

## Pulse Revolution

*Indian pulse production have increased reducing our sustenance on imports*

**T**he Pulses which form an integral part of Indian cuisine has compelled India to import a fair share of its consumption from other countries. India's persistent imports have stoked research interest in this genre of grains and we have slowly but consistently been able to increase our production, narrowing the gap between demand and production. The country is slowly witnessing a revolution, that, which is not very radical, but gradual.

India Pulses and Grains Association (IPGA), puts India's import at around 5.7 million tonnes of pulses during FY2017, almost similar to 5.8 million tonnes imported during the previous financial year. India has imported pulses worth \$2.47 billion for the period between April and November 2017 to meet its growing consumer demand. During financial year 2016-17, India had set a record in imported pulses at \$4.24 billion, up from \$3.90 billion the previous year. With a steady growth of 4-5 per cent, India requires around 24 million tonnes of pulses a year to fulfill its demand.

However, data compiled by the Ministry of Agriculture recorded that total acreage under rabi pulses jumped by nearly 5 per cent to hit the highest ever at 16.31 million ha which works out to about 15 per cent more than the average of the past five years. Similarly, many non traditional areas have espoused this crop, For instance, chickpea, a rabi crop of northern India has moved to the warm climates of south and central India. This obviously have entailed research and extension, as the crop in South India had to face dry and hot weather as it matures and faces potential attacks by wilt and pod borers. ICRISAT, headquartered in Andhra Pradesh played pivotal role in evolving varieties that were disease resistant and bypassed the hotter conditions during crop maturity. Average annual production of chickpea has risen from the annual average of 4.88 million tonnes during 1970-80 to 7.38 million tonnes during 2005-15. India has considerably progressed

towards achieving sufficiency in pulses. Chickpea has been the prime contributor, as it accounts for 46 per cent of the country's pulses production.

Adoption of new varieties and good agronomic practices have been the key in this change. But most importantly, it was the resolve by the research community to develop varieties to suit the new growing conditions. India can attain self-sufficiency in pulses if we are able to concentrate on four areas – area, seed, irrigation and market. Increment in area under production is the first and foremost requirement. One good thing about pulse crops is that they can be cultivated in degraded areas. This can convert many waste lands into pulse cropping areas. Integrating pulse crops in crop rotation is another suitable proposition of increasing area under pulses. This will not only increase the income earned from the land but also enriches the land for the next crop owing to its nitrogen fixing abilities and maintains other soil parameters quintessential for the soil integrity of that land. Seed replacement and variety replacement are also equally compelling factors that can affect our production ambition. To make that happen, availability of quality seeds during the sowing season becomes significant. Better irrigation facilities can offset for the deficiency in rain and manage the production.

Beyond the agronomic measures, farmers need regular advisories from the states. Market sensitive production is what we need. Market fluctuations and demands should be communicated in advance to the farmers and this will help them in adjusting their production in accordance with the demand. The usual practise of cultivating crops irrespective of the demands, global and domestic, often result in glut and sharp fall in prices.

India, going at the current pace can very well outlive the dependence on imports. But the real challenge is to maintain and manage the output levels. If we can succeed in gauging the market sentiments and direct the agriculture of the country to deliver accordingly, undoubtedly we can capitalize the global markets and make agriculture a more profitable enterprise.

## Technology – Illegally

*GM crops illegally being cultivated in India*

A decade later, Bt Brinjal is back to haunt India. The inglorious exit of the genetically engineered food crop from Indian soil following a moratorium, had not deterred some farmers in Haryana to sow them in their fields, of course clandestinely. The matter now in public spotlight, raises some uncomfortable questions. How strong and valid is the moratorium on Bt Brinjal? How effective is India's regulatory bodies?

A tip off and further tests have confirmed the presence of Bt Brinjal in a farm belonging to a farmer in Fatehabad district in Haryana. Bt brinjal engineered with a bacterial gene producing Cry1Ac protein and thus endowed with protection against pests that attack plants, is banned in India from being cultivated on a commercial scale. However, the crop was cleared for cultivation in 2009, and a public outcry led to shelving the variety and a moratorium was imposed on it for commercial release. Had it been cleared, Bt Brinjal would have been the first genetically engineered food crop of India. So far, India has only one GM crop to its credit, Bt cotton, the history of which has been good with India. India's cotton production increased dramatically, since its introduction, and today we are a recognizable cotton producer of the world.

Despite the ban, the crop has found its way to the Indian farms. While speculations are rife on the possible smuggling of the GM seeds from neighbouring Bangladesh, where it is completely legal to grow and sell them, interestingly it is not the first instance of illegal cultivation of a genetically engineered crop. In 2017, GM Soyabean – which is herbicide tolerant (HT), has been reported from Aravalli district in Gujarat. Herbicide-tolerant GM cotton known as Roundup Ready Flex (RRF) was also similarly found to be cultivated in three states – Gujarat, Punjab and

Maharashtra, despite the Genetic Engineering Appraisal Committee, not clearing the technology. Even the Bt cotton had followed the illegal route initially, a year before being legally approved to be cultivated. After its formal approval, the area under cotton hybrids rose from 2% in north India and 40% elsewhere to 96% across the country, from 2002 to 2011. Today, India is the world's biggest cotton producer and has the fifth largest area under GM crop cultivation, and Bt cotton seeds account for 40% of the Rs 14,000 crore national seeds market.

But in the case of GM food crops, the environmentalists are concerned about the long-term impact on human health as well as on the environment. The anti-GM activists are worried that the introduction of the transgenic variety may genetically contaminate domesticated as well as wild varieties of the crops. The GM lobbyists, however, are convinced of the good they can offer and the benefit the farmers are to acquire from this brand of technology, considering the advantage that India had with cotton. In the future, when agriculture is pitted against diminishing resources and increasing demand, technologies such as these might come in handy. Some might even argue that farmers are convinced of the efficacy of the technology and hence the rampant illegal cultivation of GM crops.

However, the pertinent question is, how poised is India to take advantage of this technology. This technology of integrating an alien gene into the genetic make up of the crop, comes with its own set of precautions. Hence, we have bodies like Genetic Engineering Appraisal Committee. Unfortunately, the monitoring and regulation has been far from satisfactory. India has not acted responsibly in using this technology and the condition warrants establishing a more responsible and vigilant institution. In the absence of which, it is better for India to steer clear of GM technology.

## Toiling in Turmeric

*Turmeric farmers are contesting against PM in the election to draw attention to their grievances*

**A**griculture in the last few years in India has fairly created an impression that it is non remunerative and its dependents, the farmers, are bearing the brunt of falling prices of commodities. Since the last few years, farmers have been vociferous about their problems and their voice was heard across nation through protest and marches. Dejected over the callousness of the authorities towards their problems, farmers have used this election season to air their grievances in the most innovative way.

This election, some farmers contested against political candidates in huge numbers, so that their problems get a wider audience. About 180 turmeric farmers contested the Nizamabad Lok Sabha election. Taking it a step further and to draw the attention of the entire nation, twenty six turmeric farmers from Telangana filed nominations in Varanasi, taking on Prime Minister Narendra Modi himself. They have taken great pains to achieve this feat considering this time when farmers are busy, as it is the end of rabi season and beginning of Kharif. Filing a nomination is time consuming and capital intensive. The contestants need to make a deposit of Rs. 25000 and will have to get an endorsement by at least 10 local voters. And, definitely a lawyer's expertise to vet the papers. Together with that, they have to navigate the hostility of the constituency.

A task as arduous and expensive as this undertaken by farmers, plainly exposes his helplessness. His woe is same as the rest of the farmers across the nation. Not getting remunerative prices and serially crashing commodity prices. Most of all, he is peeved because no one is listening to him. The price of turmeric which ruled above Rs 10,000 a tonne two years ago, have fallen to just Rs 4,000

now.

Turmeric is no ordinary crop that is cultivated in small swathes of land. India is the largest producer, consumer and exporter of turmeric in the world. Indian turmeric is considered to be the best in the world market because of its high curcumin content. India accounts for about 80 per cent of the world turmeric production and 60 per cent of world exports. Telangana is an important turmeric player with farmers growing it in about 1.50 lakh acres. Farmers toil on field for nine months to produce it. The crop after the harvest undergoes a long process of cleaning, boiling and drying before being brought to market. Approximately between 9 to 10 lakh quintals come to the market here every year.

At present, turmeric is listed as one of the 52 spices in the Spice Board. The farmers, however, are campaigning for a separate Turmeric Board along the lines of Coffee Board, Tea Board and Cotton Board. Their demand is justified considering the revenue earned in terms of foreign exchange by this spice. India gets Rs 22,000 cr foreign exchange every year from exporting turmeric. The cash crop in Nizamabad itself accounts for 30 per cent of country's production which is exported to 130 countries.

With a responsible Board in place, they are hoping to have minimum support price for turmeric. Currently the farmers invest Rs.1.5 lakh per acre and the loss per acre amounts to Rs.30000- Rs. 40000. The exclusive Board will look into the problems and challenges that they are facing and lobby for them at the policy level. Besides remunerative prices and predictability in procurement, a Board would help develop new varieties and improve yields. In fact, their demand for a Turmeric Board is more than two decades old. And it took an election and farmers' extraordinary step of contesting election to draw attention to this demand.

## AgBots – The Next Revolution

*Agriculture tomorrow will be driven by artificial intelligence*

**T**he world is absorbing technology at an alarming pace with the right mix of artificial intelligence, algorithms, robots and of automation. Substituting the human element with technology have in reality guaranteed efficiency in use of resources, minimal errors, precision and better outputs. When the world is embracing self-driving vehicles and robots treating patients, agriculture is also not very far away from such interventions.

The advantage of the technological advancements such as these are their ability to severely restrain loss of resources. They intend to increase the input efficiency. Such an aspect is crucial considering the increasing responsibility of agriculture to produce food for vehemently increasing population. According to the estimate given by the UN, world population is anticipated to grow up to 9.7 billion in 2050. We are left with the option of producing more food from the same piece of land, if not smaller, owing to the increased use of land for other purposes. Besides the population factor, future will see lesser number of people engaged in agriculture as a profession. The fact is quite true for India. The number of farmers have dipped by over 8.6 million in the past decade. The statistics show that only 54.6 per cent of total workers in India are now part of the agriculture sector with a decline of 3.6 per cent as compared to 2001. In such a scenario, AgBots, an autonomous robot used in farming to help improve efficiency and reduce reliance on manual labor, emerges as an apt alternate proposition.

Robots' application in agriculture spans from sowing to harvesting stage. They find active applications in weed control, cloud seeding, planting seeds, harvesting, environmental monitoring, pest management and soil analysis. Some sources even put the market of agricultural

robots to reach \$11.58 billion by 2025. Robots or drones can precisely remove weeds or spray them with targeted weedicides, using 90% less chemicals than conventional blanket sprayer. Most importantly they are programmed to differentiate between weeds and crops, minimizing losses to a great extent. Similarly they can identify disease, pests, alert the farmers and direct the appropriate management strategy at the precise location. Harvesting and picking is one of the most prevalent robotic applications in agriculture. This is because of the precision and speed that robots can achieve to improve yield size and reduce wastage.

Although the opportunities are alluring, they come at a cost, a great cost apparently. The investment is very high and this limits the advantage offered by this technology to just a few. Besides, the technology is still not out in the open. Awareness regarding the existence of such a technology in agriculture is very low. The skill set required to operate and manage is also a pre requisite to popularize the technology. However, these challenges in years to come will be addressed as the scope of this technology is too wide to be dismissed casually.

AgBots has the potential to offer broader and better variety of foods, wider availability of food and feed at a lesser cost economically and environmentally from lesser resources. Agriculture has come a long way from being dependent on humans and animals to now being controlled and regulated by artificial intelligence. The change is reflective of the world that we live in. Our demands have changed, our requirements have evolved and our expectations have grown. Self sustenance have given way to profit and optimization of the yields have become a priority. Agbots offers just that. A few years of research and we will enter this new world.