under pulses and thereby make India less import dependent. Therefore for the coming Kharif season, production of pulses in India is set to rise along with global producers like Canada and Australia.

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Development in Indian Warehousing Industry with Focus on Pulses

Dr. Hanish Kumar Sinha, Head – Research & Development, National Bulk Handling Corporation Private Limited

Warehousing plays a very vital role in promoting agriculture marketing, rural banking and financing and ensuring Food Security in the county. It enables the markets to ease the pressure during harvest season and to maintain uninterrupted supply of agricultural commodities during off season. Hence, it solves the problems of glut and scarcity, which are the usual problems in agricultural marketing. Though warehousing is an independent economic activity, yet is closely linked with production, consumption and trade. Warehousing is now seen as an integral part of the supply chain where goods are not only stored for safekeeping, but also where other value processes are implemented, thereby minimizing wastage and costs.

Agricultural warehousing accounts for fifteen percent of the warehousing market in India and is estimated to be worth INR 8,500 crore. However, it is perceived to be inadequate and unorganised. More than 40 percent of the agricultural warehouses are run by state enterprises such as FCI, CWC and SWCs. About 30 per cent of the warehousing capacity is held by unorganised small godown players. These unorganised warehouses lack scale and quality. On the other hand, there are a few large national-level players in the warehousing market who run professionally and also provide ancillary services around warehousing. Although there is no exact data on the number of warehouses present, some of the substantial capacities available in public, cooperatives and private sectors are depicted in the adjacent table.

Given the fact, that a huge quantity of government procured food grains are kept in open storage (CAP) for months together, the risk of quality deterioration needs no emphasis. In this context, the finding of an expert Committee, point to a total warehousing gap of 35 million MT during the 12th plan period, reflecting the excess of demand for warehousing capacity. In other words, warehousing capacity of 35 million MT needs to be created in the country during the 12th plan period to ensure that the demand for storage of agri commodities is adequately taken care of. Of this gap, as indicated above, capacity of 12.11 million MT has already been created. The gap in so far as the private sector is concerned is likely to be about 10 million MT as the bulk of the storage gap is in the public sector.

Table 1. Current Capacity of Indian Warehousing Industry

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Organization / Sector</th>
<th>Storage Capacity in Million MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food Corporation of India (FCI)</td>
<td>32.05</td>
</tr>
<tr>
<td>2</td>
<td>Central Warehousing Corporation (CWC)</td>
<td>10.62</td>
</tr>
<tr>
<td>3</td>
<td>State Warehousing Corporation (SWC)</td>
<td>23.52</td>
</tr>
<tr>
<td>4</td>
<td>State Civil Supplies</td>
<td>11.30</td>
</tr>
<tr>
<td>5</td>
<td>Corporate Sector</td>
<td>15.07</td>
</tr>
<tr>
<td>6</td>
<td>Private Sector</td>
<td>28.30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>120.86</strong></td>
</tr>
</tbody>
</table>

Source: Compiled from Various Sources
About 80 per cent handling and warehousing facilities are not mechanized and traditional manual methods for loading, unloading and handling of food grains and other commodities are used. However, the warehouses which are mechanized have just forklifts or hydraulic hand pallet trucks. These numbers clearly indicate that there is an acute shortage of organized and good quality warehousing and storage infrastructure in the country, for both agricultural and non-agricultural commodities. In spite of the fact that government has incentivized agri-warehousing capacity building, there had been lack of sustained investment in the warehousing sector. The private sector initiatives are small and sporadic in this sector. Besides, most of the private sector warehousing capacities available in the country are of poor quality, small, fragmented and do not meet the requisite infrastructure standards.

The warehousing capacity built over past 10 years, especially those sanctioned by NABARD have an average storage capacity per warehouse of 1,261 MT and around 75 per cent of numbers of godowns have capacity of less than 1,000 MT. The development of small and medium godowns indicates that most of them have been built by farmers or a community of farmers thus ensuring that distress sale is reduced and better prices are paid to farmer for their produce. Apart from this, there are few large national level players which have emerged over the last decade owing to the available capital subsidy. These include National Bulk Handling Corporation Ltd., National Collateral Management Services Ltd., Adani Agri Logistics, Star Agriwarehousing & Collateral Management Ltd., Shree Shubham Logistics Ltd., Ruchi Infrastructure Ltd., Guru Warehousing Corporation, Paras Warehousing and LTC Commercial. Irrespective of the concerted efforts from the government as well as private and corporate players in the warehousing sector, the industry is gripped with regional imbalance.

Only 22 per cent of total storage capacity is available in the major consumption states. Even some of the states have got storage capacities of less than one month of their requirement. While obvious factors like proximity to the major mandis in the state, differences in the quantities of food grain and pulses produced within the state, etc. are the major causes behind the regional imbalances, other key factors like the extent of interest and initiative shown by bank officials in promoting the concept of rural godowns to local entrepreneurs, publicity and awareness created about the scheme at the local level, etc. also played a major role behind these regional imbalances. In short, dominant producers of food grain and related agricultural products comprise the majority of godowns and storage capacity.

The warehousing industry in India gained tremendous impetus after the introduction of the Warehousing Development and
Regulatory Authority (WDRA) which came into existence on 26th October 2010 as per the provisions made in the Warehousing (Development and Regulation) Act, 2007. WDRA has been instrumental in the implementation of negotiable warehouse receipt (NWR) w.e.f. 26thApril 2011. As per the Warehousing (Development and Regulation) Act, 2007, negotiable warehouse receipts (NWRs) can be in both paper and electronic forms. The format of the NWR has been finalized in consultation with various stakeholders and Indian Banks’ Association (IBA) and paper NWRs are now being issued by the registered warehouses across the country. The advantages of electronic warehouse receipts (EWR) over the paper warehouse receipts include: reduction in manual paper handling, elimination of transportation of paper warehouse receipts, reduction in chances of forgery and quick access of information. The WDRA plays a vital role in developing an orderly, robust and reliable warehousing system in the country not only for foodgrains and other dry commodities but also for perishable commodities like fruits and vegetables wherein post-harvest losses are reported to be about 30 per cent. The introduction of NWR system in the country would not only help farmers to avail better credit facilities and avoid distress sale but would also safeguard financial institutions by mitigating risks inherent in credit extension to farmers. 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 agricultural sector. With the increased requirement of quality storage, warehousing industry would also get a boost in rural areas. This would also fill gaps in the logistic chain of agri-business in the rural sector.

With the emergence of the collateral management companies, warehouse receipt finance has gained acceptance in the banking sector, with all big and small banks now participating in this space. As a result, finance against commodities is likely to experience a phenomenal growth. While currently the size of the market is estimated at about INR 30,000 crore, as per a recent study by NABCONS, the potential for finance against collateral of major agri commodities and fertilizers is INR 166234 crore, details in this regard are given in adjacent table.

Over the years warehousing business has been transformed to a great extent from merely a storage infrastructure to a one stop shop for supply chain management through the entry of private sector. Nowadays the goods are stored as per the scientific methodology to protect them against the quantitative as well as qualitative losses occurring due to unavoidable circumstances such as floods, pest attacks, etc. Hence, ‘warehouse performance indicators’ should be introduced to check the efficiency of the warehouses which now should include quality parameters like ability to control wastage, pest control measures, provide wide range of testing, grading and certification services which can help in ascertaining the value of the commodity deposited and bring transparency among all interested entities.

In India Pulses are grown in around 24-26 million hectares of area producing 17-19 million MT of pulses annually. India accounts for over one third of the total world area and over 20 per cent of total world production. India primarily produces Bengal gram (chickpeas), red gram (tur), lentil (masoor), green gram (mung) and black gram (urad). For majority of vegetarian population in India, pulses are the major source of protein.

**Table 2. Potential for Warehouse Receipt Finance**

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Commodity</th>
<th>Loan Amount (Rs. Crore)</th>
<th>% Business Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rice</td>
<td>29287</td>
<td>17.62</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>708</td>
<td>0.43</td>
</tr>
<tr>
<td>3</td>
<td>Jowar</td>
<td>1294</td>
<td>0.78</td>
</tr>
<tr>
<td>4</td>
<td>Bajra</td>
<td>2086</td>
<td>1.25</td>
</tr>
<tr>
<td>5</td>
<td>Maize</td>
<td>4545</td>
<td>2.73</td>
</tr>
<tr>
<td>6</td>
<td>Other Coarse Cereals</td>
<td>783</td>
<td>0.47</td>
</tr>
<tr>
<td>7</td>
<td>Tur</td>
<td>3294</td>
<td>1.98</td>
</tr>
<tr>
<td>8</td>
<td>Gram</td>
<td>1949</td>
<td>1.17</td>
</tr>
<tr>
<td>9</td>
<td>Other Pulses</td>
<td>2228</td>
<td>1.34</td>
</tr>
<tr>
<td>10</td>
<td>Nine oilseeds</td>
<td>25890</td>
<td>15.57</td>
</tr>
<tr>
<td>11</td>
<td>Tobacco</td>
<td>615</td>
<td>0.37</td>
</tr>
<tr>
<td>12</td>
<td>Cashew nut</td>
<td>10041</td>
<td>6.04</td>
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<tr>
<td>13</td>
<td>Areca Nut</td>
<td>1928</td>
<td>1.16</td>
</tr>
<tr>
<td>14</td>
<td>Spices</td>
<td>13719</td>
<td>8.25</td>
</tr>
<tr>
<td>15</td>
<td>Cotton</td>
<td>11114</td>
<td>6.69</td>
</tr>
<tr>
<td>16</td>
<td>Chemical Fertilizers</td>
<td>56753</td>
<td>34.14</td>
</tr>
</tbody>
</table>

Source: NABCONS

**Table 3. Area & Production of Pulses in India**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Area (Million Ha)</th>
<th>Production (Million MT)</th>
<th>Yield MT/ Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>23.46</td>
<td>14.91</td>
<td>0.636</td>
</tr>
<tr>
<td>2004-05</td>
<td>22.76</td>
<td>13.13</td>
<td>0.577</td>
</tr>
<tr>
<td>2005-06</td>
<td>22.39</td>
<td>13.38</td>
<td>0.598</td>
</tr>
<tr>
<td>2006-07</td>
<td>23.19</td>
<td>14.2</td>
<td>0.612</td>
</tr>
<tr>
<td>2007-08</td>
<td>23.63</td>
<td>14.76</td>
<td>0.625</td>
</tr>
<tr>
<td>2008-09</td>
<td>22.09</td>
<td>14.57</td>
<td>0.659</td>
</tr>
<tr>
<td>2009-10</td>
<td>23.28</td>
<td>14.66</td>
<td>0.630</td>
</tr>
<tr>
<td>2010-11</td>
<td>26.40</td>
<td>18.24</td>
<td>0.691</td>
</tr>
<tr>
<td>2011-12</td>
<td>24.46</td>
<td>17.09</td>
<td>0.699</td>
</tr>
<tr>
<td>2012-13</td>
<td>23.26</td>
<td>18.34</td>
<td>0.789</td>
</tr>
<tr>
<td>2013-14</td>
<td>25.21</td>
<td>19.25</td>
<td>0.763</td>
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<tr>
<td>2014-15</td>
<td>22.48</td>
<td>17.15</td>
<td>0.763</td>
</tr>
<tr>
<td>2015-16</td>
<td>23.82</td>
<td>17.33</td>
<td>0.728</td>
</tr>
</tbody>
</table>

Source: Directorate of Economic & Statistics
WE ARE DOING PULSES & GRAINS CANVASSING BUSINESS SINCE 2000.
WE ARE IMPORTING LARGE QUANTITIES OF PULSES FROM CHINA, BURMA YANGON, INDONESIA AND AUSTRALIA AND SELL IT THROUGH OUT INDIA WITH OUR MUTUAL TRUST & GOOD FAITH.

OUR COMMODITIES:
Chana (Gram) | Masoor(Lentis) | Urid / Black Matpe
Green Mong | Kidney Beans | Wheat

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CHENNAI – 600 001, TAMIL NADU, INDIA.
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Pulses and pulse crop residues are also major sources of high quality livestock feed in India. In India pulses are cultivated on marginal lands under rain fed conditions. Only 15 per cent of the area under pulses has assured irrigation. Because of the high level of fluctuations in pulse production (due to biotic and abiotic stress) and prices (in the absence of an effective government price support mechanism), farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. India is having the largest shares about 25 per cent of production, 33 per cent of acreage and consumption is around 27 per cent of total pulses of the world. The acreage ranged from 23.46 (2003-04) to 23.82 million hectares (2015-16) and production varied from 14.91 million MT (2003-04) to 17.33 million MT (2015-16). The productivity has increased from 636 kg/hectares (2003-04) to 728 kg/hectares (2015-16). The major pulses producing states are Madhya Pradesh (24.12 per cent), Maharashtra (16.46 per cent), Rajasthan (12.94 per cent), Uttar Pradesh (8.82 per cent), Andhra Pradesh (8.06 per cent) and other states together (21.29 per cent) during 2015-16.

Table 4. Commodity wise share of Indian Warehousing Industry

<table>
<thead>
<tr>
<th>Commodity</th>
<th>% Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>30.00</td>
</tr>
<tr>
<td>Sugar</td>
<td>24.00</td>
</tr>
<tr>
<td>Cotton Complex</td>
<td>15.00</td>
</tr>
<tr>
<td>Maize</td>
<td>9.00</td>
</tr>
<tr>
<td>Pluses</td>
<td>7.50</td>
</tr>
<tr>
<td>Oil Seeds</td>
<td>7.00</td>
</tr>
<tr>
<td>Wheat</td>
<td>4.00</td>
</tr>
<tr>
<td>Others</td>
<td>3.50</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Compiled from Source

As per the figures given in table 2, the Pulses accounts for a share of about 4.49 per cent of the total Warehouse Receipt Finance happening in the country. Of the total food grains produced in the country, the total pulses contribute to 6.85 per cent and the cereals comprises of about 93.15 per cent (as per production statistics of 2015-16). Thus we can see that the pulses at present command a very low profile status in terms of utilizing the warehousing capacity of the country. In order to improve the situation of the pulses in the country the government has proposed a proposal to create a buffer stock of 3.5 lakh MT of pulses during the current 2015-16 crop year through domestic purchase or imports to prevent a further price spikes. Out of the proposed 3.5 lakh MT, about 1.5 lakh MT of tur and urad will be procured in the kharif marketing season and the rest 2 lakh MT of chana and masoor will be bought in the rabi marketing season. With huge build up of inventories and limited storage space with the government, there is ample scope of expansion of private warehousing in the pulses sector.

Though the storage capacity has increased at a CAGR of about 8 percent during the last decade till March 2016, the irony remains that around 20-30 per cent of the total food grain harvest is wasted due to lack of availability of storage capacity, regional imbalance in warehouses, lack of adequate scientific storage and inefficient logistic management in the country.

FSSAI guidelines for imported pulses/unprocessed Pulses

The limits for foreign matter (extraneous matter) shall be maximum 3.0 per cent by weight of which the maximum 0.5 per cent by weight may be the inorganic matter and impurities of animal origin.

In addition, unprocessed whole raw pulse shall conform to the requirements of other standards referred to in this regulation.
Pulse is the term for the edible seeds of legumes which includes dry peas, lentils, dry beans and chickpeas. Pulses are very commonly used in the Indian cuisine. Pulses have many nutritional values. The health benefits of Pulses in general are that they are very rich in proteins. Pulses have been consumed for at least 10,000 years in all over the world. Pulses contain benefits of reducing weight, control blood sugars, reducing cholesterol. Pulses are very high in fibre. They contain both soluble and insoluble fibres. Soluble fibre helps lower blood cholesterol levels, while insoluble fibre helps with digestion. Pulses are often more filling than other foods, helping to keep you full for long time. Pulses have a low glycemic index which can control the blood sugar levels in diabetic people. A healthy vegetarian diet should include a variety of peas, beans, lentils and chickpeas.

Some of Indian pulses are listed below along with their Nutritional benefits:

Beans:
- Beans are high in minerals and fibre without the saturated fat found in some animal proteins. Beans provide the body with soluble fibre, which plays an important role in controlling blood cholesterol levels. Studies find that about 10 grams of soluble fibre a day, the amount in 1/2 to 1 1/2 cups of navy beans, reduces LDL cholesterol by about 10 percent.
- Beans also contain saponins and phytosterols, which help lower cholesterol. Eating beans as part of a heart healthy diet and lifestyle may help improve your blood cholesterol, a leading cause of heart disease.
- Adding beans to your diet may help keep you feeling full longer. Beans contain a wide range of cancer-fighting plant chemicals, specifically, isoflavones and phytosterols which are associated with reduced cancer risk. Green beans may be a particularly helpful food for providing us with the mineral silicon. This mineral, less well known than minerals like calcium and magnesium is very important for bone health and for healthy formation of connective tissue. Green beans have recently been shown to stack up quite well against other commonly eaten foods as a good source of absorbable silicon.
Green gram
- Green mung beans are loaded with nutritional health benefits. By eating green gram, you get high protein, low calorie food that is packed with vitamins and minerals. In fact it is low calorie, low fat and high fibre food. And specially contains vitamin A, vitamin B and calcium, potassium, iron, magnesium and zinc minerals.
- Sprouted green gram can produce live enzymes. Green gram also contains very low Glycemic index, thus it's a good food choice food diabetics. In addition to all these benefits, it contains anti aging properties.
- Green gram can be easily digestible and prevent constipation. Green gram is good for people who are having diabetes, heart diseases, cancer, anaemia and osteoporosis. Green gram is not only good for adults; they are also very good food for children as it can be easily digestible.
- In India, infants above six months in addition to mother’s milk, green gram pulse powder is used for protein requirement for healthy growth. People are worried about weight loss and its maintenance. An easy solution to this would be green gram. Green gram not only reduces your weight but also keeps you full for a longer period of time. Since the calorie count is so less, you will be able to reduce fat much faster than you would like to think. In fact, most Indian diets have recommended the usage of green gram while cooking meals.

Bengal gram:
- Bengal gram is very popular pulse in South Asia. Bengal Gram is known as the Dark Brown Peas. It is known as most important pulse in India.
- Bengal gram has good amount of iron, sodium, selenium and small amount of copper, zinc and manganese. They are also a very good source of folic acid and fibre. It contains a contain phytochemicals called saponins, which can act as antioxidants. Regular intake of Bengal gram can give a good strength to muscles. Bengal gram enhances the utilization of glucose, which is good for diabetic persons and also for normal persons. Bengal gram extracts are good for diabetic patients. It helps in maintaining the blood sugar levels, glucose, tolerance, urinary excretion of sugar and general condition.
- The Bengal gram flour is helpful for curing the skin problems such as pimple, eczema, acne, dermatitis, scabies, etc.

Horse gram:
- This pulse is named as horse gram because it is a staple food for horses and cattle. Horse gram is grown and consumed in India for thousands of years.
- It is very rich in protein. In fact, horse gram has the highest calcium content among pulses. Low in fat and high in carbohydrate content and its slow digestible starch make ideal for diabetic and obesity patient.
- Traditional medicinal texts describe it is used for asthma, bronchitis, urinary discharge, kidney stones and heart disease. Ayurvedic cuisine also recommends horse gram for persons suffering from jaundice or water retention. Rheumatism, worms, conjunctivitis and piles are also said to quail before the power of horse gram. It reduces flatulence and reduces indigestion. It also helps to eradicate intestinal parasites.
- New researches have shown the beneficial effects of horse gram in diabetes. Regular consumption of these beans helps to reduce blood glucose level. Horse gram has to be soaked overnight and the water has to be discarded. These soaked beans have to be pressure cooked next day to use in curries and soups. Sprouted horse gram is more beneficial than soaked ones because sprouting reduces unhealthy phytochemicals and increases nutrition value.

Black gram
- Black gram is one of the highly priced pulses in India. India is its primary origin and is also primarily grown in Asian countries.
WITH BEST COMPLIMENTS

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LLP Identification No : AAE-6840

IMPORTERS & TRADERS OF:
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which include Pakistan, Myanmar and parts of Southern Asia. About 70% of world's black gram production originates from India.

- It is highly nutritious bean that is packed with remarkable health benefitting qualities. Due to its therapeutic as well as healing qualities, Black gram is essentially utilized in Ayurvedic medication.
- Black gram can be purchased in the whole form with its skin on, split form with its skin on or even split form without its skin. Soaking this just before cooking will reduce the cooking time.
- Black gram is rich in potassium, phosphorus and calcium with a significant amount of sodium. Black gram is rich in vitamin A, B1 and B3, and also has a small amount of thiamine, riboflavin, niacin and vitamin C contained in it.
- Black gram can cure diabetes, sexual dysfunction, nervous disorders, hair disorders, digestive system disorders and rheumatic afflictions. Black gram is really a healthy pulse since it is full of iron content. This can help increase the energy levels within the body and keeps you active. This is particularly important for women going through menstruation. They will be benefited by consuming black gram frequently, which will boost their energy considerably since it creates the body’s iron stores.

Pigeon peas
- It was first domesticated in South Asia around 3,500 years ago and their seeds are food grains in Asia, Africa and Latin America. Pigeon pea is chief legumes which are cultivated in semi-arid tropical region.
- It is used in the remedy of health problems such as bronchitis, pneumonia, coughs, respiratory infections, colds, chest problems and sore throat. The plant has vulnerary, diuretic, astringent, antidote, sedative, laxative, expectorant and vermifuge properties. It is used to heal earache, tumors, abdominal pain and tumors, ulcers, wounds, sores, enteritis, inflammations and different kinds of pain.
- Pigeon pea can be used to heal skin problems such as urticaria, genital irritations and dermatosis. It cures health issues like blood disorders, anemia, diarrhea, dysentery, jaundice, fevers, colic, leprosy, convulsions, flu, diabetes, hepatitis, yellow fever, strokes, urinary infections and menstrual disorders.

Conclusion:
If you do not eat pulses often, start adding them to your diet gradually. Discover tasty, nutritious dishes. Enjoy food cultures around the world for centuries. Pulses make wonderful main dishes, soups, salads, appetizers, snacks and even baked foods. Explore new ways to include pulses into your family’s diet. For vegetarians pulses are best options to get enough protein in the body. Pulse consumption also improves serum lipid profiles and positively affects several other cardiovascular disease risk factors, such as blood pressure, platelet activity, and inflammation. Pulses are high in fibre and have a low glycemic index, making them particularly beneficial to people with diabetes by assisting in maintaining healthy blood glucose and insulin levels.

In conclusion, including pulses in the diet is a healthy way to meet dietary recommendations and is associated with reduced risk of several chronic diseases. Long-term randomized controlled trials are needed to demonstrate the direct effects of pulses on these diseases.

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According to IMD, the 5 category probability forecasts for the Seasonal (June to September) rainfall over the country as a whole is given below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Rainfall Range (% of LPA)</th>
<th>Forecast Probability (%)</th>
<th>Climatological Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficient</td>
<td>&lt; 90</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Below Normal</td>
<td>90 - 96</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Normal</td>
<td>96 - 104</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Above Normal</td>
<td>104 - 110</td>
<td>34</td>
<td>16</td>
</tr>
<tr>
<td>Excess</td>
<td>&gt; 110</td>
<td>30</td>
<td>17</td>
</tr>
</tbody>
</table>

Quantitatively, the monsoon seasonal rainfall is likely to be 106% of the Long Period Average (LPA) with a model error of ±5%. The LPA of the seasonal rainfall over the country as a whole for the period 1951-2000 is 89 cm.
Traditional Indian Pulses Recipes

Mr. V. R. Venkatadri, Principal, Institute of Hotel Management, Catering Technology and Applied Nutrition (IHMB)

Under the Ministry of Tourism, Govt of India

Introduction
My 35 years of hospitality industry journey made me to experience exotic foods around the globe, outstanding food preparation skills, eye appealing food presentation styles and smart marketing techniques of dishes from respective kitchens. As a hospitality educator I spare much of my life time with younger generation called students. Among these, finding the fresh minds with innovative skills for hospitality industry became a prime priority in my life, driving them into right path also a risky and sensitive task for me I felt nowadays. Especially, budding chefs are amazingly doing well in recent days. New technologies, advanced equipments and dedicated educators are the gifted tools for them to manifest their hidden talents.

Having said, driving them in to right path. It Rang a bell in my mind when I see the previous editions of pulses handbook which emphasize “Food prepared with pulses”. When I was giving some exercise to my memory, it took me on nostalgia. My childhood, my mom’s cuisine, my mom’s food preparation style, exotic foods, finger licking tasty snacks also my memory vividly shows me that many of my mom made snacks are pulse based. What a wonder???? Three or four decades back what I used to eat frequently is not in practice nowadays. Where all those excellent, nutritious snacks vanished? Is it the mass extinction of pulses? Not at all, it is in fact forgotten by us.

I took this as an opportunity to give a rebirth to the traditional foods which is made with pulses like Porivilangai Urundai / Porul Vilanga Urundai (which denotes that, one cannot make out the ingredients that has gone into the making of this sweet ball), MaaLaadu / Pottukkadalai Urundai and Paruppu Vadai / Lentil Patties

RECIPE

1. Porivilangai Urundai

Ingredients:
- Bengal Gram Dal (Channa Dhal) ½ cup
- Split green gram dal (Moong dal) ½ cup
- Par boiled rice / steamed rice 15 gms
- Grated coconut 2 tbl spoons
- Grated Jaggery 1 cup
- Cardamom powder 2 teaspoons
- Water ½ cup

Method
1. Heat a pan, dry roast Bengal gram dal till golden brown, keep it aside
2. Add Gr (Green gram dal), dry roast till golden brown and keep it aside
3. Add Rice. Roast till it starts sputter and keep aside
4. Add grated coconut roast till it turns red remove from fire and keep it aside
5. Grind together both pulses and rice to a coarse consisten-


6. Add cardamom powder to the coarse mixture and mix
7. Heat a pan, add water, when it boils add jiggery, let it dissolve
8. Add grated coconut, stir occasionally till you obtain a soft ball consistency (when a little syrup of this put in a bowl of water, it should not dissolve and if we take it from the water it should not stick on to our fingers and should be able to roll like a ball. That’s the consistency)
9. Remove it from fire and pour it over the course pulse mixture little by little and use a spatula to mix syrup well with the mixture.
10. Apply ghee (clarified butter) in your palm, take enough mixture and start making small dumpling. Repeat the process till all mixture is made into balls. A small word of caution, you will be able to make into balls only when the syrup is hot.
11. Tasty, Scrumptious and nutritious sweet is ready to eat.

3. Paruppu Vadai / Lentil Patties

This one is still my favourite. Crisp vada with a cup of tea on any day is heaven.

Ingredients:
- Bengal gram dal ½ cup
- Toor Dal / Pigeon pea ¼ cup
- Black gram dal 3 tblspn
- Raw rice 2 tspn
- Moong dal 2 tblspn
- Dried red chillis 4 Nos
- Asafoetida a pinch
- Curry leaves one sprig
- Coriander leaves, chopped 2 tblspn
- Salt to taste
- Oil For frying

Method
1. Soak Bengal gram dal, Toor dal, Black gram dal and Rice together along with the dried red chillis for about 4 hours
2. Drain the moong dal and add it to the ground mixture
3. Mix till all ingredients are combined well
4. Heat oil in a frying pan
5. Take a small portion, size of a small lemon, and press it to make patties
6. Deep fry this in hot oil. Keep the flame to medium. You can fry 3 or 4 at the same time depending on the size of your pan.
7. When it is golden brown, remove from the oil and place it on a paper towel to remove excess oil.
8. Enjoy the crispy, hot, tasty and healthy snack.

Everyone can benefit from eating pulses. Pulses are high in fiber, complex carbohydrates and low in fat. These nutrients make pulses an important part of any healthy diet and can help maintain a healthy weight.

Pulses have additional benefits for people who:
- Are overweight
- Have diabetes
- Have high blood cholesterol levels
- Tend to be constipated
- Have celiac disease
- Are vegetarians
Pulses are very high in fibre. They contain both soluble and insoluble fibres. Soluble fibre helps lower blood cholesterol levels, while insoluble fibre helps with digestion as well as maintaining regular bowel movements. Fibre-rich foods like pulses are often more filling than other foods, helping to keep you full until your next meal.

Make sure to drink enough water when adding high fibre foods like pulses to your diet!

Pulses have a low glycemic index. Most of the carbohydrates in pulses are fibre and starch that prevent blood sugars from rising quickly after a meal or snack.

Pulses are an excellent source of folate, which has been shown to lower homocysteine levels. Evidence suggests that high levels of homocysteine (a type of protein) damages the lining of arteries and promotes plaque buildup and blood clots. Over time, this damage can slow or block blood flow to the heart or brain causing a heart attack or stroke.

Pulses are gluten free and can be eaten by people with celiac disease. Pulses are a great alternative to wheat-based products. They add starch, fibre, protein and many vitamins and minerals that may be lacking from a gluten-free diet.

A healthy vegetarian diet should include a variety of peas, beans, lentils and chickpeas in place of beef, pork, chicken and fish. Eating pulses with a grain such as wheat, rice, or oats ensures a high quality protein.

Conclusion
I dedicate my childhood memory and my mom’s recipes with pulses to the young budding chefs of hospitality industry. Whichever heights they reach, let them have a memory of traditional authentic cuisines of our country especially food with pulses. I am handing over the above mentioned “recipe relay baton” to the budding young chefs. Let them carry and exploit it. When their time comes, let them handover it to the next generation. As Chef Escoffier said, good food is the foundation of genuine happiness. I can proudly say that our forgotten traditional recipes with pulses are falling into good food category. When these good foods are introduced to our younger generation’s palate we are making a strong foundation for healthy and disease free human race which leads to the genuine happiness. Let us be a part of making an amendment in our food habit. Let us give rebirth to our forgotten recipes with pulses. Let us be a part of bringing the happiness to human race through food. Let us make pulses as our nation’s pride.

Upcoming Events of IYOP 2016

Pulse and Special Crops Convention
From July 06, 2016 until July 08, 2016 at Toronto, Canada

Children’s Ministry of Agriculture, Forestry and Fisheries tour Day
From July 28, 2016 until July 29, 2016 at MAFF, Tokyo

Pullman’s 28th Annual National Lentil Festival
On August 19, 2016 at Reaney Park, Pullman, USA

Australian Pulse Conference
From September 12, 2016 until September 14, 2016 at Tamworth, Australia

Plant Based Healthcare Conference
From September 21, 2016 until September 24, 2016 at Anaheim Marriott, Anaheim, CA

Felton Food Festival
On October 04, 2016 at Felton Food Festival, Australia

The Second International Legume Society Conference
From October 11, 2016 until October 14, 2016 at Tróia Resort, Lisbon, Portugal

Japan Beans Day Symposium 2015
On October 13, 2016 at Tokyo, Japan

Japan Beans Day Festival
On October 13, 2016 at Japan

World Food Day
On October 16, 2016 at Planet Earth

Pullman’s 28th Annual National Lentil Festival
On October 20, 2016 at Reaney Park, Pullman, USA

Engineering and Technology Innovation for Global Food Security
From October 24, 2016 until October 27, 2016 at Steellenbosch, South Africa

10th Canadian Pulse Research Workshop
On October 25, 2016 at Winnipeg, Manitoba

International Conference on Legume Genetics and Genomics
On November 01, 2016 at Jining, China

Press Conference (Conférence de presse - Francophone)
On November 04, 2016 at Ministère de l’Agriculture à Paris

Vegan Festival
From November 05, 2016 until November 06, 2016 at Victoria Square, Adelaide, Australia

American Society of Agronomy, Crop Science Society of America, and Soil Science Annual Meeting
From November 06, 2016 until November 09, 2016 at Phoenix, Arizona, United States

Pulses for Nutritional Security and Agricultural Sustainability
From November 12, 2016 until November 14, 2016 at New Delhi, India

International Seminar
On November 12, 2016 at Gandhinagar, India

FAO IYP Closing Event
On December 01, 2016 at FAO United Nations Headquarters, Rome, Italy
Advanced Pulse Storage and Management

Mr. Chandra B. Singh, Principal Engineer, Grain Management, OPI systems Inc, Canada
Mr. Ron Larson, VP, Engineering, OPI systems Inc, Canada

Summary
Seed moisture and temperature monitoring are two key components of proper pulse storage management practices. Dry and cool pulses can be safely stored for long periods. An increase in pulse seed moisture and/or temperature is a good indicator of spoilage. Moisture and temperature of pulse stored in grain bins can be wirelessly monitored in real-time over an internet connection to a smart phone, tablet or computer from anywhere. Insect density and growth can also be monitored and timely fumigation treatment can be applied if insect density increases. Pulses can be dried to safe storage moisture levels by in-bin natural air drying without exposing to high heat in high temperature dryers. Properly designed in-bin (vertical steel silos) aeration systems with automated fan and heater control effectively and timely dry and aerate (cool) the pulses using optimal ambient air conditions and minimum energy consumption. An in-bin aeration system with automated fan control can also rehydrate over-dried pulses using natural air to manage ‘shrink’. Advanced grain management technology, practices and regular monitoring ensure safe storage of pulses at a high commercial grade, optimum quality and with minimum spoilage risk. Pulses with higher percentage of immature, damaged and broken kernels and foreign material are not recommended for long term safe storage.

Keywords: Pulse storage, Drying, Aeration, Grain management

1. Introduction
Pulses are an affordable and vital vegetarian source of protein for large populations, enhancing their dietary requirements in developing and poor countries. Pulses have high protein, low fat, high carbohydrates (fibre and resistant starch) and are rich source of micronutrients, amino acids and vitamins. Pulses are an important and traditional crop grown across the world. Due to their nitrogen fixation characteristics in the soil, pulses significantly contribute to a sustainable cropping system. Major pulse crops are peas, beans, lentils, and chickpeas with the total annual global production of nearly 68.83 million metric tonnes (MT) (FAOSTAT, 2013). India is the world’s largest producer (17.24 million MT), consumer and importer of the pulses. The other top producers of pulses are Canada (5.35 million MT), Myanmar (4.49 million MT), China (3.89 million MT), Nigeria (3.422 million MT), and Brazil (3.42 million MT) (FAOSTAT, 2013).

The world is facing a huge challenge of feeding its rapidly growing population and food demand will increase by 70% by 2050 (FAO, 2009). Due to climatic uncertainty, high demand, and population growth, it is important to have a sufficient and secure stock of pulses and other grains to ensure food security. There is a huge gap between production and demand for pulses in countries like India needing to import up to 25% of their production. Insufficient and poor storage infrastructure, lack of knowledge of advanced pulse management technology and harsh climatic conditions pose greater risks and challenges in the long term safe storage of pulses particularly in developing and poor countries. Pulse growers, traders and processors incur huge economic losses due to both quality degradation and quantitative loss of pulses in storage and handling. Exposure of pulse crops to the sun, rain, humid and hot air, insects, birds, and rodents in open granaries, as well as unsealed and non-aerated warehouses, results in significant spoilage and large quantity losses.
During storage, pulses also change chemically and result in significant quality and milling losses due to mold growth, carcinogenic mycotoxin development and insect damage, discoloration, darkening due to oxidation, broken/cracked/split/peeled seeds, sprouting, odour, heat damage, and bin burnt damage. Condensation inside storage structures results in an increase in grain moisture, mold growth, and hotspot development. Pulses will absorb moisture from exposure to humid air. Pulse grains also have a tendency to produce heat as a result of respiration inside the storage. Advanced grain management practices and regular monitoring ensure safe storage of pulses at a high commercial grade, optimum quality and with minimum spoilage risk.

2. Pulse Quality
Pulse quality can be broadly categorized into physical factors, safety factors, compositional factors and cooking characteristics. There are several variables that affect the pulse quality such as growing conditions, disease, harvest conditions, harvesting methods, handling methods and storage practices.

2.1 Physical factors
Physical appearance of the pulses is an important factor in determining a commercial grade and buyers pay premium for pulses with clear, intact and quality grain. Seed color, seed size, bleached, bin burnt, cracked seed coat, peeled, broken, split, heated, frost damaged, wrinkled, stained, odour, shrivelled, immature, damaged seeds, foreign material, seed moisture, bulk density, and test weight are considered in physical assessment and commercial grading of the pulses (CGC, 2016).

2.2 Safety factors
With increasing health awareness and tight regulations, food safety has become a prominent factor in assessing the pulse quality. Consumers prefer and demand safe and healthy food. Molds leading to carcinogenic mycotoxins are a big concern in the grain and food processing industry. There is very low tolerance of mycotoxins in food and feed grain. Pulses should be free from insects and insect damaged pulses, ergot, animal excreta, Sclerotinia sclerotiorum (SCL) and chemical residues.

2.3 Compositional factors
These are intrinsic factors such as protein, starch, fibre, and micronutrients. Since pulse have several health benefits, buyers and processors are interested in knowing the composition for their specific end use product.

2.4 Cooking characteristics
Since several pulses are consumed as whole seeds, split or de-hulled after boiling, cooking characteristics also affect the quality of pulses. Cooking time, firmness of the cooked pulses, and water absorption capacity are the main cooking characteristics.

3. Storage Losses
Improper and unscientific storage may result in significant quality and quantity losses. Quality loss may affect most of the quality factors described in previous section. Significant quantity loss may occur due to insect damage.

4. Safe Storage
Safe storage refers to the duration of the storage of pulses without any significant quality or quantity loss. Seed moisture content and temperature are the two most important factors that determine the safe storage time of pulses. Dry and cool grain can be stored for long periods whereas hot and moist grain has a relatively short safe storage life. It is important to under-
stand that safe storage is cumulative, so all the storage conditions after the harvest and throughout the storage and conditioning period should be considered in assessing the safe storability of the pulses. The following table (Table 1) shows the safe storage chart for peas, and is similar for other similar pulses.

Table 1: Safe Storage Period (Number of Weeks) of Pulses (Sokhansanj and Patil, 1995)

<table>
<thead>
<tr>
<th>Storage Temp (°C)</th>
<th>Storage Moisture (% wet basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
</tr>
<tr>
<td>25</td>
<td>31</td>
</tr>
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<td>21</td>
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<td>10</td>
<td>200</td>
</tr>
<tr>
<td>5</td>
<td>370</td>
</tr>
</tbody>
</table>

5. Pulse Management
The goal of an efficient and proper pulse management is to store the pulses safely for a long period with negligible quality and quantity loss. The following guidelines are intended to help in effectively managing stored pulses.

5.1 In-bin storage system
A modern in-bin drying system is shown in below Fig (Singh et al., 2014). The drying system consists of free standing silo (vertical steel structure) containing grain for drying, aeration and storage. A single fan or multiple fans are connected to the plenum of the silo at the bottom through a transition duct. The air is pushed upwards through the grain where the air leaves the bin from the exhaust vents on the roof. Dry air entering the grain bin absorbs the moisture from the grain (or moist air adds moisture to the grain) and moves upwards. The air carrying moisture from grain exits the grain bins through exhaust vents. As drying progresses, a drying front is established between the dried grain below the drying front and the yet to be dried grain above the drying front (a hypothetical layer of 0.5-1.0 m). As this layer dries, the front moves gradually upwards until the bin is fully dried and the drying front pushes out the top surface of the grain. The in-bin system is equipped with moisture and temperature cables, plenum temperature and pressure sensors, head space temperature and relative humidity sensors, electronic insectors and an ambient weather station. These devices communicate to the grain management software on a personal computer through wired or wireless communication.

5.2 Sanitation
Sanitation of grain storage facilities is critical part of the best grain management practices. Before loading the grain bins with new crop, the bins should be cleaned and any leaks should be sealed. Maintain the area around the bin by cleaning any debris of old grain or other organic material such as grass or leaves. Insects and molds can survive on this old grain in and around the bins and can heavily infect the new crop when loaded into grain bins. It is also recommended to clean harvest equipment, handling equipment, pits, grain augers and conveyers before harvest to prevent contaminating the grain from infested equipment.

5.3 Handling
Pulses should be handled gently as they are prone to chipping and peeling. Appropriate use of harvesting and threshing machinery, careful transportation of pulse grain throughout on-farm storage, elevators, and supply chain can minimize the physical damage to the pulses. Improper loading and unloading of pulse grain may also cause damage. Dropping the pulses in very tall bins may also result in chipping and cracking of the pulses due to excessive drop from height. Bean ladders should be used to minimize the impact exposure of the seeds. Augers for pulse handling should be operated at low speed. Unnecessary movement of pulses from bin-to-bin should be avoided.

For long term safe storage, pulses should be cleaned prior to loading into long term storage. After the grain bin is filled, the bin should be cored and levelled for uniform airflow. Through top loading, broken, immature seeds, fines and foreign material tend to accumulate in the central core. This concentration will block the airflow rate through the core and will also absorb higher moisture than sound seeds, resulting in inefficient and uneven
drying and aeration, ineffective fumigation, and increased risk of spoilage, mold growth and hotspot development.

Some pulses are also prone to oxidation through the combination of sunlight, high moisture and high temperature. Oxidation causes bleaching and discoloration of pulses and reduces the pulse quality and market value. Pulses should be loaded in to silos to protect from sunlight and then dried and aerated for long term safe storage. Over drying (shrink) of pulses below optimum moisture content should be avoided. Over dried pulses are difficult to handle without damage in loading, unloading, transportation and milling and processing. Additionally, shrink is a direct financial loss to the growers and merchandisers as pulses are traded on weight basis.

5.4 Drying
For long term safe storage, pulses should be dried to 12-14% moisture content. Drying in high temperature dryers may cause physical damage and seed darkening so pulses should not be exposed to temperatures above 40°C in high temperature dryers. In-bin natural air drying with optional low temperature heater is considered as the most cost effective method with very high quality dried product. Pulses can be dried in grain silos with properly designed aeration system and sufficient airflow rate (0.75-1.0 cfm/bushel or 0.78-1.04 m3/min/t (assuming 772 kg/m3 bulk density)). Drying can be achieved in 3-5 weeks, but insufficient airflow rate may prolong drying and result in significant quality and quantity loss. Using moisture cables, progress of the drying can be monitored in-real time. Research has shown that drying with automated fan control is highly efficient and timely drying with minimum energy consumption and uniform moisture can be achieved (Singh et al., 2014). Once the pulses are dried to target safe moisture levels, aeration control should be used for cooling.

5.5 Aeration
Aeration is the process of cooling the grain after the grain has been dried to safe storage moisture levels. Cool and dry grain has long safe storage time (table 1) at optimal moisture of 14% and 2-3°C in colder climates. In warm climate pulses should be dried to 12-13% and then cooled below 15°C or as cool as conditions allow. Grain temperature can be monitored in real-time using temperature cables and progress of aeration/cooling can be tracked. Automated aeration control runs with feedback from temperature cables. The fan operates when ambient condition is cooler than the grain to ensure efficient and uniform cooling with minimum fan operation. IntegrisPro (©OPiSystems Inc.) with temperature cables also tracks the relative change in temperature for each sensor and if hotspot develops, an alarm is sent to user before the hotspot develops into wide spread spoilage. If the grain temperature exceeds the maximum grain temperature set point, the fan will automatically start to cool the grain.

5.6 Headspace condensation
Grain dried to safe moisture levels and aerated is always at the risk of spoilage from condensation in the bin. Headspace condensation is the major cause of mold growth, hotspot development and spoilage near the top surface of grain, particularly in regions where daily temperature fluctuations are high. In sunny and warm days headspace temperature may rise to 15-20°C above ambient temperature. At night, as ambient temperature falls, the bin roof also cools down but headspace remains hot and as warm air hits the cool bin roof. Condensation occurs on the inner surface of the bin roof and drops on the top grain surface. This condensed water is then absorbed by the grain, increasing its moisture and combined with its high temperature spoils rapidly, leading to mold growth, hotspot development, mycotoxins and grain spoilage.

The best way to deal with headspace condensation is by using power exhaust vents with automated control. The exhaust fans will run independently (without main fan) when conditions approach the dew point (condensation) and removes all the moist air before it has the opportunity to condense. The headspace air can be removed without running the aeration fan, avoiding the potential of warming the grain. Additionally, power vents have low power consumption.

Alternatively, unload the affected portion of grain (moldy/hot/moist) and treat it separately. Look at the daily night time temperatures and if there is cooling potential with low night time temperature, run aeration fans to take advantage of that opportunity and cool the grain.

5.7 Monitoring
Stored pulses should be monitored regularly as pulses dried to safe storage moisture levels and cooled may start spoiling due
Grain respiration generates heat and moisture and varying weather patterns may cause condensation near the sidewalls and in the headspace of the bin, resulting in mold growth and hotspot development. Heavy insect infestation may occur in bins with dry pulses if the bins are not monitored regularly. Grain sampling, insect probes/traps and electronic insect detection systems are used to monitor insect infestation in grain bins. Track the grain moisture and temperature using moisture and temperature cables. An increase in grain moisture and temperature is a strong indicator of mold/insect growth. Take immediate and appropriate action to cool the grain to avoid any further spoilage and prevent the spreading of hotspot to a larger grain mass. Operate the fans in the coolest conditions available while continuing to monitor the situation. Running the fan during coolest period of day/night cycle can aid in your ability to manage hotspots, provided that your airflow is sufficient for aeration (0.10 cfm/bu or 0.11 m3/min/t). If the hotspot cannot be controlled by aeration, there is no choice but to unload the affected portion of grain from the bin. Apply recommended fumigants for insect control as required.

References


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Soyameal Anec71
Speckled Kidney Beans
Steel Billets
Sugar Icumsa 100
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Vietnam Rice 10% Broken
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Broken Rice
Wheat 9ukrainian)
White Peas
Wheat Flour 1-st Grade
Wheat
Vietnam Rice15%-25%broken
Vietnam Long Grain 15%broken
Rice
Vietnam 25% broken Rice
Ukrainian Linseed
Sunflower Seed
Steel Scrap
Spices
Soyameal Anec73
Soyabean No 2 Us Origin
Soya Meal
Refined Palm Kernal Oil
Red Whole/split Lentils
Red Kidney Beans
Raw Sugar (brazil Origin)
Rape Seed Meal
Peas Green
Paper Writing Paper
Palm Acid Oil
Oil Seeds
Milling Wheat Ukraine
Manganese Ore
Lentils
Green Mung Beans Tanzania

Grains
Flax Seeds
Feed Wheat Ukraine
Dairy Products
Crude Soyabean Deggummed Oil
Crude Canola Oil
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Chick Peas
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Board Paper
Vietnam Rice 5%-10% Broken
Palm Kernal Acid Oil

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Impact of Monsoon Rains on Pulses Production in India in Last decade

Dr. N. Chattopadhyay, Deputy Director General of Meteorology (Agrimet Division),
India Meteorological Department

India grows the large number of varieties of pulses in the world accounting for about 32% of the area and 23% of the world production. Pulses are one of the important segments of Indian Agriculture. In India pulses are grown in around 24-26 million hectares of area producing 17-19 million tonnes of pulses annually. India accounts for over one third of the total world area and over 20 per cent of total world production. For majority of vegetarian population in India, pulses are the major source of protein. The major pulse producing states in India are Madhya Pradesh (24%), Maharashtra (15%), Uttar Pradesh (12%), Rajasthan (12%) and Andhra Pradesh (9%), which together account for 72% of the total production, growing the major pulses like Bengal gram (chickpeas), red gram (tur), lentil (masur), green gram (mung) and black gram (urad). The following map shows the major pulses growing states in India.

Though, there are some trends of increase in production of pulses in India in modest way but the pulses production is often influenced by biotic and abiotic factors. Among biotic factors, rainfall particularly in kharif, i.e., monsoon season and temperature in rabi season influences the production. Because of the high level of fluctuations in pulse production, due to biotic and abiotic stress, farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. As per as the biotic stress is concerned, production of the pulses is affected by pest & diseases. In the monsoon season, the date of onset of monsoon rain and afterwards spatial and temporal distribution of rainfall decides the prospects of pulses production in the country. In the present article, elaborate discussion has been made on how the monsoon rainfall is affecting the pulses production. The subdivision wise monsoon rainfall data has been taken from Hydrology Division of India Meteorological Department and pulses production & yield data has been taken from Indian Institute of Pulses Research and also from Agricultural Statistics at a Glance, 2013, Directorate of Economics and Statistics - http://sands.dacnet.nic.in.

Nevertheless, improvement in yields of pulses has contributed to higher pulse production in recent years which is given below. It is observed that there is, in general, increase in the total pulses production for last one decade.
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From the year 2005, there is an increase in the production of total pulses up to 2013-14, year to year there is variation of pulse production in the country. In the year 2013-14, highest production of pulses i.e. 19.78 million tones was observed because of good monsoon rainfall condition in the country. Decrease in pulses i.e. 17.38 million tones production was observed in the year 2014-15 because of less monsoon rainfall in the country. In general deficient monsoon rainfall year, pulse production in the country remained relatively low.

State-wise trends in monsoon rainfall and production of Pulses
Madhya Pradesh is the largest producer of pulses followed by Maharashtra, Rajasthan, Uttar Pradesh, Andhra Pradesh and Karnataka. From the year 2005 to 2015, West Madhya Pradesh received good rainfall than East Madhya Pradesh. Production of tur was more in Madhya Pradesh in the year 2010. Even though the subdivision monsoon rainfall was less but the spatial and temporal distribution of rainfall was good. Production of tur was less in 2006 and 2009 because of less monsoon rainfall. From the year 2012, production of mung bean was increased as the area of sowing of mung bean was increased.

In case of Maharashtra, production of tur was more in the year 2010, 2013 with good monsoon rainfall activity in Madhya Maharashtra, Marathwada and Vidarbha also as compared with the production of urad and mung. Production of lentil was more or less steady in the decade.
In Rajasthan production of mung is more as compared to tur, lentil and peas. West Rajasthan receives more rainfall than East Rajasthan. Because of drought year 2009, production of pulses was decreased and in 2010 and 2011, production was increased because of more monsoon rainfall. Also production of tur, lentil and peas was less and in steady condition.

In Uttar Pradesh except the year 2008, monsoon rainfall was relatively less in East and West Uttar Pradesh. It affected the production of pulses in the State. Comparatively production of mung was less but steady as compared to other pulses.

In Andhra Pradesh, pulses are mainly grown in Telangana. Production of urad was more in the year 2006 and 2011 but the production of Tur was decreased in 2006, 2008 and 2011. Along with this, production of mung was decreased in the drought year 2009.

In Karnataka, production of tur was more as compared with the other pulses crops and also there are fluctuations in the production values of tur. Production of mung and urad were less and steady.

Conclusion:
It has been observed that there was considerable variability of monsoon rainfall in terms of quantum and spatial and temporal variation of rainfall which caused considerable fluctuation of pulses production in the country. In future, it has been projected considerable variability in different parts of India due to projected climate change. Both these issues are causing concern in pulse production while more improved varieties of pulse and state of art technology are being tried to improve the production. Thus there is need for judicious use of rainfall along with the water harvesting, proper time of sowing even utilizing the pre monsoon rainfall for early sowing, adoption of contingent planning in case of subdued monsoon rainfall etc. Besides suitable advisories in terms of irrigation, plan protection based on the rainfall and temperature needs to be taken care of in building the faith of the farmers to more pulse cultivation which is very much appreciated by the Government of India.

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Madagascar Pulses Scenario

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POIS DU CAP BUTTER BEANS
BLACK EYED BEANS
WHITE BEANS GREAT NORTHERN (G.N)
WHITE BEANS ALUBIAS
RED COWPEAS
RAFFIA
A short story of black eye bean

“Black eye pea” is the English name of the cornille bean or Vigna unguiculata subsp. unguiculata in Latin. It is a vegetal subspecies of the Fabaceae family, of yellowish-white color, and oval and round-shaped, marked by a black spot on its germination point. It is known as the nièbé, black-eyed cowpea or cow pea. It is highly present in Africa, Latin America, the south of the United States and Turkey. It was introduced in Madagascar by the explorers and first was SARELACOS Group TALOUMIS MADAGASCAR. It has sweet flavour, the black eye bean is often found in Cypriot cuisine and the Mediterranean diet. It is highly appreciated by Africans who make it a greedy and typical entry: the cowpea donuts. In the food industry, it is transformed into flour, an indispensable ingredient for the making of pasta and biscuits. Highly rich in proteins, it constitutes food supplements.

The black-eyed bean, a legume, is a subspecies of the cowpea, grown around the world for its medium-sized, edible bean. Our high quality beans are grown in Madagascar, being the leading producer of black eyed beans.

We find the black eyes beans/ Cowpeas in the northwest of Madagascar. The production area is located In between Sofia regions (districts of Port- Bergé and Mampikony), Boeny (in the south-eastern part of the region with the district of Ambato - Boeny ) and Betsiboka (far north), in areas of Baiboho.

Quality of exported black eye bean

Madagascar is an ideal source for beans and owns all the assets to meet the external demand. The Malagasy black eye bean in particular has the required qualifications to enter the international market. It is a 100% organic product coming from certified seeds and grown without pesticide residues and other contaminants. The size and the quality of the beans meet the requisite criteria for the export products. The use of different handwork cultivation techniques allows the increase of the yield, in order to reach the amount requested for export.

White Kidney Beans Le haricot, Phaseolus vulgaris L

It is a small, dry white bean which is smaller than many other types of white beans and has an oval, slightly flattened shape. It features in such dishes as baked beans and even pies, as well as in various soups such as Senate bean soup.

Lima Bean (CAP BEAN): Le pois du Cap Phaseolus lunatus L.

Phaseolus lunatus is a legume grown for its edible seeds. It is commonly known as the butter bean or lima bean. The pod of the lima bean is flat, oblong and slightly curved, averaging about three inches in length. Sometimes called “butter beans” because of their starchy yet buttery texture, lima beans have a delicate flavour that complements a wide variety of dishes.

Madagascar, Région Menabe Région Atsimo Andrefana is the second largest commercial producer with an area cropped varying from 3000 to 19,000 ha (mainly in the flood plains of the semi-arid coastal region in the south-western part) and a production of dry seed of about 8000 MT, almost exclusively of large white-seeded types. Beans, 47% of production of Vakinankaratra is sold at the local market. More than 90% of the production is exported from Miandrivazo.Lima beans, 70% of production is exported to South Western countries.

Source: PRDR - Menabe
The Food and Agriculture Organization (FAO) of the United Nations named 2016 the International Year of Pulses. Because pulses have a positive impact on health, the environment and world economies. The author can be contacted at: komeldjina@gmail.com, tradesarelacos@gmail.com
Source Programme PROSPRER au sein de la région de la Sofia /
Source : SIC/SG
http://www.agriculture.gov.mg

The Raffia Palm

The Raffia palms (Raphia) are a genus of about twenty species of palms native to tropical regions of Africa, and especially Madagascar.

Raffia is a fibre that comes from the leaves of a palm called raffia palm of the Arecaceae family and grows in marshy areas of the northern half of the island of Madagascar. Beside it is in this part of the globe that concentrates 80 to 90% of world production. Raffia strands are made out of stripped and dried palm leaves. Raffia Majunga Superior is from Madagascar where the Raphia Farinifera has the largest leaves of any palm tree, so it is the logical choice for fibre. It can be delivered in bales of 100kg. But also in small bundles of 50gr. 100gr. 250gr. 300gr or any other weight on request.

The Raffia is a completely environmentally friendly product. Indeed, the extraction can maintain and regenerate forests Raffia while providing income to local people.
EXECUTIVE SUMMARY:
We are bearish on the Dollar Index and bullish on Crude for the next few months. This makes us bullish on the Commodity Currencies; given the strong correlation these currencies share with these two variables.

INTRODUCTION:
A commodity currency is the currency of a country which depends heavily on the export of certain commodities or raw materials for income. Commodity currencies generally refer to the Australian Dollar, Canadian Dollar, New Zealand Dollar, South African Rand and Brazilian Real etc.

Naturally the economic exposures of these countries in the global sphere is larger compared to the other more or less self-sufficient countries, resulting in a much greater impact of the volatility in the commodities exported on their GDP and currencies.

The table alongside (data courtesy World Bank) shows the increasing dependence on exports for Australia, Brazil, Canada and New Zealand. The figure for 2014 would have been higher for all the countries if almost all of them were not still trapped in a web of recession triggered by the financial meltdown of 2008 and a huge bear market in commodities since 2011.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Average since 1960</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>16.15</td>
<td>20.9</td>
</tr>
<tr>
<td>Brazil</td>
<td>9.4</td>
<td>11.19</td>
</tr>
<tr>
<td>Canada</td>
<td>27.91</td>
<td>31.61</td>
</tr>
<tr>
<td>New Zealand</td>
<td>28.58</td>
<td>29.19</td>
</tr>
</tbody>
</table>

The weakness of the commodities affected the economies and then propagated to the currencies. As we see, most of them are in a fragile state but there may be a faint ray light at the end of the tunnel as commodities begin to recover and can even strengthen.

Correlation between Dollar Index and Commodity Currencies

The above chart compares the percentage change in the Dollar Index and in the commodity currencies (BRL, RUB and CAD being inversed). Although the Dollar Index is heavily influenced by Euro and Yen, this chart shows how strongly the Commodity currencies follow the cues from the Dollar Index. The deep interconnection between the Dollar and commodities influences the economics of the commodity countries to a very large extent and it is reflected in the appreciation/depreciation of their currencies.

Correlation between Brent Crude and Commodity Currencies

Among all the commodities exported by these countries, Crude oil is undoubtedly the most significant. Volatility in oil prices makes everyone anxious but economies like Russia, Canada or Brazil depend a lot more on it and suffer far more than other economies when oil price crashes down, as it did in 2014-15. The chart above shows the strong direct correlation between Brent Crude and the commodity currencies and hence, a bottom in Crude proposes a strong case for a bottom for these currencies too.
Looking at the following charts, we are bearish on the Dollar Index and bullish on Crude for the next few months. This makes us bullish on the Commodity Currencies, which is reflected in the forecast table at the end of this article.

Brent Crude Projection

Over the last couple of years, a global supply glut, monstrous in dimensions, pushed Crude vertically down from $115 to $27, prices that had been last seen a decade back. We believe the selling has been overdone for now and the current bounce from $27 may extend all the way to $60 before another down leg reasserts itself.

The expected price activity is shown on the chart, inside the coloured box which projects a steady rise to $60 in the next 2-3 quarters, a view we have been holding since the beginning of 2016.

Forecast Table

Based on (a) our bearishness on the Dollar Index, (b) our bullishness on Brent Crude and (c) the strong correlation between these two variables and the Commodity Currencies, we would expect the Commodity Currencies to strengthen in the coming months.

Our 3-month and 6-month projections are given below.

<table>
<thead>
<tr>
<th>Projections</th>
<th>Current</th>
<th>3 Month</th>
<th>6 Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUD-USD</td>
<td>0.7632</td>
<td>0.7390</td>
<td>0.7790</td>
</tr>
<tr>
<td>USD-BRL</td>
<td>3.486</td>
<td>3.210</td>
<td>3.030</td>
</tr>
<tr>
<td>USD-CAD</td>
<td>1.251</td>
<td>1.260</td>
<td>1.220</td>
</tr>
<tr>
<td>USD-NZD</td>
<td>1.432</td>
<td>1.450</td>
<td>1.311</td>
</tr>
<tr>
<td>USD-RUB</td>
<td>64.28</td>
<td>63.00</td>
<td>60.50</td>
</tr>
<tr>
<td>USD-MMK</td>
<td>1160</td>
<td>1090</td>
<td>1025</td>
</tr>
<tr>
<td>USD-CNH</td>
<td>6.48</td>
<td>6.60</td>
<td>6.52</td>
</tr>
<tr>
<td>USD-INR</td>
<td>66.44</td>
<td>66.20</td>
<td>66.50</td>
</tr>
</tbody>
</table>

The table above shows the projected values for the Commodity currency pairs for the next 3 and 6 months. The currencies are expected to gain strength against Dollar in the coming months as we believe Dollar Index may have made a long term top and might probably have entered a bear market. Occasional bounces of Dollar against the currencies will be seen but those bounces are expected to be used to add Dollar shorts by the market participants.

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Strategies to Increase Productivity of Pulses in India

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India is the largest producer (17-18 m t), consumer (22-23 m t) and importer (4-5 m t) of pulses. Under the ambit of Indian Council of Agricultural Research, large number of high yielding varieties and matching integrated crop management technologies have been developed having capacity to enhance pulses production to the tune of 25-30% within short span, if appropriate policy support is provided to address various issues like infrastructure for life saving irrigation, quality input supply, storage, buffers stock for seed and grains, remunerative MSP (Minimum Support Price) and procurement, market and issues dealing with import of some of the less preferred pulses etc. There is tremendous scope to popularize pulses as ‘Health Food’ or ‘Nutri-Rich Food’.

Introduction

Variety of food crops including rice, wheat, coarse cereals, minor millets, maize and pulses are grown in India with total production of 253.16 mt (2015-16). India is the largest producer (17-18 mt), consumer and importer (4-5 mt) of pulses. It is important to note that pulses import crossed 5 mt during 2015-16. Therefore, to fulfil growing demand and save precious foreign currency, pulses production need to be increased from present level of 17.33 mt (2015-16) to 26.5 mt by 2020. This is possible with the convergence of potential of technology available, policy support for research and development to create enabling environment for farming community to grow more pulses with adequate amount of farm inputs. More than 500 high yielding varieties of various pulses having traits of economic importance, farmers’ preference, insulated against major diseases and other stress are available along with matching production and protection technologies to enhance per se productivity. The development of short maturity duration varieties has offered scope to bring additional area under pulses during different seasons and areas. However, the technologies relating to processing and storage of various pulses at village level in form of seed/grains/splits (dal) still need refinement so that post harvest losses can be minimized. Similarly, in view of climate change and requirements for new varieties, there are few researchable issues those need to be tackled through systematic crop improvement and other approaches. The Government of India (GoI) and Indian Council of Agricultural Research (ICAR) is fully aware of the people’s demand. Therefore, ICAR has made committed provisions by allocating additional funds about Rs.500 crores for promotion of pulses during next three years where ICAR will provide all need based technology backstopping and demonstrate pulses production technologies. Further, as it has been advocated by one and all and is a hard fact that there is non-availability of quality seed of various pulses, therefore, ICAR has taken lead to establish 150 ‘Seed Hubs’ for production of quality seed (including breeder seed) of pulse crops at ICAR-IIPR, State Agricultural Universities (SAUs) and Krishi Vigyan Kendras (KVKs) with the assistance from GoI. In addition, production units will also be established for enhancing availability of much talked quality bio-fertilizers and bio-pesticides through national agricultural research and education system (NARES). The much required and appreciated ‘Green Revolution’ that India witnessed in early seventies and intensification of cereal-cereal cropping systems resulted in decline of total factor productivity (TFP) of cereal based cropping systems in northern India in general and states like Haryana, Punjab, Western Uttar Pradesh and Bihar in particular. The availability of early maturing varieties, increased use of chemical fertilizers, mechanization and availability of irrigation favoured area expansion and vertical increase in production of wheat and rice. This resulted in shift in pulses cultivation (IIPR Vision 2050) from high productive northern zone (cool and long growing season) to marginal/sub-marginal and low productive lands of central and southern India (warm and short growing seasons).
Since, there has been little policy support for promotion of pulses in general and for research in particular during seventies/eighties, only marginal increase in yields of pulses could be realized though more than 250 improved varieties were developed for cultivation in various agro-ecological regions of the country during same period (1975-2000). However, with the support from GoI, improved production technologies have been developed having capacity to increase pulses production substantially, if transferred to the farmers’ field with required policy support.

2. Trends in area and production of pulses:
The total pulses production showed impressive growth after 2009-10 (14.66 m t) and pulses production (19.78 m t) attained its peak in 2013-14 by adding more than 5 m t to the pulses basket just in 4-5 years (Table 1). The major contribution was of impressive production and productivity growth in chickpea and of additional area under other pulses. Due to unfavorable weather and untimely heavy rains during crop season pulses production reduced to 17.20 mt (2014-15). It is also a fact that in almost all rabi season crops shown this decline in production and pulses were not only the exception. The crops also suffered due to less rains during monsoon season in 2014. The weak monsoon continued even during 2015-16 and that resulted in loss of area under rabi pulses in Rajasthan and Madhya Pradesh whereas crops suffered due to drought in Maharashtra and Karnataka in 2015-16. Since, enabling environment was created for pulses production through special campaigns and several other steps were taken by the Central and State Governments, pulses production could be maintained at the level of 17.33 mt during 2015-16 as per second advance production estimates (Source: http://pib.nic.in/newsite/PrintRelease.aspx?relid=136419) released.

In India, Madhya Pradesh is the largest producer of pulses followed by Maharashtra, Rajasthan, Uttar Pradesh, Andhra Pradesh and Karnataka. These six states together contribute 79% of pulses area and 80% of pulses production. There are four states viz., Jharkhand, Odisha, Bihar and Chhattisgarh where ample scope exists to increase coverage and enhance productivity of pulses as plenty of water is available to raise crops in different seasons and niche areas.

Table 1. Area (A) and production (P) of major pulses during 2009-10 to 2015-16 in India

<table>
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<tr>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>P</td>
<td>A</td>
<td>P</td>
<td>A</td>
<td>P</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>3.47</td>
<td>2.46</td>
<td>4.37</td>
<td>2.86</td>
<td>4.01</td>
<td>2.65</td>
</tr>
<tr>
<td>Chickpea</td>
<td>8.17</td>
<td>7.48</td>
<td>9.19</td>
<td>8.22</td>
<td>8.30</td>
<td>7.70</td>
</tr>
<tr>
<td>Mungbean</td>
<td>3.07</td>
<td>0.69</td>
<td>3.51</td>
<td>1.80</td>
<td>3.39</td>
<td>1.63</td>
</tr>
<tr>
<td>Urdbean</td>
<td>2.96</td>
<td>1.24</td>
<td>3.25</td>
<td>1.76</td>
<td>3.22</td>
<td>1.77</td>
</tr>
<tr>
<td>Lentil</td>
<td>1.48</td>
<td>1.03</td>
<td>1.60</td>
<td>0.94</td>
<td>1.56</td>
<td>1.06</td>
</tr>
<tr>
<td>Other Pulses</td>
<td>4.14</td>
<td>1.76</td>
<td>4.50</td>
<td>2.65</td>
<td>3.99</td>
<td>2.27</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>23.28</td>
<td>14.66</td>
<td>26.40</td>
<td>18.24</td>
<td>24.46</td>
<td>17.09</td>
</tr>
</tbody>
</table>

*Area (million ha) and Production (million tonnes), *Third estimates
3. Demand and supply of food grains including pulses:
Govt. of India has taken several steps to ensure nutritional security to the largely agrarian population of the country. As more and more people are becoming health cautious, demand of protein is increasing day by day. The projected estimates suggests that by 2020 about 26.5 million tonnes of pulses will be required to fulfil growing demand for human consumption to maintain present level of availability @37g per capita per day against @70 g per capita per day as per World Health Organization recommendation and demand for seed and miscellaneous uses. The output of pulses to be over 17.33 million tonnes in 2015-16 whereas demand has been estimated as 24 m t of pulses by 2017 for human consumption, seed and other uses indicating gap of about 6-7 m t. India has imported about 5.51 m t of pulses till February 2016 and exported about 0.22 m t during same period (Source: http://www.agricoop.nic.in/Admin_Agricoop/Uploaded_File/Pulses.pdf). The major (>87%) export was of large seeded kabuli chickpea. Further, the pulses demand has been projected to the tune of 26.5 million tonnes by 2020, 32 million tonnes by the year 2030 and 39 million tonnes by 2050.

4. Research network: ICAR- Indian Institute of Pulses Research (IIPR), Kanpur was established in 1993 to conduct basic, strategic andadaptive research on major pulses. Erstwhile All India Coordinated Pulses Improvement Project was trifurcated to perform location specific and adaptive research through three All India Coordinated Research Projects, one each on chickpea, pigeonpea and MUllARP (mungbean, urdbean, lentil, lathyris, rajmash and pea). Additionally, a Network Project on Arid Legumes (moth bean, horse gram, guar and cowpea) has also been created to provide required support to arid legumes (http://www.iipr.res.in).

Recently, ICAR-IIPR has established its regional stations in Madhya Pradesh (Bhopal) and Karnataka (Dharwad) to conduct intensive research on pulse crops.

5. Major Research Achievements:
5.i. Varieties developed: More than 500 varieties of different pulse crops have been developed through dedicated research network and released and notified as central or state releases for cultivation in varying agro-ecological conditions.
   • Short duration varieties: Several short duration or early maturing varieties of various pulse crops have been developed for increasing cropping intensity and bringing additional area. Through concerted plant breeding efforts short duration varieties of crops like chickpea (Pusa 372, JG 11, Pusa 547, Vijay, Rajas, KPG 59, IPC 2006-77, JSC 55, JSC 56, KAK 2, Shubhra, Ujjawal, JGK1.), lentil (HUL 57, Moitree, IPL 81, IPL 316, JL 3) pigeonpea (UPAS 120, Pusa 992), fieldpea (Adarsh, Ambika, DDR 23, Prakash, Vikas, IPFD 10-12 etc.), mungbean (Samrat, IPM 2-3, SML 668, IPM 2-14, Meha, Pusa Vishal, HUM 16, TMB 37 etc.) and urdbean (Pant U 35, Shekhar 2, Azad Urid 3) have been developed. Most of these varieties are becoming very popular among farmers.
   • Varieties resistant to multiple adversities resistance/tolerance: The commendable progress has been made in exploitation of host plant resistance and large number of high yielding varieties of different pulse crops insulated against major diseases has been developed.
   • Pigeonpea hybrids: One of the notable contributions of pulse scientists is exploitation of heterosis in pigeonpea. Identification of stable cytoplasmic male sterility (CMS) has opened up new prospects for developing CMS based hybrid. Recently, two pigeonpea hybrids (ICPH 2671 and ICPH 2740) have been developed. Still, efforts are required for development of commercially viable pigeonpea hybrids for their promotion in India.
   • Varieties with farmers’ preferred traits: Considering farmers demand for development of extra-large seeded kabuli chickpea varieties (MNK 1, PKV kabuli 4-1, Phule G 0512) were released. This paved the way to enhance farmers’ income and more production of extra-large seeded kabuli. Later, country has started export of kabuli chickpea to the tune of 3-3.5 lakh tonnes annually. Similarly, extra-large seeded lentil (IPL 406), green seeded fieldpea (IPFD 10-12), green seeded urdbean (Shekhar 1, Shekhar 2) and machine harvestable chickpea varieties (HC 5, NBeG 47, GBM 2) have been developed considering farmers’ demand.
   • Rajmash varieties for northern plains: Rajmash is traditionally known kharif pulse crop in hilly regions of north India. For cultivation in rabi season rajmash varieties like Udai (PDR 14), Amber (IIPR 96-4), Utkarsh (IPR 98-5) and Arun (IPR 98-3-1) are available. Similarly, release of Gujarat Rajmash 1 has opened doors for rajmash cultivation in central India. Ample scope exists to popularize rajmash cultivation in north-eastern plains and central India.

5.ii. Integrated crop management technologies: Local specific integrated pulses production technologies have been developed for all major pulses. These includes standardization for basal done of fertilizers/nutrients, seed rate, seed priming to ensure better germination, planting methods (raised bed, ridge and furrow, broad bed and furrow, dry sowing followed by light irrigation) for better crop establishment, pre-emergence application of weedicides, irrigation scheduling and micro-irrigation etc. Application of sulphur @ 20-25 kg/ha can enhance yield by 15-20 % irrespective of pulse crops. Similarly, soil application of 1 kg Ammonium Molybdate has helped in achieving higher productivity of chickpea in soybean belt of Madhya Pradesh (Gupta and Gangwar 2012).

5.iii. Integrated diseases management: IPM modules to minimize losses due to diseases and insect pests have been developed for major crops. However, there is need to refine and popularise the modules. It is difficult to control the soil borne diseases (wilt and...
root rots) through use of fungicides, but seed treatment with Carbendazim/Bavistin and Trichoderma has been recommended, which helps in initial establishment of plant population. Soil application of Trichoderma harzianum @10 g/kg FYM for controlling the wilt or seed treatment @10g/kg seeds in pigeonpea for wilt in pigeonpea needs promotion. Similarly, to minimize incidence of powdery mildew and rust, foliar spray of wettable Sulphur @0.3% should be popularized where Mancozeb @0.2% can be sprayed for controlling rust.

5.iv. Integrated pest management: IPM modules have been developed to minimize damage due to gram pod borer in chickpea and pigeonpea. Besides, insecticides use, in case of chickpea and pigeonpea crop, fixing of 4-5 pheromone traps per ha and erection of 20-25 bird perches per ha minimizes larval population of Helicoverpa. Foliar spray of Dimethoate @0.03% or Metasystox @0.05% for controlling the aphids in lentil; foliar spray of Imidacloprid 17.8 SL @2-3 ml/10 litre of water or Thiamethoxam 25WG@2-3g/10 litre of water (first spray after 15 days of sowing and subsequent sprays at 15 days intervals) to control insect of in mungbean and urdbean during kharif; foliar spray of Imidacloprid 17.8 SL @2-3 ml/10 litre of water or Thiamethoxam 25WG@2-3g/10 litre of water (first spray after 15 days of sowing and subsequent sprays at 15 days intervals) in spring/summer mungbean and urdbean; and seed treatment with Imidacloprid 17.8SL @5ml/kg seed in spring/summer mungbean is known to minimize insect pests, therefore, need to be popularized among farmers. 5.v. Post harvest technology: Storage of pulses’ grains is prone to damage due to storage grain pests causing huge economic losses in comparison to split ones (in form of dal). Value addition certainly ensures more money from farm produce to the farmers. IIPR, Kanpur has designed and developed a low capacity dal mill “IIPR Dal Mill”, however, other Dal Mills developed by CFTRI and CIAE are also available. Still, there is need to divert sincere efforts for improvement in milling.

5.vi. Basic research: Molecular marker assisted breeding facilitates identification of segregants carrying gene(s) or QTLs of interest during off-season under laboratory, thus help in reducing space required for advancing segregants carrying targeted gene(s) or QTLs. Since, only few plants need to be advanced, off-season facilities are availed for rapid generation turnover to develop pure lines. The genome sequences of chickpea (Varshney et al. 2013), pigeonpea, mungbean have been published. This will facilitate identification of gene(s) and development of molecular markers and their deployment for accelerated improvement in pulse crops.

Research programs have been designed to develop transgenic chickpea and pigeonpea against most important and polyphagous insect pest, Helicoverpa pod borer using Cry gene(s) in chickpea and pigeonpea at IIPR-Kanpur and other centres (Datta et al. 2012). Recently, ICAR-IIPR has submitted applications to the RCGM for chickpea and pigeonpea events carrying Cry genes.

6. Researchable issues and strategies: Efforts are required to tailor efficient plant types and develop climate smart varieties of pulses following integrated breeding approach. IPM modules need refinement in light of their application to ensure popularity among farmers. Similarly, innovative nutrient supply technologies like seed priming or seed coating, micro-irrigation etc are still require in-depth research. Efficient machines for sowing in standing crops (utera or paira), zero tillage condition, ridge sowing and intercultural operations, harvesting and threshing are still not available for pulses. On front of value addition (other than dal making) much has to be done for promotion of pulses as Health Food or Nutri-rich Food. Multipronged approaches are required to tackle various research issues. Some of these strategies are like germplasm enhancement through prebreeding, multiple adversities resistance, breeding for nutrient use efficiency, early maturing varieties, transgenic development, molecular characterization of races of pathogen and biotypes of insects and developing climate resilient varieties of pulses.

7. Proposed interventions with available technologies

7.i. Bringing additional area: Ample scope exists for promotion of pulses in intercropping and sequential cropping (Table 2). For example, short-duration (120-150 days) pigeonpea varieties are now available for northern India making cultivation of wheat after pigeonpea crop in irrigated area, which is required for diversifying of cereals-dominated cropping systems. Vast area of rice-fallows available in eastern India (Jharkhand, Bihar, Chattisgarh, Odisha and West Bengal) offer opportunities for expanding area under post-rains season pulses like chickpea, lentil and lathyrus. Farming system approach need to be adopted for cultivation of pulses in the rained rice-fallows that may include promoting (1) cultivation of early maturing paddy followed by early maturing chickpea, lentil and lathyrus varieties, (2) suitable agronomic practices (seed priming, sowing under zero or minimum tillage condition) for ensuring optimum plant population in rained rice-fallows, and (4) integrated crop management practices (nutrients, weeds, insect-pests, diseases, etc.). Similarly, ample scope exists to popularize Rajmash, lentil and fieldpea in NEH region. Recently identified extra early maturing variety of mungbean (IPM 410-3) will help in fetching more area in summer. Similarly, in coastal belts of peninsular India, short duration mungbean and urdbean varieties can bring sea changes and on sloppy lands pigeonpea cultivation need to be promoted besides its cultivation on bunds of the paddy fields in many parts of the country.
Table 2. Bringing additional area under pulses by year 2017-18

<table>
<thead>
<tr>
<th>Potential crop/cropping systems/niche</th>
<th>Specific area</th>
<th>Area (m ha)</th>
</tr>
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<tbody>
<tr>
<td>Intercropping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mungbean with Sugarcane (irrigated)</td>
<td>Western, Central and Eastern Uttar Pradesh; and Bihar 0.40 0.20</td>
<td></td>
</tr>
<tr>
<td>Mungbean with Cotton and millets (rainfed uplands)</td>
<td>Maharashtra, Andhra Pradesh and Tamil Nadu 0.30 0.20</td>
<td></td>
</tr>
<tr>
<td>Pigeonpea with soybean, sorghum, cotton, millets and groundnut (rainfed upland)</td>
<td>Andhra Pradesh, Malwa Plateau of Madhya Pradesh, Vidarbha of Maharashtra, North Karnataka, Tamil Nadu 0.50 0.30</td>
<td></td>
</tr>
<tr>
<td>Chickpea with Barley, mustard, linseed and safflower (rainfed)</td>
<td>South East Rajasthan, Punjab, Haryana, Uttar Pradesh, Bihar, Vidarbha of Maharashtra 0.50 0.30</td>
<td></td>
</tr>
<tr>
<td>Chickpea/Lentil with autumn planted / Ratooned sugarcane</td>
<td>Maharashtra, Uttar Pradesh, Bihar 1.00 0.60</td>
<td></td>
</tr>
<tr>
<td>Catch crop: Mungbean in Spring/Summer</td>
<td>Western and Central Uttar Pradesh; Haryana, Punjab, Bihar, West Bengal 1.00 0.50</td>
<td></td>
</tr>
<tr>
<td>Rice fallows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chickpea</td>
<td>Eastern Uttar Pradesh, Bihar, Jharkhand, Odisha, Chhattisgarh, West Bengal 0.40 0.20</td>
<td></td>
</tr>
<tr>
<td>Lentil</td>
<td>Eastern Uttar Pradesh, Bihar, West Bengal, Assam, Jharkhand 0.30 0.20</td>
<td></td>
</tr>
<tr>
<td>Lentil/Fieldpea</td>
<td>North-East Hill region 0.10 0.10</td>
<td></td>
</tr>
<tr>
<td>Urdbean/Mungbean</td>
<td>Andhra Pradesh, Tamil Nadu, Odisha, Karnataka 0.50 0.20</td>
<td></td>
</tr>
<tr>
<td>Kharif fallow Urdbean/mungbean in</td>
<td>Bundelkhand of Uttar Pradesh and Madhya Pradesh 1.20 0.50</td>
<td></td>
</tr>
<tr>
<td>Total targeted area</td>
<td></td>
<td>6.20 3.30</td>
</tr>
</tbody>
</table>

7.ii. Ensuring additional income to farmers: Traditionally, people of several parts of India prefer to consume immature green chickpea and pea grains as vegetables and after maturity preference is for vegetable type (green coloured) pea grains for cooking as whole grains. Since, immature green pea grains (IGPG) are utilized as fresh, frozen or canned vegetables, ICAR-IIPR has developed green, round and large seeded variety (IPFD 10-12: Harith) with high yield potential for central India. In case of chickpea, most of the present day varieties provide green immature grains for a shorter period due to their long maturity duration as all these varieties take very long time to initiate podding and develop seeds. Further, in northern India, mercury dips during December/January to less than 100C leading flower or pod drop (Chaturvedi et al. 2009) constraining availability of (IGCG). Early maturing varieties should be able to produce harvestable ICGC within 60-70 days after sowing besides retaining greenness of the immature green chickpea grains (Sandhu et al. 2007). Sincere efforts need to be diverted to tap the potential for popularization of Immature Green Chickpea Grains (IGCG) and Immature Green Pea Grain (IGPG) for vegetable purpose as ‘Health Food’ in areas where people have preference. Chickpea and fieldpea can be promoted in parts of Punjab, Haryana, southern Rajasthan, western Uttar Pradesh, Jharkhand, Chhota Nagpur plateau (south Bihar, southern West Bengal, parts of Odisha), and in central (Maharashtra) and south (Karnataka, Telangana and Andhra Pradesh) India as people of these regions have long tradition to consume immature green chickpea and pea grains.

7.iii. Expanding pigeonpea hybrid production: A large number of demonstrations of pigeonpea hybrids need to be conducted in on farmers’ fields in Maharashtra, Andhra Pradesh, Odisha, Telangana, Madhya Pradesh, Karnataka and Jharkhand, so that farmers can be convinced about the performance. The various stakeholders must be informed regarding conduct and performance.

7.iv. Increasing mechanization: Mechanization would play a key role in modernization of agriculture due to its benefits of improved labour efficiency and productivity, efficient use of expensive farm inputs, reduction of human drudgery and timeliness of operations. Line sowing by seed drills or ridge maker-cum-planter should be developed and promoted in the states where farmers are still using broadcast seed for sowing. Harvesting by combine harvesters should be promoted for the crops where suitable varieties are available. Machine harvestable chickpea varieties (NBeG 47 and GBM 2) developed need promotion in Andhra Pradesh and Karnataka.
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7.vi. Promoting ridge and furrow system of sowing: Water logging causes severe damage to rainy season pulses, such as pigeonpea, mungbean and urdbean. In pigeonpea, ridge and furrow method of planting reduced the losses from water logging and reduced the incidence of phytophthora blight.

7.vii. Integrated nutrient management: Proper nutrient management based on soil analysis is important for maximizing productivity of pulses. The farmers generally provide nitrogen (N), phosphorus (P) and in some cases Potash (K) ignoring others nutrients like sulphur (S), zinc (Zn), boron (B) and molybdenum (Mo) etc. Wide spread deficiencies have been observed for these nutrients in pulses growing areas. Thus, there is a need of developing soil map for availability of nutrients for each state and recommend application of nutrients accordingly. It is also important to ensure availability of the fertilizers/micro-nutrients to the farmers at the local level and at the right time.

7.viii. Promotion of bio-fertilizers and bio-inoculants: Legume seed treatment of host specific Rhizobium along with recommended dose of phosphoric fertilizer can ensure 15-20% higher yield over un-inoculated seeds’ sowing. Therefore, efforts need to be made for mass production of microbial cultures with quality assurance and efficient delivery system.

7.ix. Promotion of micro-irrigation system for life saving irrigation: Pulses are largely grown under rainfed conditions and moisture stress leads to reduction in productivity. Sub-optimal moisture in the soil at the time of sowing leads to poor germination and plant stand. High emphasis should be given on water conservation so that the pulses required irrigations. Micro-irrigation (sprinkler irrigation), need to be promoted for pulses. In small pockets, where pigeonpea (Tur) cultivation is with more between rows and plant spacing, drip irrigation can also be promoted.

7.x. Integrated pest management: There is a need to promote integrated pest management (IPM) approach for managing this devastating pest. An effective pest surveillance mechanism should be put in place at district/block level and region specific advisories should be given to farmers for pest management.

7.xi. Creation of seed hubs: There is a need for enhancing seed availability of new varieties. Seed rolling plans should be developed for each state and followed. Up scaling of already developed models for production of quality seed at village level involving various stakeholders is needed. Ensuring supply of quality seeds of improved varieties need to addressed to achieve desired seed replacement rate. Often it is said that breeder seed production of pulses being produced is sufficient to achieve 25-30% seed replacement rate if converted properly through defined seed chain. In fact 25% more breeder seed of the requirement should be produced as no system can deliver with 100% efficiency so is with seed production chain. Govt. of India is providing funds to establish ‘Seed Hubs’ for pulses.

- Approximately 1400-1500 tonnes of breeder seed of more than a dozen pulses required to achieve desired (30%) seed replacement rate. Breeder seed production in sufficiency quantity (around 1800 tonnes) should be produced by ICAR-IIPR and NARES considering conversion efficiency (about 60-70%) by taking into account weather conditions and other factors.
- Breeder seed should be supplied to National Seed Corporation, State Seed Development Corporations (SSDCs), Krishi Vigyan Kendras (KVKs), private seed growers and others. For lifting of seed there is already provision for 25% advance payment of the cost with indent can be implemented for private players. These institutions should convert breeder seed to foundation and certified seed.
- One cycle multiplication of certified seed at KVKs farms before their demonstration/distribution to farmers.
- Since, KVKs are directly responsible for transfer of technology, hence should be empowered to produce and purchase quality seed (as TL seed) from farmers’ fields and allowed for large sale to farmers. ICAR has already made provisions for Agronomist and/or Plant Breeder in KVKs.
- NARES should be allowed for self certification of quality seed through duly constituted Team. Strict quality control may be implemented with proper monitoring and evaluation system and accountability following Seed Act.
- Alternative methods for cumbersome and time taking Grow out test can be replaced by science based “Variety Specific Diagnostic Molecular Marker” technology for quick quality assessment.
- Adoption and promotion of new varieties by bringing them into seed chain and appropriate seed indents by the state departments following seed rolling plan.
- The seed production Hubs must be supported with required infrastructures for seed production, processing and storage for the next season and as buffer stock.

7.xii. Knowledge empowerment of stakeholders: Concerted efforts are needed on knowledge empowerment of farmers, extension personnel and other stakeholders. ICAR-Indian Institute of Pulses Research and NARES can play a proactive role in empowerment of stakeholders including farmers. The training programs must be organized for value addition to pulses.
8. Policy support:

8.i. Technology transfer: Front line Technology demonstrations (FLDs) conducted during 2012-2014 (chickpea: 1431, pigeonpea: 1116, mungbean: 450, urdbean: 494, lentil: 130 and fieldpea: 70) has clearly indicated that pulses productivity can be enhanced by 20-30% (Fig 1.) in different geographies. With the existing technologies pulses yields can be enhanced at least by 150 kg per ha on average basis. There is need to have concerted efforts for transfer of available knowledge to the farmers and seed growers and value addition so that farm output can be increased.

8.ii. Value addition: Infestation of storage insect pests starts from field itself making it difficult to store pulses seeds/grains at room temperature. To avoid losses during storage grains should be dried properly to bring down grain moisture content below 8% or instead of storing as whole grains pulses should be stored after splitting in form of dal.

8.iii. Creation of infrastructure for storage: Investment in storage needs to be achieved to ensure quality seed supply and maintaining buffer stocks. Creation of seed storage facility is more important in coastal belt or states receiving higher rainfall. Farmers can be encouraged to store seeds of pulses or grains in such stores on payment basis. Credit facilities to the farmers can be extended on the basis of seed/grain stored in such places.

8.iv. Market and import: Government of India has already started procurement of pigeonpea and chickpea in small quantity. Procurement of pulses at remunerative MSP can help farmers to grow more pulses. The recently launched E-Mandi connecting major Mandis is likely to help market access to farmers. Market intelligence research can further help in this direction.

9. Current policies for promotion of pulses:

9.i. Promotional schemes: Besides ongoing schemes like National Food Security Mission (NFSM), Accelerated Pulses Production Programme (A3P), 60000 Pulses and Oilseeds villages, enhancing Breeder Seed Production (through ICAR and its network) etc. besides Rashtriya Krishi Vikas Yojana to promote cultivation of pulses are in operation with funding support from Ministry of Agriculture and Cooperation and Farmers Welfare, Govt. Recently, Govt has made provisions of about Rs.500 crores for promotion of pulses by way of enhancing breeder (ICAR and NARES) and quality seed production with a provision to establish 150 Seed Hubs and large scale demonstrations through KVKs.

9.ii. Minimum support price (MSP) and procurement: MSP has positive impact on sale of farm produce and helps farmers in getting reasonably more price. Government of India has increased MSP for various pulses during last few years (Table 3) that has helped farmers in fetching good price.

<table>
<thead>
<tr>
<th></th>
<th>Minimum Support Price (Rs/Quintal) of pulses for the last 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigeonpea</td>
<td>3200</td>
</tr>
<tr>
<td>Chickpea</td>
<td>2800</td>
</tr>
<tr>
<td>Mungbean</td>
<td>3500</td>
</tr>
<tr>
<td>Urdbean</td>
<td>3300</td>
</tr>
<tr>
<td>Lentil</td>
<td>2800</td>
</tr>
</tbody>
</table>

Sources: Commission for Agricultural Costs and Prices (CACP).

9.iii. Incentives to pulses growers: However, there are many alternatives like incentives to pulses growers as a cost for contribution of pulses in improving soil health for sustaining agricultural production base, improving total factor productivity of cereals like wheat and rice, reducing pollution, and less water requirements. This can be achieved by pooling all subsidies under one umbrella and farmers can be paid incentive for per unit area of pulses cultivation though director benefit transfer scheme as Government of India has already initiated scheme to open bank account for all under scheme ‘Jan Dhan Yojana’.

9.iv. Pradhan Mantri Fasal Bima Yojana: Hon’ble Prime Minister of India launched “Pradhan Mantri Fasal Bima Yojana” with the objective to provide a more efficient insurance support to the farmers of the country and to address issues relating to financial support. The scheme has provision of crops insurance at low premium (2% of the actual sum assured amount) so that farmers can sustain even when crop is damaged. However, there is need to educate farmers and clear their doubts about payments of the compensation under “Pradhan Mantri Fasal Bima Yojana ” in case of partial or complete crop failures in a specific locality. This scheme will certainly help farmers to grow more pulses.
9.v. Pradhan Mantri Krishi Sinchai Yojana: Govt. of India has recently launched scheme “Pradhan Mantri Krishi Sinchai Yojana” to improve farm productivity and ensure better utilization of the resources in the country. The main motto is to enhance crop per drop by implementing water-saving technologies and precision irrigation. It has provision to dig ponds for rain water harvesting need to be linked with micro-irrigation system that has been well supported by Hon’ble Prime Minister’s “Per Drop More Crop” campaign. As pulses are grown largely under rainfed conditions, micro-irrigation can bring perceptible changes in pulses productivity and farmers’ can get more income from per unit area cultivation of pulses.

10. Summary:
The much talked schemes “Pradhan Mantri Krishi Sinchai Yojana” and "Pradhan Mantri Fasal Bima Yojana” of the Government of India have capacity to bring sea changes in pulses cultivation. Further, these two schemes can be a game changer scheme in favour of pulses growers if micro-irrigation and farm input supply can be linked. With the availability of technologies including high yielding varieties developed by ICAR and NARES and devising and implementation of appropriate policies like ensured supply of quality seed and other farm inputs, remunerative MSP, procurement, investment in creation of required infrastructure for seed/grain buffer stocks, additional 4-5 million tonnes of pulses can be produced in next 2-3 years.

11. References

Food Standard and Quality Control
Specifications for pulses of India
• Pulses should of uniform size, shape and color characteristics of the variety such as Redgram, Black gram, Bengal Gram etc.
• Shall be thoroughly clean, sweet, wholesome and free from moulds, weevils, obnoxious smell, discoloration and admixture of deleterious substance.
• It shall have good cooking quality.
• Admixture with green peas should not exceed 5%.
• Moisture should not be more than 14 % by weight obtained by heating the pulverized pulses at 130°C – 133°C for two hours.)
• Moisture content should be 2% if the pulses are without the seed coat.
• Foreign matter should not be more than 1 per cent by weight of which not more than 0.25 per cent by weight shall be mineral matter and not more than 0.10 per cent by weight shall be impurities of animal origin.
• Other edible grains should not be more than 0.5 per cent by weight.
• Damaged grains should not be more than 5 per cent by weight.
• Weevilled grain should not be more than 3 per cent by weight.
• Uric Acid should not be more than 100 mg. per kilogram.
• Aflatoxin Should Not more than 30 micrograms per kg.

3rd Advance Production Estimates of Major Crops During 2015-16
The 3rd Advance Estimates of production of major crops for 2015-16 have been released by the Department of Agriculture, Cooperation and Farmers Welfare.

3rd advance estimated production of major crops during 2015-16 is as under:
• Pulses – 17.06 million tonnes
• Tur – 2.60 million tonnes
• Gram – 7.48 million tonnes
• Moong - 1.59 million tonnes
• Urad – 1.88 million tonnes
• Other Pulses – 3.51 million tonnes
Pulses are a Smart Food and important for achieving the Sustainable Development Goals

Ms. Joanna Kane-Potaka, Director, Strategic Marketing and Communication at ICRISAT

Smart Food is defined as food that is: Good for you; Good for the planet; and Good for the small holder farmer. Read ahead for a range of facts and stories globally that show how pulses are a Smart Food.

While high fiber diet is healthy, drinking plenty of water is recommended as fiber works best when it absorbs water.

Benefits of a high fiber (60-70%) diet:
- Soluble fiber helps lower "bad" cholesterol
- Aids weight loss (more filling with fewer calories)
- Maintains bowel health and lowers risk of colon diseases
- Lowers risk of heart disease (reduces blood pressure and heart inflammation), stroke, hypertension, diabetes (slows sugar absorption and improves blood sugar levels), and gastrointestinal diseases
- Whole pulses have more fiber content than refined, processed pulse products and are better than fiber supplements
- Several cultivars [both desi (brown-seed) and kabuli (white-seed) types] developed by ICRISAT and others include - Early (90-100 days), Extra early (85-90 days) varieties, and Super-early desi (75-80 days) breeding lines

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Chickpea variety ICCV 2 is the first extra-short-duration (85-90 days) kabuli variety with Fusarium wilt resistance and heat tolerance, and was initially released in Sudan, Myanmar and India.

Adoption of early-maturing chickpea cultivars led to an increase in area and productivity in Myanmar.

Six early-maturing chickpea cultivars (Yezin 3, 4, 5, 6, 8 and 11) developed from the breeding material supplied by ICRISAT covers over 95% of the total chickpea area in Myanmar.

Investor: International Fund for Agricultural Development-European Commission, Australian Centre for International Agricultural Research
Partners: Indian Council of Agricultural Research, Department of Agricultural Research, Myanmar Agriculture Service, Yezin Agricultural University and ICRISAT.


Pulses provide substantial amounts of Vitamin E, Vitamin B6 and folic acid (as folate)

Germinated pulses have higher levels of Vitamin B12 which increases 48 hrs after germination and is highest after 96 hrs.

www.commodityindia.com
Magnesium is critical for proper maintenance of body weight and for a number of metabolic syndromes related to cardiovascular disease.

Minerals required for bone formation and for bone related metabolic processes include calcium, magnesium, phosphorus, potassium, manganese, copper, iron, zinc.

Green pigeon pea seeds have 28.2% more of phosphorus, 17.2% potassium, 48.3% zinc, 20.9% copper and 14.7% iron compared to dal. The dal, however, has 19.2% more calcium and 10.8% more manganese.

Pulses are Good for THE PLANET

Smaller water and carbon footprint

Efficient use of water: Chickpea and pigeonpea need less irrigation and thrive on residual soil moisture.

Improve soil health: Pulse crops fix nitrogen, increase soil microbe diversity, provide green manure through leaf droppings and help conserve top soil. The less fertilizer needed as a result of the naturally added nitrogen, means the carbon footprint is low.

Pulses production has lower carbon footprint than most animal sources of protein.

Better farming practices, including use of pulse crops, can lower the average carbon footprint by 24 to 37%.

Nitrogen fertilizers contribute to carbon footprint as its energy footprint is over 7.5 times more than other fertilizers such as phosphate and potash.

Pulses help reduce use of chemical fertilizers by fixing nitrogen.

"LeafyScan", a high-throughput phenotyping platform at ICRISAT, is being used to measure:

(a) leaf canopy development in low and high nitrogen soil
(b) maximum nitrogen concentration in leaf tissue and stem tissue, at flowering time.
An innovative climate change research initiative

A large genetic variation in chickpea, capable of fixing nitrogen symbiotically in early stages of growth, may exist. Further research is needed to capitalize on this.

Research on developing climate resilient chickpea using germplasm including cultivated chickpea introgressed with wild ancestors from a unique, diverse, and recent collection in Turkey, is underway. Trait differences across 20 wild chickpeas populations that affect the crop's responses to drought, heat and climate-resilient nitrogen fixation is being studied.

Investor: United States Agency for International Development (USAID)

Partners: The University of California (UC) and ICRISAT

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Well adapted to semi-arid regions

Pulses use
- less water and are drought tolerant

More efficient to obtain protein from crop products than animal products.

Water used to produce 1g protein in milk, eggs and chicken meat is 1.5 times, for mutton it is 3.3 times and for beef 6 times more than that used for pulses.1

Dryland tropics are generally water deficient and water management is a primary requirement

Here it is critical to calculate water footprint of crops

Many pulses use water differently by extracting water from shallower depths, leaving deep soil water for the following crop

Water use characteristics of pulses effectively increases the water use efficiency of the entire crop rotation

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In Muduvattu village, Kolar district, Karnataka, two farmers have water collection ponds to collect untreated wastewater and use it to irrigate their vegetable crops. These ponds, have been converted into a decentralized wastewater treatment system, using constructed wetlands. This system, piloted by an ICRISAT-led consortium of 11 partners in India, as a business model, treats grey water through constructed wetlands and renders it safe for agricultural use.

ICRISAT in collaboration with Coca-Cola Foundation and MYRADA, an NGO, work with the Muduvattu village farmers on agricultural productivity and livelihoods.

Partners: District administration, Government of Karnataka, MYRADA and ICRISAT

Investor: Coca-Cola India Foundation for Rural Water Infrastructure

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Pulses produce about 21 million tons of nitrogen per year

Pulses in the crop cycle play a major role in nitrogen fixation and in reducing carbon footprint worldwide.

- Pulses fix atmospheric nitrogen through a symbiotic relationship with nitrogen fixing soil bacteria living inside their root systems.
- Chickpea leaves 20.4 kg/ha of residual nitrate in the soil after harvesting which is the highest among pulses.
- Production and application of nitrogen fertilizer accounts for 57% to 65% of the carbon footprint of each crop.
- Pulses help in efficient use of soil phosphorus by breaking down insoluble phosphates in the soil.

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Access to good pigeonpea seeds transformed the lives of John Muskii and his family. As part of ICRISAT’s smallholder farmer seed production clubs in Chambho, Karonga district, North Malawi, he grew high-yielding certified seeds, contributing to a successful seed distribution system. In this unique agribusiness model, smallholder farmers grow certified seed that are loaned to other smallholder farmers.

John started in 1 ha land, to grow a new variety of pigeonpea, maturing in six months rather than nine and is less prone to water stress and risk of being eaten by livestock. John reaped a healthy harvest and re-invested to increase his production.

“I had never thought of agriculture having a business potential,” he says. “I am happy to admit now I was wrong. Nothing goes waste. I use the stalks as fodder for my animals, and the leaves are good for fertilizing the soil,” says John who now has two houses, 6 ha land, oxen, pigs and goats.

“We have nutritious food to eat and a good life,” says Linley, John's wife. The key for him was to diversify and keep evolving.

Partners: Ministry of Agriculture, Irrigation and Water Development, Smallholder Farmer Producers, the private sector and ICRISAT

Investor: Irish Aid

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Different compounds from pulses feed soil microbes and this benefits overall soil health.

Crops grow better in soils with diverse soil organisms as they help break down and cycle nutrients more efficiently.

- Crops grow better in soils with diverse soil organisms as they help break down and cycle nutrients more efficiently.
- Presence of diverse soil organisms tend to 'crowd out' disease-causing bacteria and fungi, resulting in healthier plants.
- Growing pulse crops in rotation enables the other crops to benefit from these large, diverse population of soil organisms.
Pulses are GOOD FOR THE SMALLHOLDER FARMER

Resilience, diverse use brings in extra income
Survive weather fluctuations: Chickpea can thrive in desert-like regions; pigeonpea crops hit by unseasonal rain have potential for a second flush.

Diverse food basket and extra income: As an intercrop with cereals and other crops, pulses bring in extra income for farmers and also increase the yield of the main crop.

Pulses are
- Consumed by humans
- Used as livestock feed
- Green manure
- Fencing, and basket weaving

Leaves, pod coats and bran are fed to animals as dry fodder. Some pulse crops are also fed as green fodder.

Multiple Uses of Pigeonpea
- As green manure, pigeonpea produces 13,619 kg/ha of dry matter and 23 kg of N/ha of dry matter
- Pigeonpea leaves and forage, high in protein and easily accessible, are largely used as fodder for cattle and other animals
- The stems and branches of pigeonpea are used to prepare baskets, fencing and thatch, and serve as an additional income source for women
- In Thailand, pigeonpea is host to insects that produce lac, used for various products such as:
  - Color-fast dye used on animal fibers (wool and silk) and for coloring soft drinks and food
  - Shellac used for painting and furniture manufacturing
- Farmers in Africa grow pigeonpea for its firewood more than for its grain. The calorific value of the pigeonpea stalks is about ¼ that of the same weight of coal
- A wind breaker/shade crop for young cocoa plants in Nigeria
- Pigeonpea acts as a cover crop or support crop for vanilla in Southeast Asia and as a substrate for mushroom production in China

Known as orphan crops, pulses receive much less attention from researchers and policy makers compared to major commercial crops.

There is a great scope for developing improved varieties of pulses, with higher resilience to drought, salinity and diseases, as they will play a vital role in the face of adverse climate change impacts on crop productivity.

ICRISAT has been involved in dryland crop research since the 1970s, including research on chickpea and pigeonpea, which are among its mandate crops.

ICRISAT phenotype and genotype research makes adoption of these crops profitable for the smallholder farmers.

Working with several partners, ICRISAT has decoded genome sequence of pigeonpea and chickpea.

Large-scale genomic resources have been developed in these crops and resulted in being elevated to “genomic resources rich crops”

These genomic resources are being used to develop improved varieties through molecular breeding approaches.

Several drought tolerant and disease resistant lines have already been developed in chickpea using molecular breeding approaches.

Major contribution to work on developing improved varieties and hybrids has been under the projects, Tropical Legumes I & II. Some broad impacts in chickpea research are:

1. Wilt and sterility mosaic disease resistant varieties and recently released short and medium duration hybrids have made a significant impact in Asian countries.

2. Long and medium duration varieties with Fusarium wilt resistance and consumer preferred large, creamy colored seeds have created impacts in eastern and southern Africa.

3. In India during 2013-14, 49% of the total indent for chickpea breeder seed was from ICRISAT-India partnership varieties.
Huge untapped potential of pulses can be enhanced by:
- Increasing production
- Value addition
- Building better marketing options

Smallholder farmers and rural poor, can benefit from development of institutions and strategies that promote market coordination and reduce transaction costs.

Helping smallholder farmers break the vicious cycle of subsistence production and poverty is a great challenge to ongoing research in reducing poverty and hunger worldwide.

Underdeveloped and imperfect agriculture commodity markets undermine smallholder farmers participation and hinder their ability to benefit from improved agricultural technologies and policy reforms.

Linking farmers to markets through efficient value chains will reduce intermediaries in the chain.

Strengthening value-adding by improved technology, infrastructure and inputs, processing and exports, can raise farmers’ income and provide incentives to improve their management practices towards higher farm productivity.

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Mini dal mills increase income.

A group of 20 women belonging to the Garima self-help group, in Radosoli village, Tahsil-Bansi of Jaipur, Rajasthan, were trained in dal making and a mini dal mill was established through an ICRISAT project in 2012-13.

The mini dal mill became operational from 2013 onwards, making dal initially for family use, but later they began selling dal in the local market and doubled their profit.

The women plan to increase the members in the group, register the SHG and create awareness among women in the neighboring villages.

Additional benefit to the women is the use of dal husk for livestock feed, and the income from the sale of pigeonpea stalks as fuel wood (₹2,000/ha).

Investor: Directorate of Agriculture, Government of Rajasthan in collaboration with Swami Keshwannad Rajastan Agricultural University, Bikaner, under the Rashtriya Krishi Vikas Yojana.

Partners: Swami Keshwannad Rajastan Agricultural University, Bikaner and ICRISAT.

Short duration pulses have paved the way for crop diversification & intensification.

Diversification strategies include crop rotation, double cropping and intercropping.

- Diversity is the relative abundance of each crop in the overall cropping pattern
- Major benefits of farm diversification to smallholder farmers are increased revenue, low input costs, adaptability to climate variation, and resilience to overcome risks and uncertainties
- Pulses are grown as a sole crop, intercrop, catch crop, relay crop, cover crop, green manure crop, etc. in different agroecological regions

Intercropping helps obtain sustainable production even under adverse weather conditions.

On hill slopes, pulses act as an excellent cover crop and are also grown on rice bunds.

Relay cropping (paira) facilitates double crop and is sustainable. Here, pulse seeds are broadcast in the standing crop of rice about two weeks before harvest, enabling use of available soil moisture. Pulse yield was more than when planted after harvesting rice.

Catch crop is a short duration crop grown between successive plantings of main crops or are crops sown to prevent minerals being flushed away from the soil. It may be harvested or plowed under to improve soil fertility.

Ratoon cropping, a multiple harvest system, where instead of cutting the crop, pods are picked and plants allowed to bear next flush of pods. Short-duration pigeonpea has created ratooning interest.

For more information about pulses see: www.icrisat.org/yp
For more information about Smart Food see www.smartfood.org (coming soon)

Vidya Ramesh
Research and Writing at ICRISAT

Over 62,000 MT pulses procured by government agencies

The government agencies have procured over 62,000 MT of pulses till now which include 50,424.07 MT of Tur and Urad from Kharif Marketing Season (KMS) 2015-16, and 11,754.06 MT of Chana and Masur from Rabi Marketing Season (RMS) 2016-17. This information was given by the Minister of Consumer Affairs, Food and Public Distribution, Shri Ram Vilas Paswan in a written reply in Lok Sabha.

The Minister says in addition, imports have been contracted for about 13,500 MT of Tur and 12,500 MT of Urad respectively. Domestic searches and surveys have also been conducted on a number of importers, traders and financiers engaged in pulses trade. Till now, request for allocation of pulses from buffer stock has been received from Andhra Pradesh, Telangana, Maharashtra, Tamil Nadu, and Rajasthan.

According to 3rd Advance Estimate pulses production declines marginally to 17.06 MT in 2015-16 from 17.15 MT last year, due to back-to-back drought and poor monsoon. Retail prices of pulses have been rising due to fall in production in the wake of poor monsoon and currently rates are ruling as high as INR 195 per kg.
Raj Khurana slowly lifted his glass and took another sip. He was relieved that he could find some way to regain stability — however temporary. Why not? Just an hour ago, as he was planning to close work and go home a bit early, he received the jolt. The shocking news that his cargo could not pass through the Customs at London. Someone in his office had goofed the documentation. It would be a long time before Khurana could repair this damage and he was sure to end up with a huge loss. Not the first time though. Every year, quite a few of his export deals end up in losses because of minor human errors. Khurana tends to rely on manual systems, spreadsheets and paper files. A manually intensive process is highly susceptible to errors.

At the same time, in another part of the globe, James Mathew in a state of exhilaration. His consignment has been accepted by his stringent customer and was going to make a huge profit. He was relishing his good fortune, a welcome contrast to the three previous deals.

In a totally different setting, Nilesh and his wife Sheela were stretching themselves on the ethereal sands of the world renowned Kovalam Beach. They had travelled all the way from Dubai for a long weekend. For a few moments, Nilesh was absorbed in his mobile.

Assuming he was engrossed in a game, Sheela fumed and said, “Can you not find something better to do? Forget your game and look at the beautiful blue sea”, she chimed. “Oh Sheela, I’m not playing; I was just signing a new contract to supply two containers of cashew. They wanted the deal to be confirmed urgently. So, I took a few minutes away from our holiday.” “What? You entered into a contract just now? Come on! Don’t fool me”, Sheela ranted. “No dear, I’m not lying. I use an online software service. I can run my export business from anywhere. Even from here.”

Exporting always looks like a big gamble and is not for the faint-hearted. In earlier years, one had to fly several hours at high cost just to discuss with an agent who showed promise of business. For centuries, exporters have been struggling to establish smooth transactions. Today, things have changed. The digital age has arrived. Technology has to be at the heart of global trade management for exporters to operate profitably. In this era of hyper competition, those who keep pace with technology and use it to their advantage will grow to unseen heights. Those who do not will struggle to survive.

It is precisely in this context that cloud based trade management solution becomes very relevant to agro exporters. What is a cloud based trade management solution? Can anyone use it? A big yes. A powerful cloud based trade management solution is very easy to use. No sophisticated computer knowledge is necessary. No special hardware or software is needed.

Cloud based trade management solution helps exporters capture every step of an export order right from the contract and shipment processing to documentation, billing and collections using a single unified software.
SOLUTIONS YOU CAN TRUST FOR STUBBORN AGRI EXPORT PROBLEMS.

- Say goodbye to documentation errors
- Execute shipments the smart way
- Complete tasks on time with alerts & notifications
- Maximize returns with accurate profitability analysis

“Rain Plus is my insurance against errors and delays”
- Mr. Saravjit Talwar, AST Enterprises, Dubai

“I operate in several countries but my office is in my pocket – Rain Plus on Mobile”
- Mr. Sameer Ganatra, KMG-Robust, Dubai, Mumbai

“I have saved a lot of time and money through Rain Plus”
- Mr. Abhijit Salecha, Sajjan Foodstuff Trading LLC, Dubai

Frontalrain Technologies, Bangalore, India
+91-776-007-6789  sravanth.b@frontalrain.com  www.frontalrain.com
What is it that sets a cloud based trade management solution apart from other software solutions?

Agri exporters can generate export documents at the click of a button. How? A cloud based trade management solution comes replete with several trade documents that are customisable. What’s more, the documents created can be emailed using the solution itself.

Shipments involve numerous tasks that have to be completed on time. But how do you assign and track the status of various tasks? With a cloud based trade management solution exporters can assign tasks to colleagues, set the deadline and also check on the status at any time.

Lack of control over transportation costs was cited as a major challenge by exporters in a recent survey. A cloud based trade management solution makes managing shipments hassle free. Deliver on time by dividing shipment related activities in 3 steps – pre-shipment, shipment and post shipment. A software such as this also comprises a world-class shipment workbench that can be leveraged to manage routes, vehicles, containers and packages.

Dubai based businessman Saravjit Talwar of AST Enterprises says, “A cloud based software solution has been a tremendous support for our business operations. We have increased our efficiency, the speed of execution and effortlessly handle a large volume of documentation with ease”.

It is important as an exporter to have real-time information about your stock. It can be a make or break factor for your export business given the tight deadlines and tighter schedules. A cloud based trade management solution helps you track the inventory position of your goods helping you replenish on time and avoid overstocking and missing out on orders. As Abhijit Salecha of Sajjan Foodstuffs Trading, Dubai says, “A cloud based trade management solution has saved me a lot of time and money”.

Like other exporters, you tend to miss out on factoring important expenses when trying to figure the profitability per shipment. A cloud based trade management solution helps determine the cost per shipment as it captures all the charges and landed cost for each sales contract/shipment.

The most discerning feature, a cloud based trade management solution user can run his export business from anywhere, anytime. Sipping his coffee at home or waiting in the airport lounge, he can run his business and perform all the transactions with ease. He just has to have his mobile phone, tablet or laptop. Isn’t that simple?
Myanmar Pulses Outlook

Mr. Soe Win Maung, Consultant, Myanmar Pulses, Beans and Sesame Seed Production

Outlook for pulses production in Myanmar for the year 2016-17 is relatively good, around 6.1 million metric tonnes and to export about 1.3 million metric tonnes. At the same time, it is expected that price would be normal and stable. In previous year, Myanmar have had lower pulses production because of damaged areas and low yield caused by widespread flood and abnormal hail storms in several pulses growing areas and the impact of phenomenal El Nino weather conditions of record high temperature and drier situations all over the country.

Although some more area of pulses could be grown, the yields were reduced by the stress of unfavourable soil moisture conditions. Among the pulses, the most severely hit by bad weather is green gram and its production was reduced substantially. On these ground, for all pulses production of Myanmar in 2015-16 is estimated to decrease from 6.12 to 5.65 million metric tonnes or 8 percent decrease in production.

Based on the decreased production in last year, outlook for FOB Yangon price of major pulses is estimated to be remained at the higher level. However, it may not return to the highest ever price levels, which happened especially for black gram and pigeon pea during the month of October 2015, because of sudden rise of demand particularly from India. In case of black gram, fob Yangon price reached its highest price of 1,820 USD/MT in October, which is more than the double of the price level of 860 USD/MT in January. Similarly, pigeon pea price skyrocketed from 760 to 1,570 USD/MT. On the other hand, the fob prices of other pulses showed not much fluctuated like black gram and pigeon pea.

Estimate of Myanmar Pulses Production in 2015-16

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Particular</th>
<th>2013-14</th>
<th>2014-15</th>
<th>2015-16 (Estimate)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Area (000’ ha)</td>
<td>1,102</td>
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<td>1,106</td>
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<tr>
<td>Black gram</td>
<td>Production (000 MT)</td>
<td>1,574</td>
<td>1,580</td>
<td>1,550</td>
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<tr>
<td></td>
<td>Yield (MT/ha)</td>
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<td></td>
<td>Area (000’ ha)</td>
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<td>Green gram</td>
<td>Production (000 MT)</td>
<td>1,451</td>
<td>1,536</td>
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<tr>
<td></td>
<td>Yield (MT/ha)</td>
<td>1.29</td>
<td>1.31</td>
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<td></td>
<td>Area (000’ ha)</td>
<td>639</td>
<td>619</td>
<td>648</td>
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<tr>
<td>Pigeon pea</td>
<td>Production (000 MT)</td>
<td>847</td>
<td>841</td>
<td>800</td>
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<tr>
<td></td>
<td>Yield (MT/ha)</td>
<td>1.33</td>
<td>1.36</td>
<td>1.23</td>
</tr>
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Different types of pulses and beans are cultivated in Myanmar and lion share of the production goes for export while the rest are consumed locally. Local consumption of pulses and beans could be found in different ways such as fried peas and beans, sprouting beans, tofu, bean curd, bean milk, and various types of snack. Fried peas and beans are served together with fermented tea while eating pulses and beans with rice or glutinous rice is popular in most of the rural communities. Pulses are also used in preparation of soup, salad, and curry. Moreover, pulses are used extensively in making of vermicelli, powder or roasted powder, pulses paste, etc. For example, pulses paste, locally known as “Pone Yee Gyi” is a popular traditional food in Myanmar.
In 2015-16, Myanmar pulses export will be around 1.23 million metric tons in comparison with the export of 1.50 million metric tons in 2014-15. Although the volume of export was down, the value of export was slightly up from 1.20 to 1.21 million USD because of the higher prices. It is expected that Myanmar pulses export could be back to 1.2 to 1.4 million tonnes level in 2016-17.

Different types of pulses and beans are cultivated in Myanmar and lion share of the production goes for export while the rest are consumed locally. Local consumption of pulses and beans could be found in different ways such as fried peas and beans, sprouting beans, tofu, bean curd, bean milk, and various types of snack. Fried peas and beans are served together with fermented tea while eating pulses and beans with rice or glutinous rice is popular in most of the rural communities. Pulses are also used in preparation of soup, salad, and curry. Moreover, pulses are used extensively in making of vermicelli, powder or roasted powder, pulses paste, etc. For example, pulses paste, locally known as “Pone Yee Gyi” is a popular traditional food in Myanmar.

Consumer preference and consumption pattern may be different from one region to other. According to the “Monthly Household Expenditure Survey” conducted in 2012 by the Central Statistical Organization (CSO), average monthly expenditure for pulses for the whole Union is 1.75 percent of total expenditure including food and non-food items. The maximum monthly expenditure on pulses was found in Mandalay Region while Rakhine State represents the minimum expenditure.

Since Myanmar is a major pulses exporter globally and a leading country in ASEAN in pulses and beans production and exports, there are plans to celebrate the “International Year for Pulses” in 2016. Workshops, seminars, paper reading sessions, publishing publications, campaign for public awareness, discussion of policy, formulation of plans and programmes for the development of the pulses sector, branding and market promotion of Myanmar pulses and pulses products and export promotion are major activities to be carried out.

Promotion of export is one of the priority agenda of the newly elected Myanmar government, which came to power since 1st April this year. The new minister for commerce gave guidance to triple the export earning of the country this year. In this concern, pulses sector, major FE earner of the country, is a focused economic sector to participate. The success of the sector depends on the policy laid down by the government, performance of farmers, traders, processors, exporters and other stakeholders in the value chain, global and local market demand and climate changes.

In brief, outlook for Myanmar pulses looks optimistic, on higher production and exports. Even support of favourable market prices and change in Myanmar governance and new administration would give boost to Myanmar pulses sector.
EVERTOP COMMODITIES PTE. LTD.

Leading Exporters of Myanmar Pulses and Importers of White & Refined Sugar

Contact:

Evertop Commodities Pte. Ltd.
318 Tanglin Road, # 01-66, Singapore 247979.
Tel: +65 6736 0896
Mob: +65 9384 6721
Fax: +65 6736 0897
Email: info@evertopcom.com
## Pulses Imports into India (Apr - Mar) 2015-16: Apr’15 - Jan’16

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### Lentils

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### Kidney Beans & White Pea Beans

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### Cowpeas

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### Other Dried Beans

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2015-16 year = Apr 2015-Jan 2016

Source: GOVERNMENT OF INDIA, Ministry of Commerce & Industry, DEPARTMENT OF COMMERCE

### Other Dried & Shelled Legumes

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### Proximate composition of pulse Grains(per 100gm)

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<th>Fat (gm)</th>
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Source: Pulses for Human Health and Nutrition, Indian Institute of Pulses Research
## Pulses Exports of Canada (In '000 MT)

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<th>March 2015</th>
<th>2015 - 2016 Crop Year to Date</th>
<th>2014 - 2015 Crop Year to Date</th>
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<td></td>
<td>Bangladesh</td>
<td>44</td>
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### Lentil

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<th>2014 - 2015 Crop Year to Date</th>
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<tbody>
<tr>
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### Chick Peas

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### Beans

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### Faba bean

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<td>.1</td>
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<td>.1</td>
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<td>1.0</td>
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</table>

**Crop Year Aug-July**

Source: Canadian Grain Comission, Statistics Canada
### Pulses Supply-Demand, Trade of Canada

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<tbody>
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</tr>
<tr>
<td>Area seeded (kha)</td>
<td>73</td>
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<td>55</td>
</tr>
<tr>
<td>Area harvested (kha)</td>
<td>70</td>
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<td>54</td>
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<tr>
<td>Yield (t/ha)</td>
<td>1.87</td>
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<td>1.85</td>
</tr>
<tr>
<td>Production (kt)</td>
<td>131</td>
<td>90</td>
<td>100</td>
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<tr>
<td>Imports (kt) [b]</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Total supply (kt)</td>
<td>269</td>
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<td>158</td>
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<td>Exports (b)</td>
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<td>110</td>
<td>75</td>
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<td>Total Domestic Use (c)</td>
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<td>63</td>
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<tr>
<td>Carry-out Stocks (kt)</td>
<td>125</td>
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<td>20</td>
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<tr>
<td>Stocks-to-Use Ratio</td>
<td>87</td>
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<td>14</td>
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<td>Average Price (d)</td>
<td>515</td>
<td>770-800</td>
<td>725-755</td>
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</table>

[a] Crop year is August-July.
[b] Imports and exports exclude products.
[c] Total domestic use = Food and industrial use + Feed waste + dockage + Seed use + Loss in handling. Total domestic use is calculated residually.
[d] Producer price, Free-on-board (FOB) plant, average over all types, grades and markets.
kha: kilohectares (‘000’ha)
t/ha: tonnes per hectare
kt: kilo tonnes (‘000’tonnes)
$/t: dollars per tonne (Canadian)
f: forecast by Agriculture and Agri-Food Canada except area, yield and production for 2015-16 which are Statistics Canada

### Pulses Area, Production & Trade of Australia

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### Pulses Production (‘000’tonnes)

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</thead>
<tbody>
<tr>
<td>Chickpeas</td>
<td>629.4</td>
<td>555.4</td>
<td>1013</td>
<td>987.43</td>
</tr>
<tr>
<td>Field peas</td>
<td>342.1</td>
<td>290.4</td>
<td>204.5</td>
<td>329.595</td>
</tr>
<tr>
<td>Lupins</td>
<td>625.6</td>
<td>549.1</td>
<td>606.768</td>
<td>488.75</td>
</tr>
<tr>
<td>Other pulses</td>
<td>795.436</td>
<td>596.505</td>
<td>585.275</td>
<td>701.701</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>1597.1</td>
<td>1394.9</td>
<td>1824.268</td>
<td>1805.775</td>
</tr>
</tbody>
</table>

Source: ABARES

### India Pulses Production Estimates for 2015-16

<table>
<thead>
<tr>
<th>Particulars</th>
<th>2014-15</th>
<th>2015-16**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>17.15</td>
<td>18.32</td>
</tr>
<tr>
<td>Total Import</td>
<td>4.58</td>
<td>4.10</td>
</tr>
<tr>
<td>Availability</td>
<td>21.73</td>
<td>22.42</td>
</tr>
<tr>
<td>Total Exports</td>
<td>0.22</td>
<td>0.25</td>
</tr>
<tr>
<td>Total Availability for Domestic Consumption</td>
<td>21.51</td>
<td>22.17</td>
</tr>
</tbody>
</table>

Source: Directorate of Economics and Statistics (DES), Department of Agriculture & Cooperation (DAC) and Department of Commerce (DoC)
Availability: Production plus Total Imports; Total Availability for Domestic Consumption: Availability minus Total export.
**: For preparation of estimate for 2015-16, production, export and import
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