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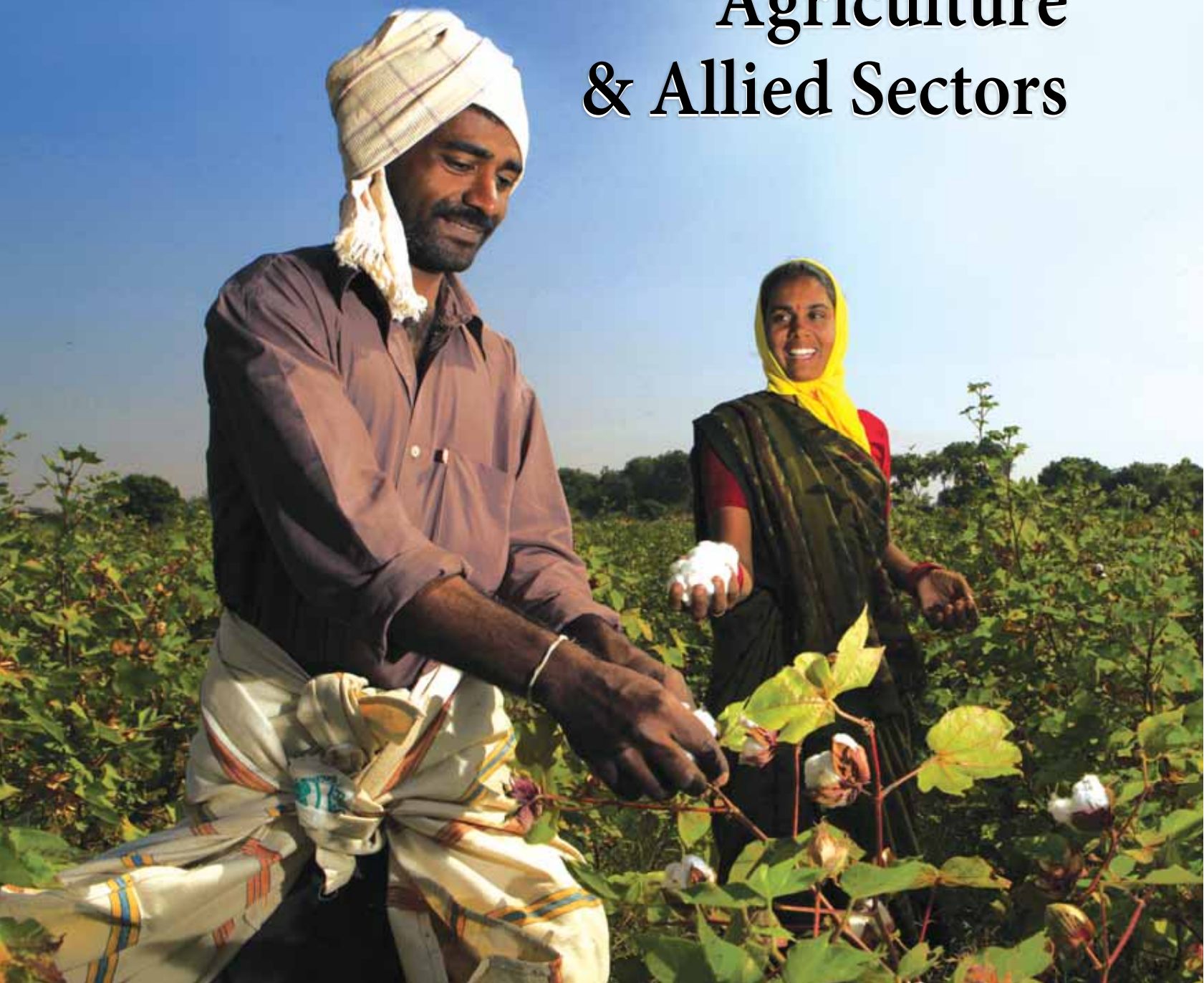
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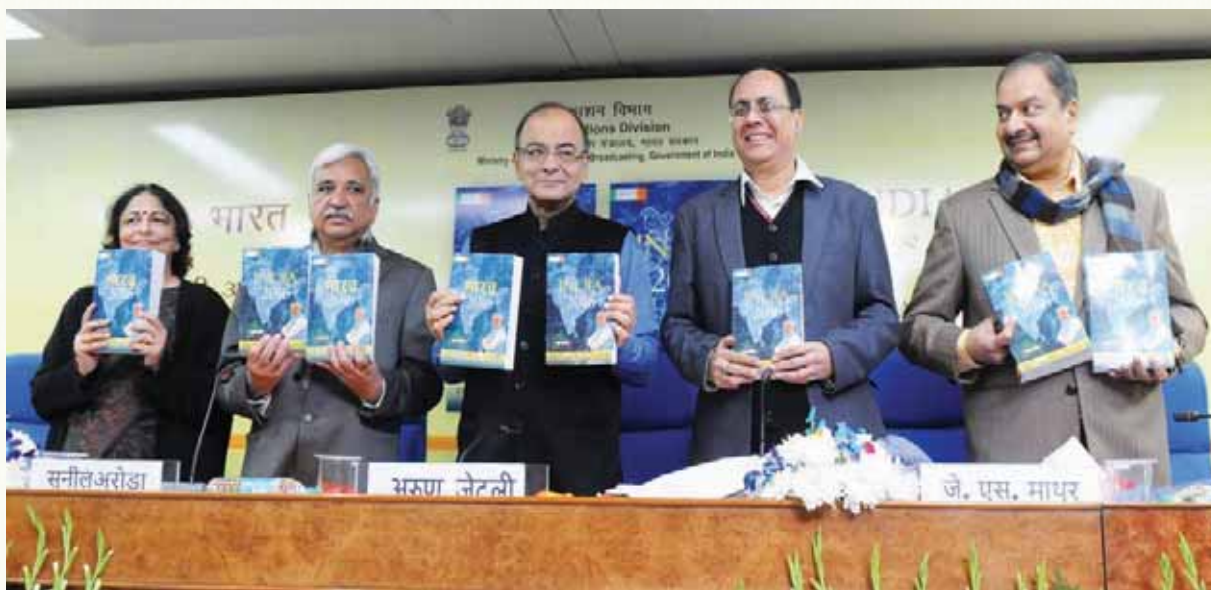
March 2016

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## Agriculture & Allied Sectors



## I&B Minister Releases India 2016 & Bharat 2016



*Union Minister for Finance, Corporate Affairs and Information & Broadcasting Shri Arun Jaitley releasing India 2016 and Bharat 2016. Also seen are Shri Sunil Arora, Secretary Ministry of I&B and other senior officials.*

**U**nion Minister for Finance, Corporate Affairs and Information & Broadcasting Shri Arun Jaitley released the print and digital versions of India/Bharat 2016 on 18<sup>th</sup> February 2016. Speaking on the occasion, Shri Jaitley termed the Annual Reference Book, an asset and a repository of information to all stakeholders. He said, the kind of details India 2016 carries, makes it a must-read for everyone. He added that digitizing government publications was a priority area.

On the occasion, the Hon'ble Minister also launched the online payment and subscription services of popular journals of the Publications Division through Ministry of Finance's Non-Tax Receipt Portal, Bharatkosh Portal. Using this facility, users can subscribe to Yojana, Kurukshetra and other print journals of Publications Division online.

The digital Employment News and subscription payment facility for both electronic and print versions of Employment News was also started through Bharatkosh portal.

Speaking on the occasion, Shri Sunil Arora, Secretary I&B said that India Reference Book was a signature book brought out by Publications Division and a ready reference for academicians and students preparing for various competitive examinations.

The online sale of some of the books of the Division through e-commerce platform was also launched on a pilot basis.

The digital version of Employment News can be accessed at <http://www.en.eversion.in>. The printed version of other popular journals of Publications Division (Yojana, Kurukshetra, Aajkal and Bal Bharti) can be subscribed online by visiting the websites [publicationsdivision.nic.in](http://publicationsdivision.nic.in), [yojana.gov.in](http://yojana.gov.in) and [bharatkosh.gov.in](http://bharatkosh.gov.in).



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**CONTENTS**

❖ Agriculture & Allied Sectors : Quantum Jump Through New Initiatives	Sandip Das	5
❖ Far Reaching Reforms in National Agriculture Market	Gargi Parsai	9
❖ Pradhan Mantri Fasal Bima Yojana	Lalan Kumar Mahto	12
❖ Reaching the Unreached: Direct Benefit Transfer in Agriculture	Amit Mohan Prasad	17
❖ Jai Kisan, Jai Vigyan: Technology in Agriculture	Kamlesh Yadav	21
❖ Lab-to-Land Approach In Agricultural Sector	Dhurjati Mukherjee	24
❖ Storage Facilities for Perishables- Critical Gaps and Initiatives	A. Suresh and K.V. Praveen	30
❖ Horticulture: Scope and Recent Initiatives	Dr. Yashbir Singh Shivay Dr. Anshu Rahal	34
❖ Cash Crops -The Role of Tea Plantation Industries	Dr. K. Baby	39
❖ India's Dairy Sector –Technology the Key to Progress	R.C. Rajamani	43
❖ Ground Water Concerns & Irrigation Scenario	Mahendra Patel	47

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# Editorial

**A**s a vibrant economy with strong fundamentals, sustained mainly by domestic demand, India has, of course, reasons to be proud of being the fastest growing economy in the world, surpassing China. Our IT enabled service and related sectors continue to provide the right fillip for the economy. At the same time, from a position of the backbone of Indian Economy, the agriculture sector's share to the GDP continues to be on the declining trend. Even if agriculture and allied sectors enjoy the role of the largest employment provider, fragmentation of land holdings, deficient monsoon rainfall and natural calamities often force marginal farmers to opt for other employment and income avenues for their livelihood. Reluctance on the part of banks to extend timely loans and limited reliable farm inputs and technological knowhow in rural areas make matters worse for our farmers.

It is indeed glad to note that from a food grain deficient nation prior to the Green Revolution, at present, India is one of the largest producers of food grains in the world. The Green Revolution was followed by White Revolution and with 146.31 million tones of milk output in 2014-15 India tops the list of major milk producing countries.

Despite noteworthy scientific advances and irrigation facilities, Indian agriculture continues to be monsoon dependent. It is a matter of concern that due to deficient monsoon rainfall during the last two years the food grain production has declined. In a country of our size and population any initiative to relaunch the agrarian sector will be a great boon to the farming community and people at large. Keeping this in mind, the Central Government has recently launched a number of farmer friendly initiatives which will definitely have a far reaching positive impact on the vital sector of the economy. The latest initiative of the Centre, the Pradhan Mantri Fasal Bima Yojana (PMFBY) will be implemented across the country in association with state governments. The Yojana provides insurance coverage and financial support in the event of failure of any of the notified crop due to natural disasters, pests or diseases. PMFBY aims to stabilize farmers' income, encourage them to adopt innovative and modern agricultural practice and ensure flow of credit. The low premium insurance cover scheme was indeed a new year gift to the farming fraternity.

Besides the above, the Ministry of Agriculture is in the process of revamping the sector with a number of innovative schemes. Reforms in agricultural marketing, soil health card, direct benefit transfer in agriculture, PM Krishi Sinchayi Yojana etc are some of the recent initiatives that will rejuvenate the agrarian sector of India.

Innovative efforts to make available the scientific and technological knowhow at the door steps of the farmers is indeed praiseworthy. The hands that feed our billion plus population need to be strengthened unflinchingly.

The allied sectors of agriculture are also scoring record growth in recent years. The success rate in horticulture sector is specially note-worthy. After China, we are the largest producer and exporter of flowers, fruits and vegetables. However, the loss in perishables continues to be very high. The loss in fruits and vegetables alone comes between 6 and 18 per cent due to insufficient cold storage facilities in our country.

We earnestly hope that sustained efforts by the Central and State governments would bear fruit and bring smile on the faces of millions of our farmers who toil hard to feed the Nation. □

# AGRICULTURE & ALLIED SECTORS : QUANTUM JUMP THROUGH NEW INITIATIVES

Sandip Das

From a deficit to food surplus country, Indian agriculture has witnessed various structural changes since independence. With farmers increasingly preferring to grow horticultural and cash crops in place of grains, the agriculture and allied sectors at present need thrust from the government to ensure that farmers get remunerative prices, and also protection against crop losses due to variability in the climatic conditions.

**T**he first phase of transformation of Indian agriculture (1950–70) was mainly driven by the need to achieve self-sufficiency in food grains as India was importing a large quantity of cereals, for meeting domestic shortages in 1950s and 1960s. The growth in foodgrain production during the first two decades, following the country's independence, was small. The grain output could touch close to 100 million tone only in 1974–75 from around 50 million tone reported during 1950–51.

Post independence era, the area under irrigation was low and there were frequent droughts and the prime objective at that time was to make adequate food supplies available to the increasing population and ensuring provision of raw materials for the expansion of industrial sector. This was to be achieved by way of - imports, reorganisation of the agricultural sector and a series of development measures encompassing expansion of irrigation and, extensive as well as intensive farming. These initiatives were given further boost by strengthening agricultural administration and kicking off special area programmes.

The advent of new high yielding varieties brought Green Revolution in late 1960s, which in combination with expansion in area under cultivation and usage of chemical fertilisers increased the output of cereals, mainly – wheat and rice, followed by other coarse cereals such as maize to a certain extent chiefly in Punjab, Haryana and western Uttar Pradesh. The Green Revolution efforts were led by renowned agricultural scientist MS Swaminathan and team of scientists from Indian Council for Agricultural Research (ICAR). Thus a combination of technological development, significant investments as well as support by the government led to a significant increase in production of cereals.

The early phase of green revolution was largely associated with the spread of new technology to better endowed and irrigated regions of northern India, therefore, special efforts were then made to spread new technology into those regions, which had remained outside the fold of technological revolution. Consequently, special programmes were launched during late 1970s and mid-1980s.



## White revolution follows Green revolution

The second phase of transformation (1970–1990) witnessed a play of a combination of expansion of the Green Revolution into new crops and areas and introduction of the 'White Revolution' or also known as Operation Flood, which laid the foundations for consolidation of gains made in first phase and led to enormous growth of milk production in the country during 1980 and 1990s. Led by Verghese Kurien, also known as 'Milk Man of India', the country's milk output saw a huge increase through setting up cooperatives in various states. Since then the milk output has risen to 146.31 million tone in 2014–15 and India continues to top the list of major milk-producing countries in the world followed by the USA, China, Pakistan and Brazil.

The 'Operation Flood' programme used a combination of food-aid in the form of milk powder and butter oil from the European Economic Community to stabilise domestic prices of dairy products and develop dairy cooperatives by creating physical and institutional infrastructure for procurement, processing and marketing of milk and building linkages with the main cities of the country. This was followed up by financial aid from the World Bank during the second phase of Operation Flood in the 1980s to integrate efforts made by state governments into a national level programme.

Besides during the 1980s an attempt was also made to increase supplies of oilseeds and reduce imports of edible oils through a Technology Mission on Oilseeds. The approach was very much on the lines of dairy development model and the effort was to develop location-specific technologies to boost supplies, create marketing facilities, and modernise edible oil processing technology. The mission was successful in boosting supplies of oilseeds initially.

Besides, in the second phase of transformation of Indian agriculture, while the gross cropped area expanded by just about 12% from 164 million hectares to 185 million hectares, but gross irrigated area during this period continued the growth momentum. More than 27 million hectares were added to the existing 39 million hectares of irrigation capacity that existed in the early 1950s. The other factors such as use of fertilisers, road network and electricity generation also expanded significantly.

### An era of horticulture, poultry and fisheries

In the most recent phase of transformation, witnessed since early 1990s saw the launch of economic reforms and liberalisation of the economy. There was a significant shift in the drivers of transformation which focused from the supply side factors to the demand side factors. Though there was a respectable growth in gross irrigated area the huge increase in the usage of fertilisers witnessed in earlier two phases also decelerated. Although there was an increase in the road network and electricity generation and investment in the agricultural and allied sectors also expanded. But the supplies of all main commodities like cereals, oilseeds and sugarcane did not show much increase. The only exceptions were fruits and vegetables and cotton, the supplies of which increased significantly during this period. Similarly supplies of livestock products



– milk, eggs, and meat maintained their growth momentum.

The noteworthy aspect is that aquaculture and catch fishery is amongst the fastest growing industries in India. Fisheries at present supports livelihood of almost 1.5 million people. During 1990 - 2010, the Indian fish capture harvest doubled, while aquaculture harvest tripled. **According to fisheries census released recently, the country's fish production rose from a level of 0.75 million tone in 1950 – 51 to more than 10 million tone in 2014 – 15. The total fish production comprises of 3.7 million tone of marine and 6.4 million tone for inland resources. The export earnings were to the tune of Rs 33,441 crore in 2014-15.**

An official with the department of fisheries under the Ministry of Agriculture said that the future demand would be based on capture fisheries in reservoirs and the required financial support for the growth of fisheries sector is met through various central schemes, National Fisheries Development Board, Rashtriya Krishi Vikas Yojana (RKVY) etc.

While agricultural or crop production has been rising at the rate around 2% per annum over the past two to three decades, poultry production has been rising at the rate of around 8% per annum. What was largely a back-yard venture before the 1960s has been transformed into a vibrant agribusiness with an estimated annual turnover of more than Rs 60,000 crore.

The country's poultry sector represents one of the biggest success stories in the past few decades. India is the second largest egg producer and third largest broiler chicken producer in the world with production estimates of 65,000 million (2.8 million tones) eggs and 3 million tones of broiler meat per year.

The impressive growth is a result of several factors, such as active developmental support from the state and central government, institutional research and development, and participation of private sector.

### Horticultural production surpass foodgrain output

The country's horticultural production that surpassed its grains output for the first time in 2012-13 improved the lead to 10% last year, data released by agriculture ministry recently had stated. The production of horticulture crops that include mainly vegetables and fruits stood at an all-time high 283.47 million tone (MT) in 2014-15, compared with the grain volume of 257.07 MT.

**The area under horticulture farming increased from 12.8 million hectare in 1991-92 to 23.41 million hectare during 2014-15, aided by the multi-pronged National Horticulture Mission (NHM) launched in the 11th Five-Year Plan period (2007-2012). Production of these crops rose 194% between 1991-92 and 2014-15. India is now second only to China in the production of fruits and vegetables.**

"We have achieved record horticultural production despite deficient rainfall last year which was followed by unseasonal rains earlier this year," Agriculture Minister Sh. Radha Mohan Singh recently said.

According to an Agriculture Ministry official, the horticulture produce has surpassed foodgrain output in last few years mainly because of thrust given to horticultural crops in the 11th Plan (2007-2012) through NHM, Horticulture Mission for North East & Himalayan States (HMNEH), National Bamboo Mission (NBM), etc.

Implementation of National Horticulture Mission paved the way for adoption of cluster-based approach for the development of horticulture crops through linking with creation of infrastructure for post harvest management and marketing.

### Boost in agri exports

Since 1990s when the per capita income grew at a much higher rate in comparison to the earlier two phases, the per capita consumption expenditure on food items such as meat and meat products (eggs, meat and fish), dairy products,

### Production of horticultural crops vis-à-vis foodgrains (in million tone)

Year	Horticultural crops	Foodgrains
2001 – 2	145.79	212.85
2002 – 3	144.38	174.77
2003 – 4	153.30	213.19
2004 – 5	166.94	198.36
2005 – 6	182.82	208.60
2006 – 7	191.81	217.28
2007 – 8	211.24	230.78
2008 – 9	214.72	234.47
2009 – 10	223.09	218.11
2010 – 11	240.53	244.49
2011 – 12	257.28	259.29
2012 – 13	268.85	257.13
2013 – 14	277.35	265.57
2014 – 15*	283.47	257.07

Source: Horticultural Statistics, 2015, \*provisional

fruits and vegetables, and other food items increased significantly. The leading development of this phase was a decline in per capita consumption expenditure on cereals. As a result, much like in second phase, the bulk of growth in food consumption basket came from the contribution of fruits and vegetables, dairy products, and meat products. The other significant development was the emergence of external demand with significant increase in exports from agricultural and allied sector. While the share of the agricultural exports in total export is low, the country has emerged as a net exporter of a range of agricultural and allied products.

According to a research paper by former Commission for Agricultural Costs and Prices (CACP) chairman Ashok Gulati, in 2011-12, the country's agricultural exports were more than \$37 billion against an import of commodities worth around \$17 billion. India has emerged as the world's largest exporter of rice, replacing Thailand and Vietnam, and the country is also the biggest exporter of buffalo meat, beating traditionally strong countries such as Brazil, Australia and the United States.

**The CACP discussion paper titled 'Farm trade: tapping the hidden potential' has stated that agricultural exports have increased more than 10 times from \$3.5 billion in 1990-91 to \$37.1 billion in 2011-12 — a healthy annual growth rate of 13.6%.**

India's share in total global exports of agricultural products mainly consisting of rice, wheat, sugar, guar gum, meat and marine products has increased from 0.8% in 1990 to 2.1% in 2011. "This share is more than the share that India has in global merchandise exports," the paper has noted.

However, the fall in global commodity prices and sluggish demand have resulted in a sharp decline in India's agricultural and processed food exports in the first three quarters of 2015 – 16. According to latest data compiled by the Agricultural and Processed Food Exports Development Authority (APEDA), the shipment of agricultural produce and processed foods, which had seen a phenomenal rise for a few years to 2014, shrank by more than 21% during April-December, 2015 in comparison with the same period last fiscal.

The exports of buffalo meat, Basmati, non-Basmati rice and others have declined to Rs 78,503 crore in April-December, 2015 from Rs 1,00,094 crore achieved in the same period last fiscal. The realisation from the shipment of rice (Basmati and non-Basmati), buffalo meat, guar gum etc. have declined sharply in the current fiscal. Experts say that this decline in exports is mainly because of global factors and India's huge agricultural good export potential is yet to be harnessed fully.

### **Govt push for crop insurance & diversification: the way forward**

Agricultural experts also say that crop diversification is the best way for a farmer to manage the risks associated with the market and ensure that the crop is suited to the agricultural conditions. Besides prevailing the climate change issues impacting the crop output, the government thrust on providing crop insurance to farmers would be crucial support in terms of ensuring that farmers' income is not hit hard. In order to provide relief to drought-hit farmers, the government has announced a new Rs 8,800 crore crop insurance scheme, with significantly lower premium, to cover for loss of crop to natural calamities.

The government has approved continuation of Rashtriya Krishi Vikas Yojana (RKVY) during the Twelfth Plan whereby the funding will be routed into three components - production growth, infrastructure & assets and sub-schemes & flexi-

fund. The proposed allocation for implementation of this scheme during 2015-16 was Rs 9954 crore.

The National Food Security Mission (NFSM) is being implemented with the new target of additional production of 25 million tones of foodgrains comprising 10 million tones rice, 8 million tones wheat, 4 million tones pulses and 3 million tones coarse cereals by the end of the Twelfth Five Year Plan (2016-17).

Besides the budgetary allocation, as Krishi Vigyan Kendras and e-governance backed Community Service Centers expand their scale of operations, farmers are gaining knowledge about scientific farming techniques including suitability of crops for their soil and climatic conditions. Thus, they are shifting to the best suited crops such as cotton, fruits and vegetables. With the global commodities prices falling sharply in the past 3-4 years, many farmers have realised the value of crop diversification.

It should be noted that most of the cash crops require assured irrigation and fertilisers which raise their input costs and also make them more vulnerable to climate risks like poor or excess rainfall. On the other hand, oil seeds, soyabean, pulses etc. do not need extra care.

The government has also devised schemes and missions like the National Horticulture Mission, National Mission on Oil Seeds and Oil Palm etc to promote these crops. The government has also signalled its intent to promote diversification by modestly increasing the Minimum Support Price (MSP) for rice and wheat while there was a comparatively larger rise in MSP for pulses. Crops like oilseeds and soyabean also have a well developed processing industry which ensures that there is a stable demand for these crops.

Since assuming office in 2014, the Prime Minister Sh. Narendra Modia had been advocating a 'lab to land' approach to increase agricultural productivity. The Prime Minister has repeatedly urged agricultural scientists to disseminate technologies to farmers in simple and acceptable manner and make 'per drop, more crop' a mantra to promote farming through optimum utilization of water. Thus use of technology mainly supported by the government would be key to ensuring country's food security as well as farmers' income security.

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# FAR REACHING REFORMS IN NATIONAL AGRICULTURE MARKET

Gargi Parsai

National Agriculture Market is envisaged as a starting point for far reaching reforms in the agriculture sector. It not only promises transparency but has an in-built price discovery mechanism which allows a farmer to get better value for his produce. With the initiation of the electronic National Agriculture Market, the government has signaled its intention to move away from the exploitative market structure. Only, the States will have to work in unison.

A farmer in Karnal brings his yield of wheat—his toil and labour of over six months-- to the mandi (market) yard and offloads the produce from a hired tractor. An *artiya* (commission agent) steps in and sets up an auction. Six or seven buyers (traders) surround the mounds of wheat. All of them by turns lift a fistful of wheat and assess the quality physically. And then begins the “*boli*” (bid) which is a silent affair conducted in sign language between the *artiya* and the buyers.

A handkerchief is spread over the *artiya*'s fingers which the interested buyer (trader) holds to indicate his price, which could well be below the Minimum Support Price set up by the Government. If the buyer holds a lone finger under the kerchief it indicates a lower price while a fist is the sum of all five fingers. The *artiya* whispers the amount offered to the hapless farmer, who normally agrees. Alternatively, the payment to farmer is postponed and he is given a sale patti (in-voice). Sometimes a trader does not even give that to avoid mandi taxes and keeps it pending to the utter distress of the farmer who then has no other way but to turn to the *artiya* for an advance or a loan.

After a deal has been struck between the *artiya* and the trader for the farmer's produce, the *artiya* deducts his commission, which by law is around two per cent but can go up to six per cent. He also deducts other charges which usually include unloading the wheat from the tractor and cleaning the produce. And then after deducting these charges, as well as, also any loan that he has extended to the farmer, the *artiya* pays the farmer.

An *artiya*, it must be remembered, also doubles up as the village money lender to the farmer and anyone in need. The farmer cannot break this cycle because the *artiya*, unlike a bank, is available round the clock trap for lending money--albeit at a high interest rate--for every need such as medical, marriage, education and so on. It is a generational relationship that does not allow farmers to come out of debt as was lucidly expressed in the old Bollywood

classic *Mother India*. The *artiya* is neither a buyer nor a seller. He is a moneyed class of middle-man or intermediary who lives off the commission that he earns from both parties and the interest he draws on loans extended to farmers or any needy villager.

For years this unseemly but deeply entrenched system of buying a farmer's produce has been going on in regulated mandis where only licensed commission agents and traders can function. A small and marginal farmer—and 80 per cent of Indian farmers are in this category with a land holding of less than a hectare-- who has travelled from his village, hired a tractor and has taken a loan for inputs cannot but sell off his produce in the mandi. Since rabi wheat is produced once a year, this is his income from which he runs his household expenses and cultivates the next kharif or inter-crop. There is no other way for him but to take loan for his livelihood and mortgage his land as collateral.

The operations in the mandis have been regulated under the Agriculture Produce Marketing Committee (APMC) Act which is restrictive as buyers cannot buy directly from farmers. Successive governments have made attempts to get out of this labyrinth by urging States to amend the APMC Act or to at least de-list some of the notified items such as fruits and vegetables so that farmers get their due and consumers get the products at reasonable prices. But fear of losing revenue earned, as mandi fees and taxes, has made many a State turn a deaf year to this crucial reform that the sector was crying out for. Apart from that, farmers, who have been illiterate and unorganized, lack the political clout to tilt the scales in their favour. Despite recommendations of several committees and commissions, they fail to get the right price for their produce and almost always end up with getting lesser than their input costs. And yet, with pulses still ruling at an average of Rs. 150 to Rs. 200 per kilogram in the retail markets, the consumer at the other end is paying through his nose. Obviously the markets were distorted by vested interests.

Now, to remove stagnancy and bring transparency in the system with digitization as the means, the present Government has taken a major step to reform this marketing system. It has decided to set up a National Agriculture Market (NAM) through the Agri-tech Infrastructure Fund with an initial budget of Rs. 200 crore. Only States that amend the APMC Act will be able to participate in this reform measure which will be implemented in phases till 2018 by the Small Farmers Agribusiness Consortium.

So far the States that have amended the APMC Act and are moving towards reforms include Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Mizoram, Rajasthan and Telangana. Haryana has amended the Act through an administrative order, while Uttar Pradesh is in the process of doing so, official sources informed. The resistance from state governments is for the fear of losing the mandi revenues from fees and taxes, which in Punjab, for instance range as high as 14 per cent.

Interestingly Bihar abolished the APMC Act but did not replace it with any other instrument which also is not such a desirable thing. Kerala too does not have an APMC Act.

One of the major drawbacks, in the APMC Act—which is a legacy of the colonial rule—is that a trader had to take separate trading license for functioning in different mandis even within a State. By one estimate, in about 7000 mandis there are about 14 lakh artiyas. The mandi commerce can be assessed by the fact that Azadpur mandi in Delhi alone has an estimated turnover of Rs. 100 crore. Every mandi has a marketing board which is supposed to oversee the services such as infrastructure development of the notified mandis and provide facilities like clean toilets and yards to farmers and traders. They are meant to look after farmer welfare including entertaining complaints of under invoicing and other exploitation. But farmers often indicate that their voices are the weakest in the system. All they want to do is, sell their produce within the day and collect their money.

With the initiation of the electronic National Agriculture Market, the government has signaled its intention to move away from the exploitative market structure. Only, the States will have to work in unison.

Inaugurating a conference on NAM in New Delhi a few months ago, Union Agriculture Minister Radha Mohan Singh said that NAM will be a pan-India electronic trading portal which seeks to network the existing APMC mandis and other markets to create a



unified national market for agricultural commodities. In a sense, NAM is a 'virtual' market where price discovery and bids will be conducted online, but it has a physical mandi (market) at the back-end. For now, the commission agents will continue to play a role but in a transparent manner without surprising farmers with hidden costs. Through the NAM portal, a buyer in Kolkata, for instance, will be able to do spot bidding and access a commodity in Haryana. The commission agent (artiya), in his new avatar as a service provider, will facilitate physical delivery and transportation of the commodity. He will be active in the front-end as well as the back-end.

To participate on the online portal, each state will have to set up its own e-marketing portal. The Central Government has set three basic criteria for a State to plug-in into the Centre's NAM. First, the State will have to amend the APMC Act to provide for electronic trading. Secondly, the State APMC Act must provide for issuance of licenses to anyone in India including private players to trade through NAM in local mandis. Thirdly, and, most importantly, there must be a single license for each State that covers all mandis within the State with a single-point levy of transaction fee. Under the existing APMC Act, a trader had to procure different licenses for different mandis and pay transaction fee in each mandi for moving, for instance, a produce from one mandi to another which went against the economies of scale. States have been given a grant of Rs. 30 lakh to align their mandis to the new reformed structure.

With the introduction of NAM, the farmer will have a choice to bring his produce to the local mandi or to become a bigger player by seeking online buyers (traders) operating in other markets. This does away with the restriction of a State to not sell in another one. At the same time, processors, multi-national giants like Cargill and ITC will enter the market. Flour millers who were reportedly big beneficiaries of the foodgrains diverted from the Public Distribution System, can go in for transparent trading.

In such a transaction, the quality of the produce may become an issue. But, according to Agriculture



Ministry sources, States will have to set up and notify testing laboratories in mandis whose certificates will have to be uploaded for a buyer to be satisfied about the farmer's produce.

Alternatively, the warehouse which will store the produce till it is transported, will upload Warehouse Depository Receipt (WDR) about the certified quality tested in the warehouse laboratory.

As the system is envisaged, capacity building will be done for artiyas or their nominees to become an active and informed player in this digitised system. A farmer, or on his behalf an artiya, a cooperative or even a local trader, will upload the quantity of the lab certified quality produce and quote the seller's (farmer's) price expectation. The registered buyer/traders/company/flour miller etc. will see online the quotation and quote their price. The highest bid will be sent through SMS to the farmer or his representative. At the close of the day, if the farmer agrees, he will send a 'Y' indicating yes or a 'N' rejecting the offer and put up his produce for sale the next day.

If the deal is struck, then a primary invoice will be generated after usual deductions by the artiya and sent to the buyer who will make online payment through any of the regional and cooperative bank that are likely to participate in the process. Only after the buyer deposits the amount in the Settlement Account of the clearing bank, will physical delivery will be made.

The SFAC has identified strategic and consortium partners and will launch a pilot e-platform by April this year with five to six mandis under the national portal. The target is to cover in phases 250, 200 and 135 mandis during 2015-16, 2016-17 and 2017-18 respectively.

Amongst the States, Karnataka, Gujarat, Maharashtra, Telangana, Jharkhand, Chhattisgarh, Madhya Pradesh, Rajasthan and Chandigarh have taken the lead and come up with proposals for setting up e-marketing portals to link up their

mandis. Karnataka, for instance, has connected with 73 markets across 24 districts and has transacted about 939 lakh quintals in the last few months. Several other states have shown their willingness to become a part of this reform process.

NAM is envisaged as a starting point for far reaching reforms in the agriculture sector. It not only promises transparency but has an in-built price discovery mechanism which allows a farmer to get better value for his produce. For the local trader in the mandi, NAM offers a wider market. Bulk buyers, private players, processors, exporters etc. will be able to do direct trading at local mandi level. The integration of all mandis of the States into NAM will ensure common procedures for issuance of licenses, levy of transaction fee and free movement of produce. Gradually, it is expected that farmers will get remunerative price for their produce and will not have to wait for payment. Of course, in the back-end they will have to be trained, skilled and educated in the new processes. The process has the potential to build on the strength of a local mandi at the back-end and create, at the front-end a national network of physical mandis that can be accessed online.

It is expected that this spot trading involving long-distance transportation of goods will facilitate the emergence of integrated value chains and scientific and modern storages. The artiyas will slowly have to evolve into efficient service providers. Transparent and direct buying and selling will cut costs and eventually benefit consumers, it is presumed.

Combined with the Soil Health Card Scheme that indicates the health of a farmer's field, the newly launched village-based Crop Insurance Scheme and the Pradhan Mantri Krishi Sinchai Yojana, the National Agriculture Market is a reform that will invigorate the agriculture sector and increase food production by 2020 considerably from the current average level of 250 million tonnes.

The National Agriculture Market is a promising initiative but it will have to be seen how it pans out and what role the artiyas/middle-men come to occupy. A farmer wondered if there was the possibility of a local trader/artiya buying his produce from the local mandi at below Minimum Support Price and selling it online in another mandi online at a higher price or of traders forming cartels to suppress prices. Indeed the government will have to think of in-built mechanisms to safeguard the interests of farmers.

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## PRADHAN MANTRI FASAL BIMA YOJANA

Lalan Kumar Mahto



Under PMFBY insurance plan, the premium rate will be 2 % of the actual sum assured amount for Kharif crops and 1.5 % for the Rabi crops. For the commercial and horticulture crops, the premium rate will be 5 %. The remaining share of the premium, as in previous schemes, will continue to be borne equally by the Centre and the respective state governments.

India is an agriculture oriented country with two third of its population dependent upon agriculture for their livelihood with an approximate share of 18% in GDP. But it is not so easy for our farmers to earn secure income from agriculture. Indian agri-business is synonymous with risk and uncertainty because agriculture in India depends upon the natural factors, i.e. adverse weather conditions, flood, drought etc.

Uncertainty of nature leads the farmers to distress. Low productivity, less income and high loans taken for agriculture are forcing some of our farmers to commit suicide. They are living a stressful life even after making others' life stress free by fulfilling their most basic need i.e. food.

Therefore, to cope up with these agro-problems, a risk management tool "Agriculture Insurance" was launched for the farmers. The objective is to provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests or diseases.

The list of crops being covered for insurance differs from state to state. Generally quite a few Kharif and Rabi season crops are covered. These crops are insured at the community/block/gram panchayat levels. Agriculture insurance for farmers helps greatly in reducing risk horizontally across the states (a drought in Rajasthan is mitigated by a bumper crop in Andhra Pradesh) and vertically across big and small farmers. In fact, states which have accepted the scheme require that any farmer borrowing from any financial insists take insurance too.

Unfortunately, data shows that only 4 % of the Rabi (winter) crop and 11 % of the more risk-prone Kharif (monsoon) crop holdings are insured so far.

On the positive side, the percentage of the holdings covered is more than the percentage of area covered indicating better penetration among the small land-holders, the most vulnerable farmers. Most of the crops covered were food crops (summer paddy, wheat) indicating that food security is the primary concern for India's small farmers.

### Pradhan Mantri Fasal Bima Yojana (PMFBY)

The Hon'ble Prime Minister, Shri Narendra Modi has launched a brand new crop insurance scheme on 13<sup>th</sup> January, 2016. This crop insurance scheme is called Pradhan Mantri Fasal Bima Yojana (PMFBY) which will be implemented in every state of India, in association with the respective Governments. This crop insurance scheme will be administered under the Ministry of Agriculture and Farmers' Welfare.

The main motto of this new scheme is to provide a more efficient insurance support to the farmers of the country. Govt. has decided to provide low premium insurance cover to the farmers so that they can sustain even if the crop is damaged. This announcement has been made during the Makar Sankranti which is the harvest festival of India, celebrated across the country. It is celebrated as Pongal in the South, Lohri in North and Bihu in Assam. Total budget estimate for flooring this project is estimated to be approximately Rs. 17,600 crore.

Most farmers take loans for buying agricultural seeds, fertilizers, irrigation facilities, pesticides and other agricultural machineries for cultivation of crops. But sometimes unavoidable natural disasters like drought, flood, fire, pest attack etc. strike and destroy the crop yield.

Then farmers are forced to choose the path of suicide as they become unable to cope up with

the burden of debt. There is an alarming number of farmer suicides which is a burning issue, not only in India, but also throughout the world. Reports of near about 3000 farmers' suicide have been reported in India, in the last three years itself. So the Centre has planned to introduce a new crop insurance scheme called Pradhan Mantri Fasal Bima Yojana in the country and rectify the loopholes, present in the existing one.

In the year of 1999, an insurance scheme was launched which was named National Agriculture Insurance Scheme (NAIS). But it had some drawbacks due to which it could not achieve the desired results. It was implemented only in 14 states of India, which are most affected by weather calamities. States like Madhya Pradesh, Uttar Pradesh, Rajasthan etc. were in the list of the affected states. As per NAIS, the insurance premium rates were from 1.5 % to 3.5 % of the net sum assured for all food crops. These food crops included pulses, cereals, oilseeds, grains etc.

Cotton was the most popular commercial crop at that time, which got largely affected by pest attacks. Later, the NAIS was restructured and modified as MNAIS which stands for Modified NAIS. But MNAIS was implemented in only 6 states and thus could not get success. The other failing factors of these past schemes were caps on the sum assured, slow claim process, fraud in the insurance system etc. Also a major setback of this insurance plan was that those farmers who have taken loan for purchasing agriculture machineries, crop seeds, insecticides and pesticides etc. were only given the insurance benefit.

So due to all those disadvantages of the earlier insurance scheme, the Govt. has planned for a new crop insurance scheme that will not only provide insurance to all farmers from crop damage, but also becomes a financial support for them. Under this insurance plan, the premium rate will be 2 % of the actual sum assured amount for Kharif crops and 1.5 % for the Rabi crops. The remaining share of the premium, as in previous schemes, will continue to be borne equally by the Centre and the respective state governments. The sum assured amount is likely to be increased so as to provide a better insurance cover to the farmers.

Apart from this, the Prime Minister has mentioned that technology will be used in implementation of the scheme to make it a fast, user friendly, efficient and fraud free. This new crop

insurance plan will be functional from the next Kharif season of crop cultivation.

With farmers having been required to pay a premium share of as high as 15 per cent in several areas in the country, there has been a long-standing demand to bring down these rates. The Centre's move to bring down and cap these interest rates is being viewed as a major government policy outreach towards the farmers.

The Centre currently has a bill of Rs 3,100 crore on account of its share of the premium for the 23 per cent crops that are currently insured in the country. Once 30 per cent of the crop comes under insurance cover, the Centre's financial liability is estimated to go up to Rs 5,700 crore. This financial liability is expected to touch a whopping Rs 8,800 crore once the target of bringing 50 per cent crop under insurance is achieved in three years, officials said. As the Centre's financial liability goes up, the bill of the states where the scheme gets implemented will also go up correspondingly.

Under PMFBY, there will no upper limit on government subsidy and even if balance premium is 90 per cent, it will be borne by the government. Earlier, there was a provision of capping the premium rate which resulted in low claims being paid to farmers.

This capping was done to limit government outgo on the premium subsidy. This capping has now been removed and farmers will get claim against full sum insured without any reduction. **The use of technology will be encouraged to a great extent. Smart phones will be used to capture and upload data of crop cutting to reduce the delays in claim payment to farmers. Remote sensing will be used to reduce the number of crop cutting experiments. The new Crop Insurance Scheme will also seek to address a long standing demand of farmers and provide farm level assessment for localised calamities including hailstorms, unseasonal rains, landslides and inundation.**

Calling it a "historic" decision, Union Home Minister Shri Rajnath Singh said that this scheme will act like a "safety shield" for the farmers and will protect them against the vagaries of nature. "This new crop insurance scheme will have the lowest premium for farmers in the history of independent India. The new scheme has taken care of the

anomalies in the existing two schemes and added new provisions,” Singh said.

Agriculture Minister Radha Mohan Singh described PMFBY as an “*amrit yojana*” and added that the scheme will also cover post-harvest losses.

### First meaningful initiative to give financial security to agrarian India

The large number of farmer suicides in India over crop failure has been the most disturbing, distressing and disheartening trend to emerge from the rural hinterland in the last few years. In a country of our size where farmers toil hard to feed a population of 1.25 billion, it is rather ironical that their deaths were reduced to mere statistics and numbers.

Thus, when the Union Cabinet rolled out a revamped, robust and well thought out crop insurance scheme the government not only took a concrete step to alleviate rural distress that has the potential to transform the village-based economy, it also ensured that farming remains a remunerative and rewarding occupation for millions of farmers in the country. While the agriculture sector contributes only 17 per cent to India’s overall GDP, farming and allied activities support nearly 60 per cent of the country’s population.

### Revamping old crop insurance scheme to suit poor farmers

In this backdrop, the Pradhan Mantri Fasal Bima Yojana is an extremely farmer-friendly scheme that has eliminated all complexities in order to meaningfully address crop losses faced by farmers. For one, the premium to be paid by the farmers is extremely low when compared to the insurance plans sponsored by the previous governments.

There will be a uniform premium of only two per cent to be paid by the farmers for all kharif crops compared to 2.5-3.5 per cent earlier, and 1.5 per cent for all rabi crops. The premium for commercial and horticultural crops is now only five per cent while earlier, it was calculated on actuarial basis and was often very high after accounting for all risk factors.

Importantly, the balance premium will be paid by the government to provide the full insured amount to the farmers against crop loss on account of natural calamities. Thus, the flagship crop insurance scheme has done away with the cap on the premium to be

paid by the government that earlier resulted in low claims being paid to the farmers.

Another key feature is that the insurance scheme will provide localised risk coverage and has added a number of natural calamities.

For instance, given that last year, unseasonal rains during March and April had destroyed crops during the harvest season in several states, the insurance plan will now provide coverage for post-harvest losses caused owing to rain and hailstorm across India. Earlier, this was applicable only to cyclone-prone regions.

Further, the insurance scheme also makes provision for compensation if farmers have to skip sowing owing to natural calamities like floods, unseasonal rains, hailstorm and cyclones.

### Challenges

At the same time, there are a few challenges. The present Modified National Agriculture Insurance Scheme covers only 37 million (27 per cent) of India’s farming households. Given that the premium under the Pradhan Mantri Fasal Bima Yojana is extremely reasonable, the government is already aiming to raise the cover under the scheme to 50 per cent of the farming households.

If this target is achieved, it will ensure that poverty, hunger and death that strike our farmers with alarming regularity see a massive decline in the next few years. The government is already looking to harness technology in an effective manner so that there is no inordinate delay in payment of claims to the farmers.

**With over 200 million new bank accounts, a bulk of them in rural areas – already opened under the Pradhan Mantri Jan Dhan Yojana, claims will now be directly transferred to the farmer’s bank account and will thus put a curb on leakages.**

### Conclusion

By all accounts, Pradhan Mantri Fasal Bima Yojana is the proverbial game changer for Indian farmer. The simplified crop insurance plan adds to the list of schemes and policies that aim to make life better for the average Indian. It is time farming became “*Safal*” with Fasal Bima Yojana.

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सत्यमेव जयते  
Prime Minister

## PM'S LETTER TO FARMERS ON PMFBY

**M**y dear Farmer Brothers and sisters,

The news of the 'Pradhanmantri Fasal Bima Yojana' must have already reached you. Farmers in our country have often felt at risk- at times from crop losses due to natural disasters, at times by falling market prices. Over the last eighteen months, we have taken several steps to help those of you who faced such difficulties.

There have been insurance schemes for farmers in the past as well. However, they were unsuccessful because of various reasons ranging from high premium rates to low claim value and non-coverage of localised crop-loss. As a result, not more than 20 per cent of farmers opted for crop insurance; and those who did face many difficulties to get their due. Eventually, farmer's faith in insurance schemes eroded over time.



It was against this backdrop that we engaged in detailed consultations with States, farmers and insurance companies; following which I now place before my farmer brothers and sisters, the farmer-friendly Pradhanmantri Fasal Bima Yojana. This Pradhanmantri Fasal Bima Yojana has the following highlights:

- This is the biggest-ever government contribution to crop insurance
- As a result, farmers will have to pay the **lowest-ever premium rate**
- Government will bear the remaining financial burden-even if the Government's share exceeds 90%
- There will be only **one premium rate** for each season for all foodgrains, oilseeds and pulses-removing all variation in rates across crops and districts within a season: Kharif: 2.0% only Rabi:1.5% only
- Farmers will get full insurance cover-there will be no 'capping' of the sum insured, and consequently, claim amounts will not be cut or reduced.
- For the first time, **Inundation** has been included under localised risk cover.
- For the first time, **post-harvest losses** arising out of cyclones and unseasonal rain have been covered nationally.
- For the first time, emphasis has been given to **mobile and satellite technology** to facilitate accurate assessment and quick settlement of claims.

This scheme will be implemented from the forthcoming Kharif season. It is simple to join and offers maximum security. I welcome your wholehearted participation

नरेंद्र मोदी  
Yours sincerely

## Operational Guidelines for PMFBY



The Prime Minister, Shri Narendra Modi, unveiled the operational guidelines for the Pradhan Mantri Fasal Bima Yojana (PMFBY) at a farmers' rally in Sehore, Madhya Pradesh on 18<sup>th</sup> February 2016.

Explaining the benefits of the scheme to the farmers, the PM said it can provide a solution for the farmers' problems, in times of difficulty. He said care had been taken to eliminate the shortcomings of previous crop insurance schemes, and create trust among farmers with regard to crop insurance. Technology would be used extensively for the scheme to ensure early settlement of claims. The PM exhorted farmers to take benefit of the scheme.

Speaking about the Digital India movement, the Prime Minister said welfare of the farmers is at the core of this initiative. He announced the launch of the digital platform - National Agriculture Market – from the 14<sup>th</sup> of April, 2016, on the birth anniversary of Dr. Babasaheb Ambedkar. The digital platform would enable farmers to get a better price for their produce.

The Prime Minister also gave away soil health cards, and settlement certificates for insurance claims to select beneficiaries at the function.

# Kurukshetra

FORTHCOMING ISSUE

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# REACHING THE UNREACHED: DIRECT BENEFIT TRANSFER IN AGRICULTURE

Amit Mohan Prasad

A recent example from Uttar Pradesh has demonstrated that DBT can be effectively implemented in the agriculture sector also and with immense benefits. The state has successfully implemented direct benefit transfer of subsidy on seeds for two consecutive seasons. The plugging of leakages has been a major achievement of implementing DBT on hybrid seeds.

**D**irect Benefit Transfer (DBT), loosely understood, any benefit transferred directly to the bank account of the beneficiary, so that he gets the full amount without any reduction or deduction. DBT can be in two forms, direct cash transfer in case of certain entitlements like scholarships, pensions, relief during natural disasters etc., and direct subsidy transfer in case of agricultural inputs, petroleum products, and subsidised food grains through PDS etc. DBT of both types result in efficiency, right targeting of beneficiaries and saving of money on most occasions. However, transferring cash directly into the bank accounts in case of entitlements is much easier as compared to transferring subsidy in a back ended manner where the beneficiary pays the full price of the commodity before receiving the subsidy into his bank account.

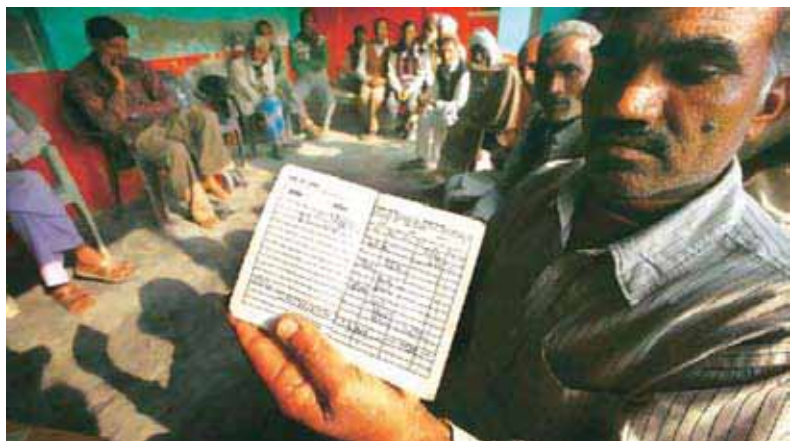
The experience of DBT in LPG under PAHAL has shown that it has resulted in substantial savings for the exchequer. The consumers pay the full price of domestic gas cylinders in the first instance and the subsidy is, thereafter, transferred into their bank accounts. DBT for agricultural inputs is more complicated as there is no fixed beneficiary list. For implementing DBT in agriculture, the requirement of data regarding the names and addresses of beneficiary farmers and their bank account numbers is a pre-requisite. However, DBT on agricultural inputs can also lead to substantial savings for the exchequer and efficiency in service delivery.

A recent example from Uttar Pradesh has demonstrated that DBT

can be effectively implemented in the agriculture sector also and with immense benefits. The state has successfully implemented direct benefit transfer of subsidy on seeds for two consecutive seasons. It was done for all hybrid seeds in Kharif 2015, which was followed by DBT on all kinds of seeds (certified and hybrid) during Rabi 2015-16.

It all started in Kharif 2015, when the idea of introducing direct benefit transfer for seed subsidy was first deliberated in the government in order to bring about transparency. Chief Minister of Uttar Pradesh had declared 2015-16 as “Kisaan Varsh” in his budget speech and therefore the department wanted to take some unique initiative for the benefit of the farmers.

UP also practised the system of ‘at source’ subsidy for seeds as in the rest of the country. Under this system, farmers are provided seeds at the subsidised rates from the designated retail outlets. During the Kharif season of 2014, a large number of complaints were received regarding malpractices in the distribution of subsidised hybrid seeds of paddy etc. An enquiry was ordered



by the government to verify the complaints and it was decided that the payment of hybrid seed producing companies will be made only after the enquiry gets completed. By the time, Kharif 2015 approached the enquiry had yet not been completed and the payments were still held up. When the UP Seed Corporation floated tender for procuring hybrid seeds for the ensuing season, the hybrid seed producing companies refused to participate in that citing the non-payment of last year.

This caused a dilemma before the state government as it would have been embarrassing for the department to declare that it will not be able to distribute subsidised hybrid seeds to the farmers. In fact, this problem presented itself as an opportunity to switch over to the new system of direct benefit transfer.

A meeting of all hybrid seed producing companies was organised and they were informed about the intention of the Government of Uttar Pradesh to switch over to the system of DBT for hybrid seeds where they would be able to get their entire price upfront from the farmers and therefore the problem of held up payments would simply not arise. They agreed to participate in the new arrangement. Subsequently, after detailed discussions with all stakeholders, a proposal was moved to introduce this new system.

For successfully implementing DBT, it is necessary to have a robust database. A scheme called “*Kisaan Pardarshi Seva Yojana*” launched by the state government in the previous year came handy. Under this scheme, a database of farmers in the state with their identity proof, copy of record of rights of landholding and bank passbook number was being prepared. The essential idea was to disburse all benefits under various departmental schemes and programmes in a recorded manner. Though the state has over 2 crore farm holdings, the database contained the record of only a little above one lakh farmers in the beginning of April, 2015. Once the decision to implement DBT for seed subsidy on hybrids was taken and given wide publicity, farmers started getting themselves registered online in large numbers. In fact, 5,10,867 farmers registered themselves for procuring hybrid seeds at subsidised rates. DBT on

certified seeds during Rabi 2015-16 has increased the registrations exponentially and the database currently contains the details of more than 40 lakh farmers and is growing by the day.

Hybrid seed producing companies were asked to set up their retail outlets at the government block seed store and the farmers were given the freedom to buy hybrid seeds of their choice. Varieties notified for Uttar Pradesh were admissible for receiving subsidy. Farmers bought hybrid seeds from these retail outlets at full price and deposited a copy of the cash memo along with a duly filled pre-designed form to the government employee present at the seed store. Farmers could buy seed according to their landholding size and the subsidy on this quantity was transferred into their bank accounts, details of which had been taken at the time of registration. Against a total of more than sixty thousand quintals of hybrid seeds distributed during Kharif 2014, the quantity came down to approximately fifteen thousand quintals during Kharif 2015. Approximately one and a half lakh farmers procured subsidised hybrid seeds under the new system.

**The state had spent an amount of more than Rs. 85 crores on subsidy on hybrid seeds of paddy, maize, jowar and bajra in 2014 Kharif, whereas the figure came down to less than Rs. 25 crores during 2015 Kharif, when DBT was used.**

It would be inappropriate to term this as a trend at this stage. The reasons for the fall were many including inadequate knowledge of the new system, farmers not going for expensive hybrid seeds in view of a weak monsoon forecast etc. However, the main reason for the fall in subsidy amount has been the knocking off of fictitious beneficiaries thereby preventing the diversion of subsidised commodity to open market. The plugging of leakages has been a major achievement of implementing DBT on hybrid seeds.

Spurred by the success of DBT during Kharif, the state government decided to go for the changed system for certified seeds during Rabi 2015-16. Though some of the stakeholders, whose interests were going to be hit opposed it vehemently, the state government decided to go for it. Certified seeds are used by farmers in very large numbers as compared to the hybrid



seeds. Hence the department prepared itself for carrying out the larger operation. Technology plays a very important part in this. Not only the farmers register themselves online on a portal but the entire exercise of generating bills, sending these to treasury for payments and finally transfer of subsidy amount into the bank accounts of the farmers is software driven. There were several shortcomings in the software developed which had come to light during Kharif operations. All the shortcomings were addressed and made compatible for a large scale operation. Efforts to further streamline the process is going on, so that the entire process becomes very simple to operate and user friendly.

Once the decision of the state government to implement DBT on certified seeds during Rabi was announced, farmers started registering themselves online in very large numbers. Thirty to thirty five thousand farmers were registering themselves on a single day. Due to overload, complaints regarding the server getting slow were received from the field functionaries. Several times, the speed had to be increased by taking extra bandwidth. There was resistance from several quarters in the implementation of this scheme but the entire operation was carried out in a smooth manner with utmost team spirit.

During the current Rabi season the amount spent on subsidy for seeds of wheat, pulses and oilseeds has been Rs. 127 crores as compared to Rs. 217 crores during last Rabi. The overall savings during Kharif (hybrid seeds) and Rabi (all seeds) has been approximately Rs. 150 crores for the state. The number of farmers benefitted under the new system has risen to approximately nine lakhs

in a transparent manner, many of whom have received subsidised seeds from the system for the first time in their lives.

The important thing is that the entire process has been very transparent. The department exactly knows the names and addresses of all farmers who have benefitted from subsidy on seeds. During earlier years, bigger numbers of beneficiaries were claimed but their truthfulness always remained doubtful as it was next to impossible to provide the complete list of beneficiaries.

Without the computerised system, it was not possible to furnish the list of farmers whenever questions were asked regarding this.

DBT has resulted in impressive savings for the exchequer in both the seasons. However, that is not the most important achievement of the changed system. The main advantage is that the new system is more inclusive and empowering for the small and marginal farmers, who had very little voice in the old system of 'at source' subsidy. It has made targeting of correct beneficiaries possible in an utmost transparent manner. The small and marginal farmers are now approaching the designated outlets with a sense of entitlement after having registered themselves online on the portal of agriculture department. It has plugged leakages, stopped paper transactions, prevented diversion of subsidised seeds to open market and ensured transparency in the system.

Certified seeds can be and should be recycled for three years. Earlier there was no system to check, hence the big and influential farmers used to take new certified seeds every year. With the readily available data, thanks to DBT, certified seeds can be provided to a new set of farmers during the next Rabi season. This will ensure speedy distribution of fruits of science through faster spread of new seeds, which will result in enhanced productivity and production.

The new system has generated very robust data for planning purposes for different agro-climatic zones of the state. It has also resulted in renewing the contact between the department and farmers on a big scale, which will be beneficial for the purposes of extension of technology.

Another interesting spin off of the DBT system has been stoppage of temporary embezzlements by the seed store in-charges! The money collected by the farmers is to be deposited in the treasury. In the 'at source' system, this was not being monitored properly which used to result in temporary embezzlements. Now, as per the government order, the subsidy into the accounts of farmers can be transferred only after the money collected from the farmers has been deposited into the treasury. This is ensuring that no embezzlements take place as under pressure from the farmers who are eager to receive their subsidy quickly, the money collected from them has to be deposited as soon as possible. The departmental officers, who were reluctant to adapt to the changed system, are now feeling happy after realizing this spin-off.

However, there are two major challenges in the system of DBT for agricultural inputs. The first is the issue of upfront payment by the farmer and the second is the non-inclusion of sharecroppers as they do not 'own' land and hence are not registered. The second challenge can be addressed through change in land leasing laws. A solution for addressing the issue of upfront payment can be through the use of Kisan Credit Card (KCC). Farmers are given a credit limit of up to Rs three

lakhs by the banks, depending on the size of their landholding. This credit limit can be used to make the upfront payment and the subsidy can subsequently be credited into the bank account of the farmer.

Since the entire operation is on scale, across all seventy five districts of Uttar Pradesh, it is easily replicable across other states of India. The entire operation is software driven, hence easier to operate as compared to the old system. It only requires firm determination by the States to switch over to the new system, which is definitely more farmer friendly and transparent.

Technology is providing us solutions on a continuous basis to make our systems more inclusive, transparent and accountable. To make the system farmer friendly and to root out malpractices in the agriculture sector, one has to start with seeds! Once the data is robust and a 'climate change' takes place, the migration to fertiliser and other commodities will be the natural corollary.

*(The author is the Principal Secretary, Agriculture, Govt. of Uttar Pradesh.)*

### **PM Kaushal Vikas Yojana Completes 10 Lakh Enrolments Under Skill India**

Pradhan Mantri Kaushal Vikas Yojana (PMKVY) has completed 10 lakh enrolments under the scheme. The scheme has been implemented by National Skill Development Corporation (NSDC) through a network of 1012 training partners affiliated to the scheme.

As on 5th Feb 2016, the scheme has seen 10,28,671 enrolments under 382 active job roles out of which 70% have already completed their trainings.

PMKVY has been implemented across all 29 states and 6 union territories of the country, and covered 596 districts and 531 constituencies. It addresses the requirement for skill development across 29 sectors in which around 566 job roles have been identified for courses in which the youth can get trained. These courses help in making them more employable with hands on experience on skills and also more efficient in their work.

The Union Cabinet had approved India's largest skill certification and monetary reward scheme, Pradhan Mantri Kaushal Vikas Yojana (PMKVY), on 20 March 2014. The scheme was launched by Prime Minister Shri Narendra Modi on 15 July 2015, on the occasion of World Youth Skills Day.

# JAI KISAN, JAI VIGYAN: TECHNOLOGY IN AGRICULTURE

Kamlesh Yadav

In the U.S alone, 80 per cent of corn, 92 per cent of soybeans and 86 per cent of cotton planted are biotechnology varieties. Other countries, such as China, Argentina, India, Canada, and Brazil have similarly embraced science-based technologies.

**R**einvigorating former Prime Minister Sh. Atal Bihar Vajpayee's slogan-Jai Jawan, Jai Kisan, Jai Vigyan, PM Modi said that technology has power to transform people's lives- from mitigating poverty to ending corruption.

"Jai Jawan, Jai Kisan, Jai Vigyan ....." the Prime Minister said while greeting the nation on the National Technology Day. In his message he said the vitality of technology is everywhere – from mitigating poverty to simplifying processes, ending corruption to providing better services to people. The Prime Minister conveyed his special greeting to all technology enthusiasts and scientists, whose passion for technology and quest for innovation continues to make India proud.

Our current trajectory with food is not comfortable. The world population will climb to over 9 billion in the coming years, with nearly all of the growth occurring in less developed parts of the world where agricultural productivity is relatively low, such as Sub-Saharan Africa and Asia. This population boom will be accompanied by increased strains on our food supply and resources, causing increased pressure on already delicate political and ecological systems, as well as threats to global security.

To feed our ballooning population, global food production must increase by an estimated 70 per cent and almost double in developing countries. Moreover, we will need to address both under-nutrition and over-nutrition, which contribute to poor health outcomes and imposes significant costs on our society. As a result, the need has never been greater for innovative solutions that will lead to significant improvements in our food and nutritional security, including greater investment in science and technology.

For years, scientific and technological advancements have benefited farmers in the

industrialized world by driving agriculture production. However, smallholder farmers who are responsible for 80 per cent of the food production in the developing world have yet to see similar gains. These farmers, the majority of whom are women, lack access to many of the tools needed to be successful, such as modern irrigation practices, crop management products, fertilizers, post harvest loss solutions, improved seeds, mobile technology, as well as access to information and extension services.

Broader use of, and investment, in science based technologies can enable:

- Improved livelihoods of farmers and their families by producing more and higher quality crops for a growing population.
- Enhanced nutritional value and food safety to improve the health and wellbeing of people around the world; and
- Agriculture sustainability through reduced resource use.

We must imminently work to meet global food demand through science-based innovation that reaches farmers, particularly small farmers, around the world. Nearly every industry has experienced scientific advancements that have led to profound achievements, and in many cases, have enabled us to solve some of the globe's biggest challenges. Innovation in the agriculture industry offers a similar promise of improving farmer's lives, feeding and nourishing more of our population, and consequently, improving the political, ecological and economic stability of our world.

## Science Based Solutions

Science based agricultural tools hold great promise for tackling the world's growing population and food demands. From improved seeds to modern crop protection solutions, to mobile technology

for farmers in the fields, to making foods fresher, safer and healthier along the food chain, the agricultural and food system of the future can be more productive, more sustainable, more efficient and more interconnected.

Closing the current gap in agricultural productivity will require a significant increase in agricultural yields around the world. This will require seeds that enable crops to withstand environmental and biological stresses, crop protection solutions, modern irrigation practices, mobile technology, fertilizer and mechanization.

### Plant Breeding

Plant breeding, the science of optimizing a plant's genetic makeup to produce desired characteristics, can be accomplished through a number of techniques, including hybridization and more complex molecular techniques. Through plant breeding techniques, we can produce higher yielding crops that are better in quality, tolerant to environmental pressures, resistant to pests and diseases, and tolerant to insecticides and herbicides.

### Agricultural Biotechnology

Plant breeders use agricultural biotechnology as another source of genetic variation to produce superior crops with improved yields, while requiring fewer inputs. The products of this technology have been widely used by farmers for over a decade in varieties of corn, cotton, soybeans and canola. Biotechnology expands the genes available for crop improvement beyond those present in the breeding populations and uses the tools of genetic transformation to bring specific genes to the genetic makeup of the plants. To date, this method has been used to enable crops to tolerate insects, viral diseases, certain herbicides, produce grain with improved nutritional quality, and resist stresses caused by extreme weather.

### Crop Protection Solutions

Advances in crop protection have been a powerful tool in combating the pests, diseases, and weeds that can be devastating to crop yields. In total food crops compete with tens of thousands of species of weeds, nematodes and plant eating insects. As a result, even with crop protection products, 20 to 40 per cent of food crops are lost each year to pests.

Through the use of crop protection products, which include chemical (e.g., insecticides, fungicides, and herbicides) and non chemical tools (e.g., biological pest control and barrier based approaches), farmers have significantly curbed these losses and increased their productivity yields. These tools enable farmers to produce more crops with less land, making them critical to ensuring a reliable food supply.

### Other Technologies

Beyond improved seeds and crop protection tools, other technologies enable farmers to increase their productivity, such as modern irrigation practices, mobile technology, fertilizer and mechanization. Over the years, irrigated land has proven to be twice as productive as rainfed farmland. This will be particularly important in the coming decades given that an estimated 1.8 billion people will live in water scarce regions by 2025.

Similarly, mobile technology can enable farmers to increase their yields by connecting them through text messages and helplines to agricultural market information, best practices, and extension services designed to meet their localized needs. Fertilizers have also contributed to doubling and tripling crop yields, supplying crops with the essential nutrients missing from soil, as well as facilitating the more efficient use of land and water.

### Embracing Technologies

While technology has a pivotal role to play in achieving global food security, overcoming barriers to acceptance remains difficult. Given the magnitude of our challenge, the global community must think beyond single solution approaches to feeding the world and give farmers the choice and access to all the tools that can boost productivity and sustainability. Realizing that no tool will be perfect, agricultural technology provides one of the best opportunities to address world hunger. It will be critical to engage in meaningful stakeholder dialogue on the challenges and benefits of technology and the variety of tools available, on the gaps we face and what tools and investments are needed, and the way in which regions can foster an environment that unleashes innovation.

### Stakeholder Dialogue and Partnerships

Meeting global food demand will require innovative partnerships and an open and collaborative

dialogue among stakeholders. The global community should build upon the common goal of tackling world hunger and malnutrition and move beyond disagreements about whether any one tool is best to get there, because no single tool will solve a problem of this magnitude. It will take new partnerships between the public and private sector, NGOs, governments and the development community that drive a broad spectrum of advancements in agriculture and nutrition.



Farmers know what is best for them and their land, and should have the ability to choose the tools and technologies that are right for them and the markets they serve, whether it be organic practices using conventionally bred varieties, hybrid seeds, or biotechnology. Typically, farmers want access to the tools and technologies that will provide them with the best chance of increased yields and success. When given the choice and the financing tools for investment, farmers often choose science –based agricultural technology, such as higher yielding crop varieties as an alternative to saving seeds each year.

In the U.S alone, 80 per cent of corn, 92 per cent of soybeans and 86 per cent of cotton planted are biotechnology varieties. Other countries, such as China, Argentina, India, Canada, and Brazil have similarly embraced science-based technologies. Moreover, in every country where improved crop varieties have been planted, farmers increased their incomes- in 2009, by as much as \$10.8 billion worldwide. Farmers deserve the opportunity to embrace any one of the available agricultural tools and practices to meet the food demands of their families, communities and the world.

Finally, the global community must create an environment that unleashes innovation to improve agriculture globally. The investment required to bring agricultural technology products to market is substantial. For biotechnology products, development to approval takes anywhere from twelve to twenty years up to \$150 million for each product. Similarly, crop protection products can take as long as ten years and up to \$250 million. Consequently, private sector investment in innovation technologies requires policies and science-based regulatory frameworks

that support technology adoption, as well as strong intellectual property protections.

Other factors also play a role in agriculture investment. Governance practices influence the ability of organizations to invest in improved agriculture in developing regions. Infrastructure, such as roads, bridges, ports and railways is also essential for farmers to be successful and for private sector investment. In addition, the availability of financing, capital and insurance enable farmers to make longer term investments in their land. Finally, local governments must invest in their own agriculture sectors to contribute to the success of their farmers. The commitment of governments in developing nations will be key to bring science-based tools to the smallholder farmers who need them most.

## Conclusion

As with any crisis of our time, world hunger and malnutrition will require the efforts of all stakeholders. Through increased collaboration and partnerships, we can leverage the resources, expertise and tools of the collective whole. The Green Revolution demonstrated the potential for science to bring countries from famine to surplus food. The world must again embrace collective innovation to achieve global food and nutrition security. We will need to support the full array of innovative solutions that are available to farmers, including agricultural biotechnology, to meet global food demand.

*(The author is a Scientist at Narendra Dev University of Agriculture and Technology, Faizabad, UP)*

# LAB-TO-LAND APPROACH IN AGRICULTURAL SECTOR

Dhurjati Mukherjee

The much talked about Green Revolution was confined to two states in North India. Agricultural experts for the last decade or so have been talking on the need for a second green revolution, covering the Eastern states where productivity even now is quite poor compared to national and, of course, international standards.

**T**he Indian agricultural sector may go in for a transformation as the government initiates revival measures. India, no doubt, is the largest producer of milk and the second largest producer of foodgrains (more than 200 million tonnes) as also fruits and vegetables (150 million tonnes) and sugar-cane. This may provide satisfaction but it is also a fact that under nutrition and malnutrition in the country has been one of the most acute problems. Though this paints a rather poor image of the country, it also needs to be judged keeping in view India has one of the highest growth in population in the world. It is indeed a very challenging task to boost up food output to keep pace in feeding the growing millions.

It is a well-known fact that due to the cost factor most fruits are beyond the purchasing capacity of the poor and the economically weaker sections. As regards to the milk only some among the lower sections can afford milk for the family though it may be available for children. And though rice and wheat output are quite high, there is need for further increase in production.

An advance estimate of the current fiscal of the Ministry of Agriculture estimated the kharif production at 124 million tonnes—6 million tonnes less than last year and lower than in any of the last three years. Cereal output is estimated at 118 million tonnes which happens to be 5 million tonnes below the last three years' average output while production of pulses is placed at 5.6 million tonnes, half a million tonnes below the three-year average.

The past two kharif (summer) seasons were hit by weak monsoons while heavy unseasonal rains affected the intervening rabi crop in different

parts of Punjab, Haryana, UP and Rajasthan. Now agri scientists are of the opinion that high winter temperatures may impact wheat production, specially in Punjab and Haryana. In UP also, if the weather becomes warm and dry, it may affect flowering and ripening of wheat and gram. The same also holds good for Rajasthan.

There are apprehensions that the country may face rice scarcity during the summer of 2016 but positive measures at this juncture may help tide over the crisis. However, the government may have to import some rice if the situation becomes difficult.

All this comes close on the heels of the recent meeting of the WTO at Nairobi where India lead a group of nearly 50 developing nations to stave off attempts by rich countries to kill food and agriculture subsidies and open domestic markets to agricultural commodities. It is impossible for India, Brazil, Indonesia etc. to cut their own subsidies and lower import duties so that agricultural





commodities from the West can easily invade these markets. This cannot and should not be allowed at the cost of the Indian farmer who depends on his small farm for survival, and this was aptly reiterated by our Commerce Minister.

Over the years, technology, no doubt, helped in raising production and productivity and this needs to be carefully monitored. The much talked about Green Revolution was confined to two states in North India. Agricultural experts for the last decade or so have been talking on the need for a second green revolution, covering the Eastern states where productivity even now is quite poor compared to national and, of course, international standards.

The '*lab to land*' approach has been in the air for more than two decades – or even longer – but now it appears that the government is seriously interested in making this a reality. Around 20,000 agricultural scientists will be required to divide their attention between research and extension education to fulfil the Prime Minister's dream to revitalize the farm sector.

The new mandate has been extended to about 6000 scientists functioning at different centres of the Indian Council of Agricultural Research (ICAR) and over 15,000 scientists working with state agricultural universities under the recently launched programme called *Mera Gaon Mera Gaurav (MGMG)*. The scheme envisages scientists to “select villages as per their convenience and remain in touch with the villages and provide information to the farmers on technical and other related aspects in a time frame through personal visits or on telephone”.

It is understood that groups of four multi-disciplinary scientists each, would be constituted at these institutes and universities. The scientists are expected to perform the functions with the help of Krishi Vikas Kendras (KVKs) and Agriculture Technology Management Agency (ATMA), both already mandated with extension work. At the national level, the Assistant Director General (Extension) and the principal scientists of Agricultural Extension of ICAR would be the nodal officers.

A section of scientists at the ICAR have reportedly stated that if the focus is shifted to extension work, research may suffer. The obvious



answer to this is that if research cannot be translated to the field and does not benefit the small farmers, such academic research work has little or no value. It may also be a fact that arm chair researchers do not want to exert themselves and see the grass-root problems and help the farming community with solutions, thereby aiding the process of productivity increase.

The aim of reaching out to around 20,000 select villages is indeed a significant step taken by the present Govt. That PM is aware of the problems in the agricultural sector and this decision should go a long way in gearing up the much needed increase in production and productivity. Problems like diseases of plants, putting the right amount of fertilizers and chemicals, saving the plants from infestation of insects etc. could be tackled if the scientists render proper advice and guidance. The maximum benefit would obviously go to small and medium farmers who are not qualified enough and need this guidance.

Even if there is cooperation from 2000-3000 scientists of ICAR and another 7000-8000 from the various state agricultural institutes and universities, there is reason to believe that there could be considerable help to the farming community. As is well known, the KVKs are not of much help and in most areas these are virtually defunct. Thus this exercise is expected to result in unexpected gains to most farmers, who are presently facing various sorts of problems.

This endeavour would help in bringing technology to the villages where productivity levels are rather poor and need to be substantially increased. Crop failures could be tackled and also the after-effects of drought and floods. The IITs

are also doing some work in the villages and the programme of technology transfer could effectively change not just agricultural productivity but also other manufacturing activities in these areas.

Apart from this, the government **announced a new Rs 8800 crores crop insurance scheme** – called the **Pradhan Mantri Fasal Bima Yojana (PMFBY)** -- for farmers with a significantly lower premium to cover the loss of crop due to natural calamities. As per the scheme, farmers will pay only 2 per cent of the sum insured for kharif foodgrains/oilseeds production and 1.5 per cent for rabi crops under the Yojana. This indeed is a very judicious programme aimed to boost production and productivity.

While there is need to give stable crops, production of pulses has to be substantially boosted up. This being the **International Year of Pulses**, there has to be special incentives to ensure higher growth so as to meet the demand of the poorer sections, specially in countries like India. The IYP aims to heighten public awareness of the nutritional benefits of pulses as part of sustainable food production aimed towards food security and nutrition. The Indian government should seize the opportunity to encourage connections through the food chain that would better utilize pulse based proteins and increase production of pulses.

In a country like ours where protein deficiency is rampant among women and children, there

**Table I**  
**Trends in Agricultural Production during Five Year Plans**  
(Average Production in Million Units)

Crop	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eight	Ninth	Tenth	Eleven
Rice	25.0	30.3	35.1	41.8	47.3	54.5	65.1	78.7	87.3	85.6	97.3
Wheat	7.9	9.7	11.1	25.4	29.8	41.2	48.3	62.9	71.3	70.2	84.4
Jowar	7.5	8.7	8.8	8.3	10.8	11.3	10.90	10.7	7.9	7.2	7.0
Bajra	3.4	3.4	3.9	6.0	5.0	6.0	5.2	6.7	7.1	8.2	9.2
Maize	2.7	3.6	4.6	6.1	6.3	7.3	7.6	9.8	11.6	14.0	19.8
Other	6.6	6.5	6.3	6.4	7.1	6.0	5.4	4.9	4.5	3.6	4.0
Pulses	10.1	11.7	11.1	10.9	11.7	11.8	12.5	13.3	13.1	13.3	15.9
Total	63.2	74.0	81.0	103.0	118.1	138.1	155.0	189.0	202.9	202.2	237.4
Oilseeds	5.5	6.7	7.3	8.3	8.9	11.4	13.9	21.9	21.2	23.2	28.9
Sugarcane	55.3	80.3	109.2	128.1	153.3	174.9	196.4	258.4	292.4	277.0	325.8
Cotton	3.9	4.8	5.4	5.9	6.8	7.5	8.4	12.2	10.8	16.0	28.1
Jute	3.9	4.4	5.7	5.5	5.2	6.4	8.9	8.1	9.6	10.1	10.3

Source: Sury M M (2013): Five Year Plans of India, New Century Publications, New Delhi

**Table II**  
**Productivity of Land in Some Countries, 2012**

Rice/Paddy	(kgs/hec)	Wheat	(kgs/hec)	Maize	(kgs/hec)	Groundnut (in shell)	(kgs/hec)	Sugarcane	(kgs/hec)
Egypt	9,702	China	4,995	USA	7,744	China	3,575	Argentina	71,429
<b>India</b>	<b>3,591</b>	France	7,599	France	9,085	USA	4,699	Brazil	71,304
Japan	5,391	<b>India</b>	<b>3,173</b>	<b>India</b>	<b>2,057</b>	Vietnam	2,134	China	68,811
Myanmar	4,049	Iran	1,971	Argentina	7,343	<b>India</b>	<b>1,179</b>	<b>India</b>	<b>87,200</b>
China	6,744	Pakistan	2,714	Philippines	2,856	Brazil	3,089	Gautemala	1,25,164
Thailand	3,000	UK	6,657	China	5,956	Japan	2,410	Colombia	1,14,983
USA	8,349	Egypt	6,516					Egypt	
<b>World</b>	<b>4,395</b>	<b>World</b>	<b>3,115</b>	<b>World</b>	<b>4,494</b>	<b>World</b>	<b>1,676</b>	<b>World</b>	<b>68,854</b>

Source: Compiled from various sources.



is need to promote pulses as they are affordable and highly nutritious source of protein and vital micronutrients that can greatly benefit health and livelihood. It also needs to be mentioned here that pulses also offer a great potential to lift farmers out of rural poverty as they can yield two to three time higher prices than cereals and their processing provides additional economic opportunities. In this connection, it would be pertinent to refer to the observations of the UN Secretary General that pulses contributed significantly in addressing hunger, food security, malnutrition and human health and also are a vital source of plant-based proteins and amino acids.

Added to this is the fact is the government's initiative, specially of the Prime Minister for expanding the base of the recently announced crop insurance scheme so that at least 50 per cent of farmers are covered in two years. The PM highlighted benefits of the scheme where farmers would have to pay very low premium, in his recent ***Mann ki Baat*** programme. This obviously would bring confidence among the farming community and help them increase their farm income through higher and diversified production.

Recently the UN Secretary General, Ban Ki Moon, appealed to the member states to achieve zero hunger by 2025. For India with around 30 crore chronically hungry population, it is indeed a great challenge to plan strategies to gradually reduce underweight children from the present 30 per cent to nil in the next ten years. But with the present rate of progress, this can be achieved if the focus on the rural sector remains unhindered.

Reforming the rural economy is the key for bringing the much-needed transformation that

India needs at this juncture today. Primarily the agriculture sector has to be made viable and sincere efforts by the government could substantially increase such exports. Added to this are agro-based industries that have high potential both in the country and abroad, if marketed properly. Recently the government has also demonstrated its 'Make in India' approach by giving thrust on khadi and handloom industry to make it cater to latest fashions and needs of the young generation.

The approach of the present government appears to be sincere and quite positive but the implementation of the schemes has to be closely monitored so that results are not delayed. It appears that there is realization of the fact that to upgrade the livelihoods of the masses and to make the country economically strong, the focus has to shift to the rural areas. The villages are our lifeline and thus the initiatives taken by the government to transform farming and also the rural sector as a whole should yield results, if there is sincerity in implementing the schemes taken up.

Well-known economist like Prof. Michael Lipton, formerly of Sussex University, had around two decades ago said that there was a trend in the Third World countries to subsidize the urban middle class at the cost of the rural poor. In India, as also in many developing countries, the trend is to maximize growth by ignoring agriculture and rural development and emulate the Western models of development.

Keeping in view the need for grass root development geared towards poverty alleviation, food security and sustainable agriculture, a strategy has to be formulated which could bring about balance between agriculture and industry and between the rural and urban sectors. The strategy should also try at narrowing – or at least not further – the widening disparity between the ever increasing millionaires and the poor and the deprived. The coming years are thus expected to be crucial for revival of the agricultural sector and, in turn of rural India.

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## MGNREGA - THE JOURNEY OF A DECADE

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has completed ten years of implementation in February, 2016. The achievements of a decade in providing employment and income to unemployed rural masses are indeed a matter of national pride and celebration. Since the start of MGNREGA, the expenditure on the programme has amounted to Rs.3,13,844.55crore and out of this 71 per cent has been spent on wage payments to workers. Some of the highlights are:



- During 2014-15 and 2015-16 nearly eight crore rural households have been given employment under MGNREGA. 42 lakh households have been benefitted with 100 days of employment in an year
- Focus on skilling of MGNREGA workers; 18 lakh youth/households to be skilled in phases.
- 10000 'Barefoot Technicians' (from MGNREGA workers) are to be trained in the first phase.
- Rs.47936 crore earned as wages by rural workers employed under the programme since April 2014 till February 2016.



- In 2015-16 with highest ever participation 57 per cent of the workers are women.
- To simplify MGNREGA Annual Master Circular issued superseding 1039 Circulars/ Advisories issued earlier.
- Nearly 64 per cent of total expenditure on assets in 2015-16 has been on activities related to agriculture and allied sectors.



- Person-days- generation in 2<sup>nd</sup> and 3<sup>rd</sup> quarter of 2015-16 is highest in last five years.
- Highest expenditure on MGNREGA in 2015-16 in last five years.
- 94 per cent of wages have gone directly into the accounts of MGNREGA workers in 2015-16.
- Credible Social audits to ensure transparency and accountability.

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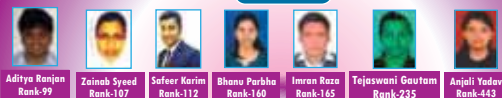
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# STORAGE FACILITIES FOR PERISHABLES- CRITICAL GAPS AND INITIATIVES

A. Suresh and K.V. Praveen

Since sufficient storage facilities are not available, most of the farmers are forced to sell their produces immediately in the market. During the peak production times, this results in a 30-40 per cent decrease in price and sometimes even leads to price crash. On the other hand, during the lean seasons, the consumers have to pay exorbitant prices, which deters many from accessing them.

The post-harvest handling and food processing sectors are increasingly emerging as a means of higher income to the farmer-producer. The sector also caters to the demands for a changed consumption basket; helps in reducing the wastage of the agricultural products; and acts as a cushion to minimise the price fluctuations that is more frequent in case of the perishable agricultural products like fruits and vegetables, milk, meat and fish.

Cold storage facilities serve as a link between the agriculture, industry and consumers, and also act as a means for enhancing the shelf-life and preserving the product quality. Development of storage facilities at disaggregate levels, hence, emerges as a priority investment area for India.

While the storage facilities for grains have received greater policy support since long, such an accelerated focus for perishables has not been observed. In this context, This article examines the need for establishing storage facilities for perishables, the current status of the cold storage facilities created and the recent initiatives in this direction. Also dealt with are the major challenges that need to be addressed for establishing storage facilities for perishables.

## Post-harvest losses of agricultural produces

As on 2013, India produced 264.77 million tonnes of foodgrains and 254.96 million tonnes of fruits and vegetables. In case of paddy, as well as spices, India is world's largest producer, and in fruits and vegetables, India stands next only to China. With a production of 138 million tonnes, India is also the world's leading milk producer. However, a significant amount of these agricultural commodities produced in India is wasted due poor post-harvest handling. Various agencies have

provided estimates on the extent of post-harvest losses. Among them, a study of the Indian Council of Agricultural Research (ICAR) provides some useful insights:

- Among food grains, cereals faced losses to the tune of 3.9-6.0% and pulses to the tune of 4.3-6.1%, mainly on account of poor storage.
- Oilseeds recorded a loss ranging between 2.8-10.1%, with an average loss of about 6.0%.
- Fruits and vegetables recorded highest loss ranging between 5.8- 18.0%.
- The losses reported in inland and marine fisheries was to the tune of 6.9 and 2.9%, respectively, (without considering the on-board losses). It was to the tune of 0.8% in case of milk; 2.3% in case of meat and 3.7% in case of poultry.
- The estimated post-harvest losses are at Rs 44,000 crores per year, valued at whole sale prices.

In nutshell, through development of cold chain facilities, the post-harvest losses that occur notably in case of perishables can be reduced significantly.

## Price fluctuations of selected fruits and vegetables in India

Among perishables, the case of fruits and vegetables deserve special attention on account of the high level of price fluctuations faced by this commodity group mainly on account of seasonality.

Since sufficient storage facilities are not available, most of the farmers are forced to sell their produces immediately in the market. During the peak production times, this results in a 30-40 per cent decrease in price and sometimes even

**Table 1. Coefficient of variation in prices of onion and pineapple in major markets of India**

Year	2008	2009	2010	2011	2012	2013
<b>Market</b>	<b>Onion</b>					
Delhi	44.48	32.29	53.78	65.47	35.91	59.09
Bengaluru	44.16	47.67	64.96	72.11	43.37	40.93
Hyderabad	100.72	67.74	82.79	90.80	82.79	144.36
Mumbai	43.85	70.38	78.46	79.42	52.39	28.35
	<b>Pineapple</b>					
Delhi	12.97	10.07	8.35	12.73	13.74	34.75
Bengaluru	10.02	9.01	19.88	14.68	14.35	12.92
Hyderabad	129.46	111.70	42.03	86.73	95.75	268.90
Mumbai	7.74	8.07	47.29	16.93	14.99	4.81

leads to price crash. On the other hand, during the lean seasons, the consumers have to pay exorbitant prices, which deters many from accessing them. To show the price fluctuation experienced in the major markets of India, the examples of onion and pineapple is presented in table 1.

The high values of coefficient of variation suggest high price fluctuations in all the markets. The only means to address this issue is to make year round market availability of these perishable products. This will be possible if adequate cold storage facilities are established. Development of cold storage facilities would help in cushioning the impacts of the seasonality of agricultural production and price fluctuations.

### Critical gap in cold storage

The Government of India and various state governments have undertaken efforts to create infrastructure for cold-storage. However, the facilities created till date are grossly inadequate. There are many studies that estimated the gap in the cold storage infrastructure in India. For example, a study by National Stock Exchange Limited in 2010 estimated that the country needed a total cold storage facility of 61.1 MT, whereas the available capacity was only 24.3 MT, indicating a total gap of 36.8 MT. As per the Emerson Climate Technologies, another agency to have studied the cold storage infrastructure in India, the available cold storage capacity is estimated to be a little over 30 MT against the requirement of 61.1MT.

It is further anticipated that with a shift in the composition of the consumer basket towards high value commodities, including horticultural products, there is a need to create additional storage facilities. In this context, the ASSOCHAM has provided an estimate of additional cold storage capacity of 36.8 MT. Further, they have estimated that the cold chain industry would register an annual compound growth rate of 25.8%.

Lately, as per the study conducted by National Centre for Cold-chain Development (2015), the total capacity of cold storage created in the country is 31.82 million tonnes. This accounts for only less than 10 per cent of the total production of horticultural and non-horticultural produces.

### Product segmentation in case of cold storage

Various agricultural commodities have different levels of requirement of cold storage. For a perspective on this issue, NCCD has classified the commodities into fresh fruits & vegetables; fresh flowers; dairy products like milk, icecream, butter; meat, fish and poultry; processed food products; and other items including pharmaceuticals, electronics etc.

The fresh fruits & vegetables and flowers require mild chill whereas the meat, fish and poultry requires frozen conditions. Based on the temperature level required in a cold storage, four broad categories have been described in the report. They include normal (above 20 °C), mild chill (10 °C to 20 °C), chill (0 °C to 10 °C) and frozen (below -18 °C). However, the cold storage facilities already developed are not multi-purpose, and largely cater to storage of potato (about 75 %). There exist only a few units, which are exclusively meant for fruits and vegetables.

### Development of cold storage facility in India

The cold storage in India was regulated under the Cold Storage Act, 1964, followed by Central Cold Storage Order, 1980. The establishment of the cold storage was strictly controlled by the Government. However, the existing legislations were modified in 1997 to enable the participation of the private sector also. This has led to a spurt in the growth of the cold storages in India. It is estimated that the country has a total of 6891 cold storage units with a

capacity of 31.82 MT. During the period 2004-2014, the country experienced about 45% increase in the number of cold storage units.

### Prominence of cold storage structures

Even though India has made some progress in creating cold storage infrastructures, it lacks terribly in the development of the other necessary infrastructure. Various studies have noted that India lacks severely in the case of the associated infrastructure like pack-houses and reefer vehicles for refrigerated transport. Further, India has a long way to travel in order to achieve the standards of many other countries, where bulk of the perishables are transported through refrigerated means to minimise the spoilage and quality deterioration.

Thus the following interventions are needed:

- a) Creation of about 69000 modern pack houses
- b) 32.7 MT of new cold storage facility
- c) About 53000 units of refrigerated transport vehicles/container
- d) About 8300 ripening chambers (modern)

State wise analysis of cold storage facilities brings out following facts –

- a) Uttar Pradesh has the highest number of cold storage. This is followed by Punjab, Maharashtra, West Bengal and Gujarat.
- b) The cold storage establishments are under the private sector (about 96%).
- c) Among the commodities, potato dominates for about 75% of the total capacity created.
- d) About one third of the cold storage facilities have a capacity of less than 1000 MT.
- e) The presence of multi-purpose storage facilities

is very less (only about 23%). They are mostly concentrated in a few locations.

- f) Bulk of the cold storage facilities are stand alone, without linkage with producers and consumers and no associated facilities. The major reasons for this is the under-development of the cold storage transport through reefer vehicles.

### Initiatives of the Government in promoting development of cold storage facilities

Recognising the importance of development of cold chains in India, the government has undertaken various steps to promote such facilities, through the involvement of many agencies-

- a) Concession under the income tax and service tax rules are applicable to the establishment of the cold storage units
- b) Launched central sector schemes of integrated cold chain, value addition and preservation infrastructure
- c) Launched centrally sponsored schemes of cold chain, primary processing centre and reefer trucks under National Mission on Food Processing.

Cold storage units and assistance are also sanctioned through various schemes of the National Horticultural Board, APEDA, Department of Agriculture and cooperation, and the National Cooperative Development Corporation

The support involves grant-in-aid, subsidy, capital investment subsidy, interest rate subvention on term loans etc. depending upon the schemes. The schemes of National Horticulture Mission, National Horticulture Board and the Ministry of Food Processing Industries have received a total

**Table 2. Category wise composition and demand for cold storage infrastructure**

Type of Infrastructure	All India Requirement	All India Created (B)	All India Gap (A -B)
Pack- house	70080 nos.	249 nos.	-69,831 nos.
Cold Storage ( Bulk)#	34164411 MT	31823700 MT	-32,76,962 MT
Cold Storage ( Hub)#	936251 MT		
Reefer Vehicles	61826 nos.	9000 nos.	-52826 nos.
Ripening Chamber	9131 nos.	812 nos.	-8,319 nos.

Source: National Centre for Cold Chain Development (2015), All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap), New Delhi



assistance of about Rs.4302, 3157 and 4138 million respectively for establishing cold storage facilities in India during the period 2011-12 to 2014-15. This huge amount was sanctioned for establishing about 900 cold chain facilities in various states.

### Conclusion

The changing food habits of the Indian population are witnessing a shift in favour of high value perishable commodities like fruits & vegetables, milk, meat and fish. The concern, however, is that India has the capacity to store just above 10% of the perishables produced. The available cold storage capacity is estimated to be a little over 30 MT against the requirement of 61.1MT. The lack of cold chain facilities meant exclusively for selected product categories add to the worries.

The government has recently initiated several schemes and programmes, involving even the private and cooperative sectors, to develop

the cold storage infrastructure. Tax concessions have also been announced for such units. In the last decade, the country has experienced about a 45% increase in the number of cold storage units. Establishment of many more such units is the need of the hour in order to bring down the post-harvest losses. There is also a need to increase the number of pack houses, reefer vehicles, ripening chambers and other associated infrastructure in the country. The cold storage industry of the country has to expand in the times to come to cater to the changes in the crop diversification, food habits and to transfer higher values to the farming community. For this, assistance in terms of higher flow of credit, technical support and institutional backup are the need of the hour.


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#### FORM IV

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# HORTICULTURE: SCOPE AND RECENT INITIATIVES

Dr. Yashbir Singh Shivay and Dr. Anshu Rahal

**A**griculture has been a way of life and continues to be the single most important livelihood of the masses in India. Agricultural policy focus in India, across decades, has been on self-sufficiency and self-reliance in foodgrains production. Considerable progress has been made on this front. Foodgrains production rose from 212.85 million tonnes in 2001-02 to 257.07 million tonnes in 2014-15, whereas during this period horticulture production increased from 145.79 million tonnes to 283.47 million tonnes i.e. 1.94 times increase has been seen in horticultural production, whereas foodgrains registered only 1.21 times increase. The Government has identified horticultural crops as a means of diversification for making agriculture more profitable by efficient soil management through 'Soil Health Card' Scheme, efficient land and water use through 'Per Drop More Crop' Scheme and creating skilled employment for rural masses. Recent efforts have been rewarding in terms of opening new vistas for farmers' welfare through 'e-Kisan Mandi' portal and easing export of value added horticultural products. Presently horticulture has established its credibility in improving income through increased productivity, generating employment and in enhancing exports. Resultantly, horticulture has moved from rural confines to becoming a commercial venture.

After China, India ranks among the largest producers and leading exporters of flowers, fruits and vegetables in the world and has an immense scope for improvement in the forthcoming years. Horticulture is one of the most important branches of agriculture. Horticulture has become an answer for the economic development of various states in our country. It contributes more than 34% GDP of agriculture, which calls for technology-led progress. Under the purview of agriculture and allied activities, the share of plan outlay for horticulture which was 3.9% during Ninth Five Year Plan, has increased to 4.6% during the Twelfth Plan. Globally, India is the second largest producer of fruits and vegetables. It leads the production of mango, banana, coconut, cashew, papaya, pomegranate, areca nut, potato,

and okra (lady's finger) etc and is the largest producer and exporter of spices. It ranks first in the productivity of grapes, banana, cassava, peas, papaya etc. Export of fresh fruits and vegetables in term of value is nearly 14% and that of processed fruits and vegetables is 16.27%. About 1,596 high yielding varieties and hybrids of horticultural crops (fruits- 134, vegetables- 485, ornamental plants- 115, plantation and spices- 467, medicinal and aromatic plants- 50 and mushrooms- 5) have also been developed in our country.

## Horticulture Production Scenario in India

The green revolution of the 1960s and 1970s ended chronic food deficit, and while cereals still command the attention of policy makers, fruit production has surged impressively, making India the second largest global producer behind China. The annual upswing in horticulture has seen fruit production grow faster than that of vegetables, though the latter constitute the largest segment of this sector of agriculture. "Grapes occupy the premier position in exports with 107.3 thousand tonnes valued at Rs 1,086 crore in 2014-15. Other fruits which attained significant position in exports are banana and mango," the agriculture ministry has noted in a handbook called 'horticultural statistics at a glance 2015'.

The handbook, published by Oxford University Press, points out that significant progress has been made in increasing the area under horticulture crops, resulting in higher production. "Over the last decade, the area under horticulture crops grew by about 2.7% per annum and annual production increased by 7%," it said. However, even though India is second in the list of major fruit producers ahead of the US, Brazil, Spain, Mexico, Italy, Indonesia, the Philippines and Turkey, there is scope for higher production as its productivity lags behind that of most of these countries.

India's success in horticulture can be traced to small towns and districts. In 2012-13, Chittoor and Anantapur in Andhra Pradesh, Baramulla in Jammu and Kashmir, Nalgonda in Telangana, Sagar

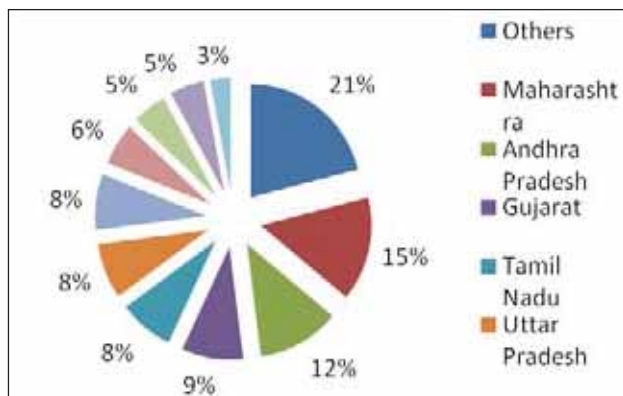
and Shahdol in Madhya Pradesh, Darjeeling in West Bengal, and Pune, Aurangabad, Jalgaon and Sangli in Maharashtra shone on India's fruit map. State-wise, Maharashtra topped the list, followed by Andhra Pradesh and Gujarat.

India has witnessed voluminous increase in horticulture production over the last few years. Significant progress has been made in area expansion resulting in higher production. Over the last decade, the area under horticulture grew by about 2.7% per annum and annual production increased by 7.0%. During 2013-14, the production of horticultural crops was about 283.5 million tonnes from an area of 24.2 million hectares (ha). Out of the six categories, that is, fruits, vegetables, flowers, aromatic, spices and plantation crops, the highest annual growth of 9.5% is seen in fruit production during 2013-14. The production of vegetables has increased from 58,532 thousand tonnes to 168,300 thousand tonnes since 1991-92 to 2014-15 (2<sup>nd</sup> advance estimates).

The annual growth in citrus fruits is quite high (10.48%) during 2013-14. This fruit has been contributing 12–13% of total fruit production over the last few years. In 2013-14, the total fruit production was highest in the case of Maharashtra (134.6 lakh tonnes) followed by Andhra Pradesh (105.11 lakh tonnes) and this may be seen from Figure 1.

Apart from the health improvements, the production of vegetables improves the economy of a country as these are very good source of income and employment. The contribution of vegetables remains highest (59–61%) in horticulture crop productions. During 2013-14, the area under vegetables is estimated at 9.4 million ha. with a

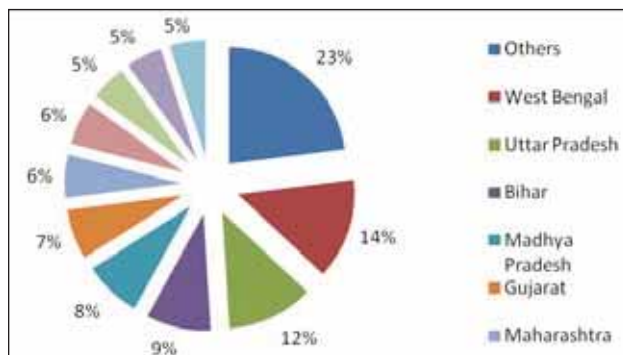
**Figure 1: Leading fruit-producing States in India during 2013-14**



production of 162.9 million tonnes in India. For this period the total vegetable production was highest in case of West Bengal (23,045 thousand tonnes) followed by Uttar Pradesh (18,545 thousand tonnes). The graphical representation of production share of leading vegetable-producing states of 2013-14 is shown in Figure 2.

Great potentialities exist for cultivation of

**Figure 2: Production share of leading vegetable producing states of India during 2013-14**



flowering plants. Increasing trends in area and production of flowers has been observed since 2003-04. In addition to the beautification of the local landscape, great scope exists for export of flowers; and floriculture is important for bee-keeping industry which too provides an alternate source of income to the Indian farmers. The highest production of flowers (loose) was recorded in Tamil Nadu (343.65 thousand tonnes) followed by Karnataka (211.50 thousand tonnes).

The floral industry today has grown up to much larger proportions and offers a wide scope for growth and profits. The major countries involved in the import of flowers are: the Netherlands, Germany, France, Italy and Japan while those involved in export are Columbia, Israel, Spain and Kenya. In India, Floriculture industry comprises flower trade, production of nursery plants and potted plants, seed and bulb production, micro propagation and extraction of essential oils. Though the annual domestic demand for the flowers is growing at a rate of over 25% and the international demand at around Rs 90,000 crore, India's share in the international market of flowers is negligible. Still, India has a blooming future as far as floriculture is concerned. Enormous genetic diversity, varied agro climatic conditions, versatile human resources etc.

offer India a unique scope for judicious employment of existing resources and exploration of avenues yet untouched.

According to NHB database (2013), India produces nearly 76731.9 (lakh number) of cut flowers and 1729.2 ('000MT) of loose flowers from an area of 232.7 ('000ha). West Bengal is the leading cut flower producing state (33.1%) while; Tamil Nadu produces maximum loose flowers (18.10%).

Professional qualification combined with an inclination towards gardening and such other activities, produces efficient floriculturists and landscaping professionals. The skills and knowledge required are imparted under the professional courses of floriculture and landscaping.

Yet the love and affection towards flowers and mother Earth plays an emphatic role towards making up career in Floriculture.

### Job opportunities

For an aspirant there is an immense scope for hopeful quality education in various state agricultural universities. Applicants should have passed 10+2 (Senior Secondary Examination) with Physics, Chemistry and Agriculture/Biology as their subject. Candidates qualifying the written examination of Pre Agricultural Test (PAT) are considered eligible for admission to UG degree programme in State Agricultural Universities in Agriculture/Horticulture. Learners who have completed their graduation course in horticulture have many careers prospective.

More recently the students aspiring higher studies in horticulture can take up their degree as specialization in Floriculture, Medicinal & Aromatic Plants, and Spices & Plantation crops, Pomology, Olericulture and Post Harvest Technology. The job opportunities are accessible for the students within the country and even abroad. After graduation the student becomes eligible to be appropriate for employment offered by banks, finance sectors, seed companies, sales and marketing etc. The nationalized banks, Reserve Bank, State Bank etc put forward an opportunity for post graduates in agriculture and horticulture as Agricultural Officers, Probationary Officers, Field Officers and Rural Development Officers. Different agricultural universities also



employ horticultural postgraduates for distinct posts from concerned field of their specialization.

### Self employment in Horticulture

As Horticulture Consultant provides advice, design, evaluation, supervision of garden or orchard etc. one can start the Agriculture Clinic and Government provides money (up to 10.00 Lac) for this venture. An educated horticulturist expert can raise commercial nursery of fruit plants, flower and ornamental plants, Seed producer of vegetables and flower crops, Fruit/ Vegetable / Flower grower, Floral decorator/ florist shop, Horticulture Services Contractor, Mushroom grower, Seed dealer/ Merchant, Proprietor cold storage, Processing work of horticulture production and one can start establishing an institute for vocational education (Horticulture/ Landscape) etc.

### Export destinations of Indian floriculture products

Globally, more than 140 countries are involved in cultivation of floricultural crops. Among various countries Germany continues to be the highest consumer followed by Japan. India is having an enormous scope in the future. The domestic industry is growing at annual rate of 7-8% per annum. The area under flowers has crossed to 0.191 million hectares during 2011-12 which is concentrated mostly in Tamil Nadu, Andhra Pradesh, Maharashtra, West Bengal, Karnataka, Kerala, Himachal Pradesh and Uttarakhand. The two main markets for Indian fresh cut flowers are Europe and Japan. The European Union is believed to consume over 50% of the world's flowers and includes many countries

with a relatively high per capita consumption of cut flowers. Germany is the biggest consumer of flowers, followed by the UK, France and Italy. Together, the two markets (Europe and Japan) account for around 75% of Indian fresh cut flower exports.

Besides diverse agro-climatic conditions and geographical locations suited for growing various types of flowers, there are many factors unique to India in horticulture.

### Effective strategies to promote floriculture

- Creating more public awareness regarding use of floriculture produce through media and other agencies as well as more exposure of floriculture products during consumer exhibitions
- Retailing of flower produce through super markets in addition to Florist shops to encourage flower consumption especially in metropolitan cities
- Organizing post harvest infrastructure for marketing needs at the domestic terminal markets
- Promotion of interaction between growers and scientific Institutions for effective lab to land technology transfer

### National Horticulture Board

National Horticulture Board (NHB) was set up by Government of India in April 1984 on the basis of recommendations of the “Group on Perishable Agricultural Commodities”, headed by Prof (Dr) M.S. Swaminathan, the then Member (Agriculture), Planning Commission, Government of India. The NHB is registered as a Society under the Societies Registration Act 1860, with its headquarters at Gurgaon. The main objectives of the NHB are to improve integrated development of Horticulture industry and to help in coordinating, sustaining the production and processing of fruits and vegetables.

### Mission for Integrated Development of Horticulture (MIDH)

With effect from 2014-15, the Mission for Integrated Development of Horticulture (MIDH) has been operationalized by bringing all ongoing schemes on horticulture under a single umbrella. Production and distribution of quality planting material, productivity improvement measures

through protected cultivation, use of micro-irrigation, adoption of integrated pest management and integrated nutrient management along with creation of infrastructure for post-harvest management and marketing are focus areas of the MIDH.

### Commercial Horticulture Scheme

#### 1. Development of Commercial Horticulture through Production and Post Harvest Management of Horticulture Crops

Credit linked projects, relating to establishment of commercial production units in open field as well as under protected conditions, and projects on Post harvest Management, and primary processing of products are eligible for assistance under this scheme. However, release of Subsidy need not be credit linked in North Eastern States and for the institutions like Public Sector Units, Panchayats, cooperatives, registered societies/trust and public limited companies provided they can meet remaining share of the project cost out of their own resources. Such projects will have to be appraised by appraising agency approved by NHB.



### General Conditions

- i) Credit component as means of finance of the project should be term loan from banking or non banking financial institutions. For credit linked projects under NHB, eligible subsidy amount to be capped at par with term loan sanctioned by the lending Banks.
- ii) Normative cost of various components shall be prescribed by NHB.
- iii) Benefit of exclusive components of cold storage scheme shall also be available to the promoters

over and above the assistance that will be provided under Commercial Horticulture Scheme to set up integrated projects for production and PHM components.

- iv) Projects relating to setting up of new units shall be technically and financially appraised to ensure and enable entrepreneur to incorporate latest available technology.
- v) Assistance can also be availed for a combination of PHM infrastructure components by a beneficiary, within the prescribed norms of individual items

### Cold storage scheme

**NHB provides Capital Investment subsidy scheme for construction/expansion/modernization of cold storage and storages for Horticulture Products.**

#### Description of components and Pattern of Assistance.

**Components:** Credit linked projects relating to Cold Storages including Controlled Atmosphere (CA) and their modernization are eligible for assistance under this component. Subsidy need not be credit linked for the institutions like Public Sector Units, Panchayats, cooperatives, registered societies/trust and public limited companies provided they can meet remaining share of the project cost out of their own resources. Such projects will have to be appraised by appraising agency approved by NHB.

### General conditions for cold storage projects

- 1) For credit linked projects, credit components as means of finance of the project should be term loan from banking or non banking financial institutions. For credit linked projects under

NHB, eligible subsidy amount to be capped at par with term loan sanctioned by the lending Banks.

- 2) Assistance for setting up of new Cold Storage infrastructure will be available only to Multi Chamber cold Storage units with technologies which are energy efficient with provision of thermal insulation, humidity controlled, advance cooling systems, automation, etc, having specification and standards approved by the Ministry. To ensure, compliance of notified standards, all projects will be subjected to technical scrutiny by NHB empanelled Technical appraisal agency.
- 3) Extant specifications standards and protocols on cold storage and cold-chain components will be adhered to, while approving cold storage projects.

In addition to the above-mentioned activities National Horticulture Board also provides financial assistance to other activities to promote horticulture production in India viz. **Technology Development and Transfer for Promotion of Horticulture; Market Information Service for Horticulture Crops; and Horticulture Promotion Services/expert services and strengthening capability of NHB Horticulture Promotion Service** etc.

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# CASH CROPS -THE ROLE OF TEA PLANTATION INDUSTRIES

Dr. K. Baby

In the latter half of the 19th century a significant trend in Indian agriculture was the emergence of the commercialisation of agriculture. So far agriculture had been a way of life rather than a business enterprise. Now agriculture began to be influenced by commercial consideration i.e. certain specialized crops began to be grown not for consumption in the village, but for sale in the national and even international markets. Commercial crops like cotton, jute, groundnuts, tea, oilseeds, sugarcane, tobacco and rubber etc. were more remunerative than food grains. The cultivation of crops like condiments, spices, fruits and vegetables could cater to a wider market. Perhaps, the commercialisation trend reached the highest level of development in the plantation industry i.e. in tea, coffee, rubber etc. which were all produced for sale in a wider market.

A cash crop is an agricultural crop which is grown for sale to return a profit. It is typically purchased by parties separate from a farm. In earlier times cash crops were usually only a small but vital part of a farm's total area, while today, especially in developed countries, almost all crops are mainly grown for revenue. In least developed countries, cash crops are usually crops which attract demand in more developed nations, and hence have some export value. Prices for major cash crops are set in commodity markets with global scope, with some local variation based on freight costs and local supply and demand balance. A consequence of this is that a nation, region or individual producer relying on such a crop may suffer price variations. India is top producer country of many crops. The major crops in India can be divided into four categories viz. Food grains, Cash Crops, Plantation Crops and Horticulture crops. Apart from these there are several other crops grown in different states of India which contributes to the country's economy and its overall growth.

## Cash Crops

In India, it is the Plantation crops which form a major chunk of cash crops. They include crops such as areca nut, coconut, cashew, oil palm, coffee, tea and rubber. The plantation crops play a crucial role in view of their export potential and also for their domestic requirements. Plantation crops provide employment thus helping in poverty alleviation particularly in rural sector. Cash Crops

in India form an important base over which the Indian trade and commerce flourish both within and outside the country. Earlier, cash crops were grown at a very small scale but today their area and contribution to nation's economy has grown.

## Economic Importance of Cash Crops

- Cash crops contribute to national economy by way of export earnings.
- India is the leading country in the total production of certain cash crops in the world.
- Cash crops provide direct as well as indirect employment to millions of people. For instance, tea industry offers direct employment to 10 lakhs and indirect employment to even larger number.





continent of Asia in China, India and Sri Lanka.

### Tea Cultivation

India is first in the cultivation of tea in the world. Tea cultivation needs hot climate, excess rainfall and sloppy soil. Due to this tea is cultivated only in excess rainfall and sloppy areas of hills. Though tea is grown in 16 States of the country, there are distinctly different tea growing regions which account for bulk of production. Four States of Assam, West Bengal, Tamil

- These crops help conserve the soil and ecosystem.
- Plantation industry supports many by-product industries and also many rural industries.

Nadu and Kerala account for about 98% of the total tea production in India. The teas originating from Darjeeling, Assam and Nilgiris are well known for their distinctive quality world over.

### Tea Industry

The tea sector plays a significant role in the country's economy. Tea exports constitute a significant component of foreign exchange earnings of the country. The industry also contributes revenue to the state and national exchequers by way of sales tax, corporate, income tax, etc. Tea industry provides direct employment to more than a million workers, about half of whom are women. More than two million people derive their livelihood from activities associated with the industry. However, the aging bush/plant profile is acting as a major constraint for further growth of this sector.

Tea is one of the most popular and lowest cost beverages in the world and consumed by a large number of people. Owing to its increasing demand, tea is considered to be one of the major components of world beverage market. The global market for hot beverages (coffee and tea) is forecasted to reach US\$69.77 billion in value and 10.57 million tonnes in volume terms by the year 2015 (GIA, 2011). Tea cultivation is confined only to certain specific regions of the world due to specific requirements of climate and soil. Majority of the tea producing countries are located in the

### Tea Production

In 2003, world tea production was 3.21 million tonnes annually. In 2010, production reached over 4.52 million and has been growing since. The largest producers of tea are the People's Republic of China, India, Kenya, Sri Lanka, and Turkey.

Production of tea reached 1197.18 million kg in 2014-15. Around 955.82 million kg was produced in North India and 241.36 million kg was produced in South India. India has around 563.98 thousand hectares of area under tea production, as per figures for December 2013. Tea production is led by Assam (304.40 thousand hectares), West Bengal (140.44 thousand hectares), Tamil Nadu (69.62 thousand hectares) and Kerala (35.01 thousand hectares).

According to estimates, the tea industry is India's second largest employer. It employs over 3.5 million people across some 1,686 estates and 157,504 small holdings; most of them are women.

India produced over 1.1 million tonnes of tea during 2013 and over 1.2 million tonnes during 2014. Hence, India is ranked second among the



largest tea producing countries in the world, next only to China. The major tea producing States in India is the following:

**Assam:** Assam is the largest producer of tea and accounts for more than 52 per cent of the tea produced in India. It is one of the largest tea producing regions in the world. The main districts producing tea are: Lakhimpur, Kamrup, Sivasagar, Goalpara, Cachar, Derrang and Nagaon.

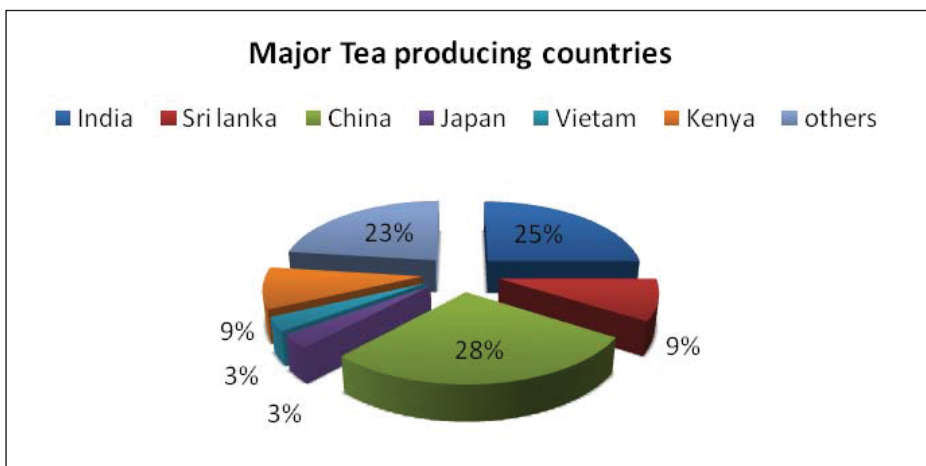
**West Bengal:** West Bengal ranks second in the list of tea producing states and accounts for more than 25 per cent of the tea produced in the country. The main districts producing tea are: Darjeeling, Jalpaiguri and Coochbehar.

Other Tea producing States in Northern India are: Himachal Pradesh (Kangra and Nandi districts), Uttarakhand (Dehradun district), Jharkhand (Ranchi district), Arunachal Pradesh, Tripura, Manipur and Meghalaya.

**South India:** In South India, tea is grown on the hilly slopes of the Nilgiris and Palanis in the states of Tamil Nadu, Karnataka and Kerala. Tamil Nadu occupies the third position in the list of tea producing states.

### Indian Tea Exports

Indian tea exports amounted to 170 million kilos of tea shipped overseas. Major buyers of Indian teas were Russia (37 million kgs), Iran (15 m kgs), Pakistan (14 m kgs), United Kingdom (14 m kgs), United Arab Emirates (12 m kgs) and the United States (11 m kgs) during Jan-Oct 2015.



The top export markets in volume terms for 2014-15 were Russian Federation (39.14 million kg), UK (18.58 million kg) and Iran (17.53 million kg). In terms of value, the top export markets were Russian Federation (US\$ 94.43 million), Iran (US\$ 75.73 million) and UK (US\$ 57.74 million). All varieties of tea are produced by India. While CTC (Cut Tear Curl) accounts for around 89 per cent of the production, orthodox/green and instant tea account for the remaining 11 per cent.

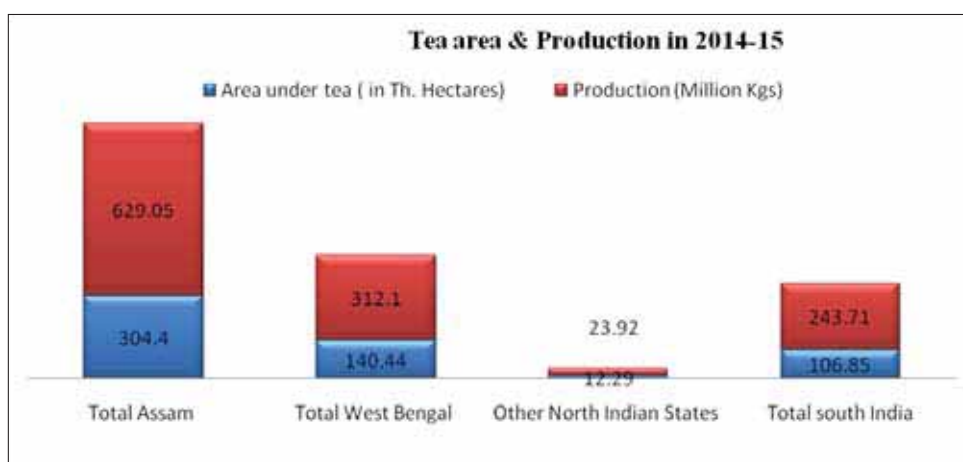
### Govt. Initiative- Tea Board of India

The Tea Board of India is a state agency of the Government of India established to promote the cultivation, processing, and domestic trade as well as export of tea from India. It was established by the enactment of the Tea Act in 1953 with its headquarters in Kolkata. The Tea Board of India



### Production: (Quantity in Million Kgs)

	1998	2005	2007	2010	2011	2012	2013	2014
<b>Production</b>	874	946	986	966	1116	1126	1200	1207
<b>Imports</b>	9	17	16	20	21	21	20	20
<b>Exports</b>	210	199	179	222	215	208	219	207
<b>Consumption</b>	650	760	798	860	881	903	926	945
<b>Total Auction Price (Rs/Kg)</b>	76.73	58.67	67.97	106.32	106.07	125.25	132.2	130.91



is responsible for the assignment of certification numbers to exports of certain tea merchants. This certification is intended to ensure the tea's origin, which in turn would reduce the amount of fraudulent labeling on rare teas such as ones harvested in Darjeeling.

Tea industry has expressed disappointment over reduction in export benefits for tea in Foreign Trade Policy 2015-2020. Government has replaced Vishesh Krishi Gram Udyog Yojana (VKGUY) with Merchandise Exports from India Scheme (MEIS) in the new policy which directly impacts organic tea exporters. The government has taken a number of measures to help the tea industry. A consultation with stakeholders of tea sector including representatives of small tea growers, large tea estates, buyers, dealers, auctioneers of tea etc, was held at Guwahati in 13.10.2014. Another meeting was held in Kolkata on 17.7.2015 to discuss issues relating to mandatory sale of tea through public auction and changes needed in the procedures and norms governing tea auctions. A view of stakeholders obtained in course of

the consultations has enabled the government to analyze and undertake improvements as necessary in the rules of marketing of tea.

### Conclusion

India is the largest producer of black tea as well as the largest consumer of tea in the world. Currently, India produces 23% of total world production and consumes about 21% of total world consumption of tea – nearly 80% of the tea produced is consumed within India. Over the last 20 years, India's world ranking as an exporter has come down from number one to number four, in the face of stiff competition from Sri Lanka, Kenya, and China. The review of the global scenario of tea in terms of area, production, yield, exports and imports indicated overall increase in the quantity of tea in the world market over last two decades and the trend is increasing. So strategies must be adopted to meet up the challenges in global demand for tea in the coming years. Besides, general consumption of tea, health benefit effects of tea need to be promoted more vigorously to gain the non-conventional areas of tea in the world for an expansion in the consumption. Value addition and diversification for a wide range of tea products need to be developed for balancing the supply.

*(Dr. K. Baby is Head, Department of Economics, Govt. College, Chittur, Kerala)*

# INDIA'S DAIRY SECTOR – TECHNOLOGY THE KEY TO PROGRESS

R.C. Rajamani

National Dairy Plan with an outlay of more than Rs. 17, 300 crore to achieve a target of 180 million tonnes of Milk production annually by 2021-22. Milk production is expected to grow at 4% with an annual incremental output of 5 million tonnes in the next 15 years. Under this plan the government is contemplating to enhance milk production in major producing areas, strengthen and expand infrastructure to produce, process and market milk through the existing and new institutional structures.

**E**vocatively hailed as the “White Revolution”, India has come a long way since the heady decade of the 1970s to rank as the world’s number one milk producer today.

In its exciting ascent to the global peak in terms of milk production, India’s dairy sector has witnessed several structural changes in production, processing and consumption, each necessitated by changing socio-economic conditions in the country.

Today, the country is able to provide on an average 302 gm per person per day milk, which is higher than the minimum required recommended by the WHO.

Milk production has increased from 137.68 million tonne in 2013-14 to 146.31 million tonne in 2014-15. For the first time there has been a record enhancement of milk production of 6.3 % compared to increase of just 2.2 % worldwide.

With 3.9% contribution to the national gross product, the dairy sector is not only a substantial source of livelihood for many but also the most credible base to ensure national food requirements.

At current production levels, India continues to top the list of the major milk producing countries in the world followed by the USA, China, Pakistan and Brazil. At present, New Zealand, US, Germany, France, Australia and Ireland are among the top countries with the highest milk surpluses. China, Italy, Russia, Mexico, Algeria and Indonesia figure in the list of countries with the highest milk deficits.

However, India’s milk productivity per animal is far less than the average in developed dairy nations. No doubt, there is an urgent need to focus on using latest technology to enhance milk productivity.

Appropriately, the union Agriculture Minister Shri Radha Mohan Singh has underlined the productivity weakness when he said recently:

“It is time now that programmes focusing on improvement in productivity of indigenous cattle are developed and implemented intensively.” While focusing on promoting cross breeding of dairy cows to meet the ever increasing demand indigenous cattle breeds have been neglected.

It is in this context, that the National Gokul Mission was launched for the preservation and promotion of indigenous breeds of cows under National Programme for Bovine Breeding and Dairy Development for the first time in the country. Under the scheme, a sum of Rs. 45 crore was earmarked for the year 2013-14 while Rs. 550 crore was released for 29 proposals from 27 states by December, 2015. Two new national Kamdhenu Breeding Centres were being set up, one each in north and south India.

## Changing Consumer Preferences

The consumer preferences in India are diversifying towards high value added dairy products such as dairy beverages, fermented milk products, western dairy products, functional dairy products and packaged traditional dairy products.

Market growth rate for some of these products is in the range of 15-20%. Keeping in view possibilities and trends, it is important that we find newer ways, means and technologies for processing milk into different dairy products.

To fill up the gap related to the scarcity of veterinary doctors the government has increased the number of veterinary colleges from 36 to 40 and seats have also been upped from 914 to 1332 in 17 veterinary colleges.

In India, there are wide variations in profitability at the regional level on one hand, and across small-holder vis-a-vis commercial level on the other. The net returns on investment range from 15-30% on commercial dairy herds in dynamic milk regions, while profit margins on small-holder farms are below 10% in several regions.



The consumption of milk and milk products has increased in both rural and urban food baskets. In the past decade, there has been an increase in the consumption of milk and milk products in rural and urban areas by 29 and 26 percent respectively.

### **Growth of Dairy Industry**

The growth in dairying has contributed positively to overall growth of agriculture sector. While growth rate in agriculture is expected to remain only two per cent, the growth related to fruits and vegetables, livestock and dairy, poultry as well as fisheries is likely to touch the mark of 5-6 per cent. It will be an extremely important contribution in the economic development of India.

The Indian dairy industry has acquired substantial growth from the Eighth Plan onwards. India's milk output has not only placed the industry first in the world, but also represents sustained growth in the availability of milk & milk products.

To bring about structural changes in unorganized sector, measures like milk processing at village level, marketing of pasteurized milk in a cost effective manner, quality upgrade of traditional technology to handle commercial scale using modern equipment and management skills, a new scheme Dairy Venture Capital Fund was initiated in the Tenth Five Year Plan. The assistance under the scheme is provided to the rural/urban beneficiaries under a schematic proposal through bankable projects with 50% interest free loan component.

### **National Dairy Development Board**

The National Dairy Development Board was created to promote, finance and support producer-owned and controlled organisations. NDDB's programmes and activities seek to strengthen farmer cooperatives and support national policies that are favourable to the growth of such institutions.

Fundamental to NDDB's efforts are cooperative principles and cooperative strategies.

The Dairy Board implements cooperative development and governance programmes across the country. The aim is to help create self-reliant and professionally managed cooperative institutions, responsive to the economic and social expectations of their members.

In addition to helping build self-sustaining cooperatives, the NDDB is committed to serve its rural constituency by including Women's Development and Leadership Development Programmes as a central part of its activities. Need-based consultancy is provided to help evolve strategies to strengthen dairy cooperatives as well as to increase milk procurement.

As a part of its effort to add value to the business of dairy cooperatives, the Dairy Board identifies, develops, tests and transfers product, process and equipment technologies.

In this, emphasis is placed on maintaining high quality standards. To check milk quality, test kits have been developed. NDDB also provides services for analysis of dairy product samples.

NDDB carries out extensive research and development activities in Biotechnology aimed at developing formulations and technologies useful for improving the productivity of milch animals. In 1979, the Dairy Board set up an Animal Disease Diagnostic Laboratory at Anand to undertake scientific research activities. NDDB has expanded its research activities to include Animal Genetics, Animal Health and Animal Nutrition for supporting its Productivity Enhancement programme for dairy cooperatives.

### **Dairy Cooperatives**

Dairy Cooperatives account for the major share of processed liquid milk marketed in the country. Milk is processed and marketed by 170 Milk Producers' Cooperative Unions, which federate into 15 State Cooperative Milk Marketing Federations.

The Dairy Board's programmes and activities seek to strengthen the functioning of Dairy Cooperatives as producer-owned and controlled organisations. NDDB supports the development of dairy cooperatives by providing them financial assistance and technical expertise, ensuring a better future for India's farmers.

## National Dairy Plan

Government is also examining launching a National Dairy Plan with an outlay of more than Rs. 17, 300 crore to achieve a target of 180 million tonnes of Milk production annually by 2021-22. Milk production is expected to grow at 4% with an annual incremental output of 5 million tonnes in the next 15 years. Under this plan the government is contemplating to enhance milk production in major producing areas, strengthen and expand infrastructure to produce, process and market milk through the existing and new institutional structures. The plan envisages breed improvement through natural service, setting up plants to augment cattle feed, bypass protein and mineral mixture. The plan also proposes to bring 65% of the surplus milk produced under the organized sector for procurement as against the present 30%.

### 'Mera Gaon Mera Gaurav'

The Prime Minister Shri Narendra Modi has conceptualised the scheme of "*Mera Gaon Mera Gaurav*" to take the technologies developed by the scientists in the field and make the villages a practical learning laboratory for the scientists. There are about 20000 scientists in the agriculture sector who will go to the villages and directly work for the development of the villages especially disseminating agriculture knowledge to them. The *Krishi Vigyan Kendra* (KVK) and the Agricultural Technology Management Agency (ATMA) centres are engaged in extension but without a close nexus between the scientist, extension workers and farmers. Without proper cooperation among them the overall development of agriculture in the villages is not possible.

India has vast network of institutions for imparting higher education in various agriculture and allied disciplines. The projections indicate that by 2020, there would be annual demand of over 40,000 graduates, 10500 post graduates and 2800 doctoral degree holders in agricultural and animal sciences. To fill up the gap related to the scarcity of veterinary doctors the strength of veterinary colleges have been increased from 36 to 40 and strength of the students pertained to this faculty has been enhanced from 60 to 100. The strength of the seats has been increased from 914 to 1332 in 17 veterinary colleges.



### More Cattle, less productivity

Though India is the world's largest milk producer, the feat is attributed to a massive cattle headcount rather than high yield per cow. The poor milk output per cow -- about one-tenth of the US and one-fifth of New Zealand -- has left the country struggling to keep pace with demand.

The problem lies mainly with the "intrinsically low genetic potential" and "poor quality animal nutrition", according to the United Nation's Food and Agriculture Organisation.

Commercial dairy farms currently rely on Jersey-Holstein cross-breeds for better yields. Black-and-white Holsteins — a native of the Netherlands — and the British Brown Jersey cow — which gives creamier milk — are usually preferred for cross-breeding. The Centre also runs a major programme for genetic upgrade called the National Project for Cattle and Buffalo Breeding.

Government on 28 July 2014 launched the Rashtriya Gokul Mission (a nationwide scheme) to promote conservation and developments of indigenous breeds of cows in a focused and scientific manner. The Mission is a focused project under National Programme for Bovine Breeding and Dairy Development.

The Mission is being implemented through State Implementing Agency (SIA viz. Livestock Development Boards, LDBs). The funds of the scheme will be allocated for establishment of Integrated Indigenous Cattle Centre, Gokul Gram.

Under the mission an Indigenous Cattle Centres or Gokul Grams will be established in breeding tracts of indigenous breeds. The Gokul Grams will be set up in a PPP mode and will be established in

- **The native breeding tracts**
- **Near metropolitan cities for housing the urban cattle**

The Gokul Gram will also function as state of the art, in-situ training centre for farmers and breeders. Metropolitan Gokul Gram will focus on genetic upgrade of urban cattle.

These Grams that will have a capacity of 1000 animals will have unproductive animals along with productive ones in a ratio of 60:40. These Gokul Grams will have house fodder production to meet the Nutritional requirements of the animals.

The scheme will identify and trace animal with unique identification number, upgrade information network on animal productivity and health to national data base and create a dedicated helpline and doorstep delivery of health services.

The RGM is a focussed project under National Programme for Bovine Breeding and Dairy Development with an outlay of Rs 500 crore during the 12th Five Year Plan. In India, the world's largest producer and consumer, milk production is estimated to be over 160 million tonnes in 2015-16, as against 146.31 million tonnes last year.

Rashtriya Gokul Mission, envisages funding "integrated cattle welfare centres" called "Gokul Grams" to protect local cows from being cross-bred into different varieties.

Under the new scheme, farmers who maintain the best centres would be eligible for "Gopal Ratna" awards. Each cow will have a unique identity number, to be fed into a national database.

The scheme will also focus on the upkeep of cattle after they are past the milk-producing phase, when they are often utilised for meat.

"Gopalan Sanghs" or breeding facilities will be set up for varieties with high-genetic pedigree, seeking to promote public-private partnerships in the field.

### **Budget Focus**

With the Union Budget 2016-17 being presented on February 29, the Agriculture Ministry has alerted the Finance Ministry on the needs of the farm sector that include the vast and ever growing dairy industry.

Aiming to control animal diseases and boost milk output, the Agriculture Ministry has sought

measures like a new scheme on animal health card, e-market platform for bovine germplasm and increase in allocation for Rashtriya Gokul Mission in Budget 2016.

The ministry has sought funds worth Rs 140 crore to cover 85 million milk producing animals under the *Pashu Sanjeevani* scheme which would aim to control spread of animal diseases, enhance productivity and improve quality of livestock.

In its pre-Budget recommendations, the Agriculture Ministry has proposed launching of a '*Pashu Sanjeevani* scheme' with components of health cards, emergency helpline and health services at door step.

The proposed animal welfare scheme will identify and trace animal with unique identification number, upgrade information network on animal productivity and health to national data base and create a dedicated helpline and doorstep delivery of health services, they added. In the absence of an authentic market for quality and disease free bovine germplasm, the ministry has proposed creation of '*e-Pashu Haat*' connecting breeder state agencies with stakeholders on an online platform, thereby maintaining identification and traceability of germplasm sold.

The ministry has said that the proposed e-market will enhance availability of disease-free germplasm with known genetic merit, provide a one stop portal for bovine breeders, no involvement of middlemen in sale and purchase of animals, allow sale of animals tagged with animal wellness card besides propagating indigenous bovine breeds and raise milk output.

That apart, the ministry has suggested a scheme to promote sex sorted semen to increase female population to make milk production more remunerative to farmers. The new scheme has been proposed as at present out of 300 million bovines, only 85 million are milk producing, leaving large number of unproductive animals.

The ministry has also proposed the Finance Ministry to make Rashtriya Gokul Mission (RGM) -- which works towards development, preservation and conservation of indigenous breeds -- a separate scheme with higher fund allocation.

***(R.C. Rajamani is a Senior Journalist based in Delhi. This article was written before the Budget 2016-17 was presented )***

# GROUND WATER CONCERNS & IRRIGATION SCENARIO

Mahendra Patel

Groundwater through wells has 60.86 per cent share in total irrigation. Almost 70 per cent of groundwater potential has been utilized. Water table in many regions has been falling at an alarming rate. NASA scientists in the US, using satellites to track groundwater loss in India's north-western grain basket have found annual average 33 cubic km drop in the water table in the region.

**A**s the Prime Minister Sh. Narendra Modi has urged, India must quickly expand its irrigation network and improve water usage to offset the impact of less monsoon rainfall to ensure quick results for farmers by reviewing administrative mechanisms, financial arrangements and technology use in irrigation. There should be intensive efforts to increase the number of farm ponds. Falling groundwater levels in some states could force an urgent shift in crop patterns". This article highlights the current irrigation scenario in India and pinpoints the areas of serious concern.

## Irrigation Scenario

The share of agriculture in India's GDP progressively declined from 23.4 per cent in the 9<sup>th</sup> five year plan to 17.60 per cent in 2014-15 but population depending on agriculture as the main source of livelihood declined to 48.9 per cent from 59.9 per cent between 1999-00 and 2011-12. Agricultural growth rate during 2014-15 is estimated to be 0.2 per cent as against country's 7.3 per cent economic growth rate. Food output in 2014-15 is estimated to be 251.12 million tons [MT] significantly less than 257.13 MT and 265.14 MT in 2012-13 and 2013-14 respectively. Monsoon rain still continue to influence the agricultural growth. About 55 per cent of net cropped area is rain-fed which is critical for security of food, fodder and farm income and even responsible for farmers' distress. About 80 per cent of horticulture-based livelihoods and 100 per cent of forest products are realized without assured irrigation. Yield of food grains in rain-fed areas is almost 50 per cent of that in irrigated areas. India's 44 per cent food grains come from 56 per cent unirrigated land.

Our water scenario is fast changing because of increasing population, rising demand for

irrigating agricultural land, rapid urbanization and industrialization, electricity generation, impact of global warming and erratic rainfall.

As against the ultimate irrigation potential of 140 million hectares estimated in 1997, currently irrigation facilities of 102.8 MHA are created and 45 per cent of country's net sown area [63.36 MHA] is irrigated leaving 55 per cent at the mercy of monsoon rains. According to World Development Indicators [1998] in the mid-1990s, the percentage of irrigated area in India was less than that in Bangladesh, Nepal and China and less than half that in Japan and Korea. Crop-yields in India are relatively lower than that in East Asia and have almost stagnated despite a holding size that is larger on an average than in China. Rice yields in India are almost half that in Japan.

Water for Life Decade [2005-15] and the annual World Water Day being held on March 22 every year reminds all stakeholders about the fact that water is finite, scarce, costly and precious and, therefore, should be efficiently managed for country's sustainable development. On March 22 of each year, the electronic and print media are expected to critically discuss and





publish the policy, programs, performance and issues identified during the previous years and present the framework to pursue the unfinished tasks to accomplish the mission.

### Groundwater

Groundwater facilitates farmer to source water where and when he wants it. Storing and replenishing groundwater is cost effective than building and maintaining surface irrigation structures. Around 70 per cent of India's irrigation needs and 80 per cent of its domestic water supplies are sourced from groundwater. A large part of agriculture is dependent on non-renewable groundwater. In 1960-61, the share of groundwater which was just 1 per cent of total irrigation resources increased to 30 per cent in 1990-91 and further to 45 per cent in 2011-12. As against this, share of canal irrigation declined from 36 per cent in 1990-91 to 25 per cent in 2011-12. Erratic monsoon affects farmers owning tube-wells compelling them excessive extraction of groundwater whereas most small and marginal farmers [accounting for about 85.9 per cent of the total holdings and cultivating 42.8 per cent land] without their own tube-wells and pump-sets have to buy water at substantial cost.

From time to time, Government introduced several water resources development programmes to increase cropped area under irrigation and significantly enhance water use efficiency, viz. [i] Command Area Development Program [CADP] in 1974-75, to bridge the gap between irrigation potential created and its actual utilization by introducing suitable cropping pattern, strengthening research, extension and training facilities, organizing field demonstrations

and supplying inputs [ii] Rural Infrastructure Development Fund [RIDF] in 1995-96 to complete hitherto incomplete irrigation projects mobilizing deposits out of the shortfall in commercial banks' lending targets to agriculture to complete irrigation development projects [iii] Accelerated Irrigation Benefit Program (AIBP) in 1996-97 for extending financial assistance to State Governments to complete incomplete irrigation schemes. From 2004-05 CADP was merged with AIBP and renamed as Command Area Development & Water Management [CAD&WM] with core components of construction of field channels aimed at enhancing water use efficiency.

### Micro-irrigation

National Mission on Micro Irrigation was established to increase water-use efficiency by promoting drip and sprinkler irrigation systems. Since mid-1990s use of micro-irrigation comprising Drip and Sprinkler irrigation system has been encouraged as it is the most efficient method to save water and increase water use efficiency as compared to the conventional surface method of irrigation, where water use efficiency is only about 35 to 40 per cent. Water saving due to Drip is between 12 per cent and 84 per cent depending upon crops, sources of lifting water, etc. Studies reveal that water saving including water use efficiency and productivity gains are higher in those crops cultivated under Drip as compared to Sprinkler. Around 80 crops can be cultivated under Drip and Sprinkler. While Drip is most suitable for wide spaced horticulture and other crops, Sprinkler is for closely-spaced crops. Micro-irrigation enhances input use efficiency and crop productivity; reduces energy consumption, weed infestation, soil erosion and cost of cultivation. Researches have established that investment in micro-irrigation is financially/economically viable. The internal rate of return (IRR), which varies across States and categories of farm-sizes, was ranging from 3 per cent to 35 per cent for marginal farmers, 14 per cent to 88 per cent for small farmers and 15 per cent to 128 per cent for large farmers. The IRR was higher among large farmers in Kerala and Maharashtra because of diversified intercropping pattern in orchard/plantation crops. Micro-irrigation promises farmers not to over-



exploit groundwater. The study in nine promising States in 2010 revealed that area covered under Drip and Sprinkler was 14,28,460 hectares [12.25 per cent] and 24,42,430 hectares [7.99 per cent] as against potential of 1,16,59,000 hectares and 3,05,78,000 hectares respectively. Thus, after two decades, total area under Micro-irrigation was only 38,70,860 hectares [9.16 per cent] as compared to potential of 4,22,37,000 hectares. Out of this, about 30 million hectares are suitable for Sprinkler irrigation for crops like cereals, pulses, oilseeds and fodder crops and a potential of around 12 million hectares under Drip for cotton, sugarcane, fruits, vegetables, spices, condiments; and some pulse crops like red gram, etc. Only a few states like Andhra Pradesh, Maharashtra and Tamil Nadu have expanded area under micro-irrigation. Factors attributed to low adoption rate include high investment cost, complex technology and socio-economic issues such as, a large number of small and marginal farmers, fragmented landholdings, cumbersome procedure to access institutional credit and Government subsidies, farmers' limited knowledge in operating and maintaining systems as often the system is facing problems of clogging of filters and drippers, besides the required pressure from the pumps not being maintained due to the poor conditions of the pump sets resulting in low pump discharge. The 12<sup>th</sup> five year plan targets bringing about 10.1 million hectares under macro-irrigation [4.8 MHA under drip and 5.3 MHA under sprinkler systems]

### Areas of Serious Concern

While the Government has invested significant resources to develop irrigation facilities, following are the issues that have substantially constrained the harnessing of full potential of irrigation resources, full utilization of water, increase in irrigated cropped area and water use efficiency impacting on crop productivity per unit of water resources, farmer's income and employment generation. The program implementers need to consider these issues seriously and demonstrate their administrative skill, capability and commitment to formulate and implement a time-bound program to achieve the mandated tasks in five years.

- **Delayed implementation:** Reports indicate that despite the Central Government providing

more than Rs.530 billion between 2004 and 2014 to State Governments for completion of irrigation projects, implementation of 163 out of 297 projects was delayed, including some projects for over 20 years.

- **Incomplete projects:** Between 500 and 600 projects have remained incomplete since 1969-74. Currently, 557 projects are yet to be completed. Andhra Pradesh has completed only 17 out of 105 projects, followed by Karnataka [33/305], Maharashtra [94/186] and Madhya Pradesh [90/242] projects.
- **Time and cost overrun:** Worst impact of the inordinate delays in completion of projects has been the time and cost overruns. A study on cost overruns revealed that cost escalation was 138 per cent for 12 projects, 500 per cent or more for 24 medium projects and 1000 per cent and more for 24 out of 151 major projects approved earlier than 1980. Average cost escalation was 200 per cent for major projects starting from 1985.
- **Under utilization:** The gap between the irrigation potential created [IPC] and the irrigation potential utilized [IPU] has been steadily widening from the first plan [1951-56]. IPU is 80 MHA [77.82 per cent] of 102.80 MHA of IPC. Factors responsible for low utilization of irrigation as studied by Indian Institute of Management [Ahmedabad, Bangalore, Kolkata and Lucknow] focus on lack of proper operation and maintenance, incomplete distribution systems, non-completion of Command Area Development works, changes from the initially designed cropping pattern and diversion of land for other purposes. Besides, inadequate provision of budget for operation and maintenance of the irrigation system is significantly responsible for underutilization followed by non-completion of distributaries, minors, field channels and on-farm development.
- **Groundwater depletion:** Groundwater through wells has 60.86 per cent share in total irrigation. Almost 70 per cent of groundwater potential has been utilized. Water table in many regions has been falling at an alarming rate. For decades, farmers in agriculturally-predominant regions of Punjab, Haryana, Uttar

Pradesh and Rajasthan were encouraged to sink tube wells to get free water for agricultural purpose. Electricity for pumping out water was supplied virtually free or at heavily subsidized rates. This led to over-exploitation of groundwater and even encouraged farmers to flood crops like rice, wheat and fruit trees with water indiscriminately which impacted on soil and environmental degradation and low crop productivity. Rate of groundwater depletion raced faster than the rate of replenishment in many States. **NASA scientists in the US, using satellites to track groundwater loss in India's north-western grain basket have found annual average 33 cubic km drop in the water table in the region. The satellite study has revealed a loss of 109 cubic km groundwater in Punjab, Haryana and Rajasthan between August 2002 and October 2008, twice the capacity of India's largest surface water reservoir, the Upper Wainganga in Madhya Pradesh.**

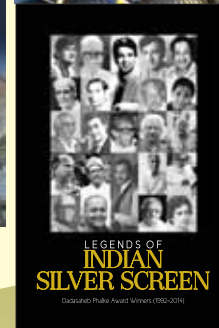
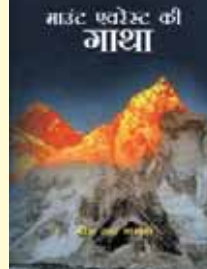
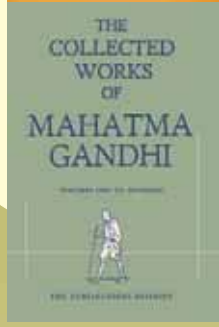
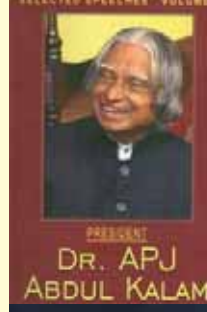
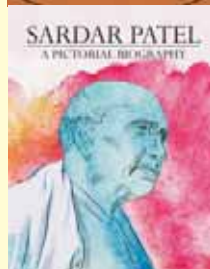
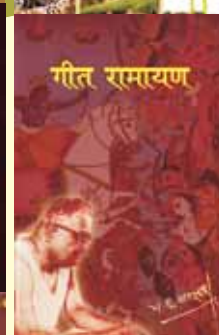
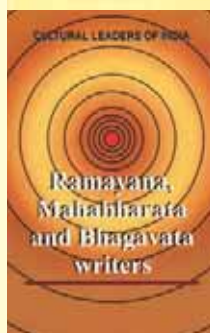
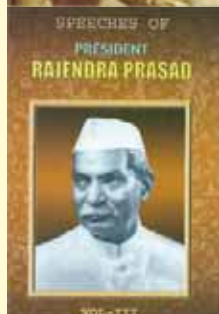
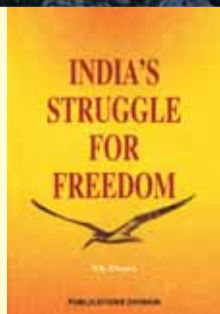
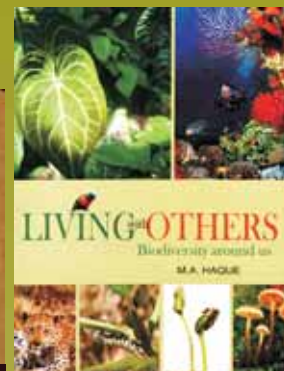
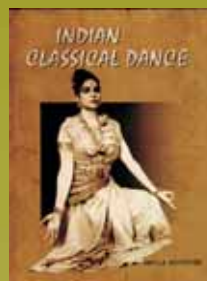
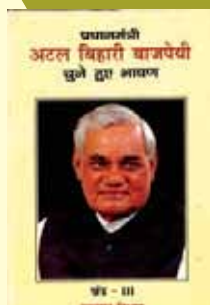
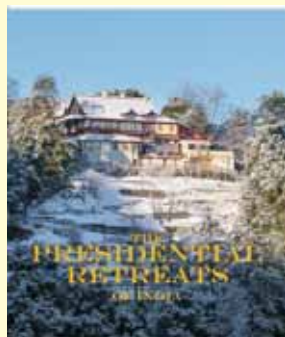
- **Food insecurity:** Water required to meet the food deficit in India eventually has to be searched in water-scarce regions, which have good endowment of arable land. This puts additional pressure on the water scarce-regions for freshwater. Hence, food crisis is as much a crisis of land in water-rich regions, as crisis of water in semi-arid and arid water-scarce regions. Problem of over-exploitation of groundwater in the water-scarce regions increases the magnitude of the crisis. In nutshell, problem of groundwater over-exploitation is more serious than we realize. If unchecked, its impacts on national food security are likely to be severe as the regions that are experiencing over-exploitation are also the regions producing surplus cereals that are transferred to land-starved water-surplus regions. The alluvial areas of Punjab, Rajasthan and Haryana that experience decline in water levels are the largest contributors to India's wheat stock and the hard rock regions of Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Chattisgarh and Karnataka are the largest contributors to India's rice stock. The food security impacts would be aggravated in the light of issues, viz. [i] depletion shrinks the area under cereals

irrigated by wells [ii] when water becomes scarce, and cost of irrigation water rises, the farmers move away from traditional cereal crops that give low returns per unit of water and cultivate cash crops. This can lead to decline in food production impacting national food security. This calls for researches and implementing strategies to [a] improve the surface irrigation in intensively irrigated areas facing over-exploitation [b] improve the efficiency of utilization of green water and the rainwater held in the soil profile [c] reduce the soil water depletion, through reduction in the amount of residual moisture held in soils after harvesting[d] reduce the consumptive use of water (Evaporation Transpiration) through shift to low water consuming crops that are economically more efficient, i.e. crops that give higher net returns per unit of water consumed. But, under the current pricing regime followed in canal water, and the electricity pricing policy for farm sector followed by many states, the marginal cost of using water and electricity is almost zero, except when the supply of energy and water is extremely limited. This necessitates the policy and programs to incentivize farmers of these regions that can encourage them to adopt measures to improve the efficiency of water use and also improves the returns per unit of land. Therefore, what is most important is to introduce reforms in water and energy sector, including volumetric pricing of canal water and consumption based pricing of electricity used in groundwater.

**Conclusion:** Over the years, there has been a manifested lack of attention to water legislation, water conservation, water use efficiency, water harvesting and recycling and infrastructure. Current scenario exhibiting number of incomplete projects accompanied by low utilization of irrigation potential already created shows that return on capital invested in creating irrigation facilities is inordinately delayed or almost lost. All incomplete projects need to be completed by 2020 by drawing a suitable road map indicating specifically the role, responsibility and accountability of officials, department and ministry concerned.

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