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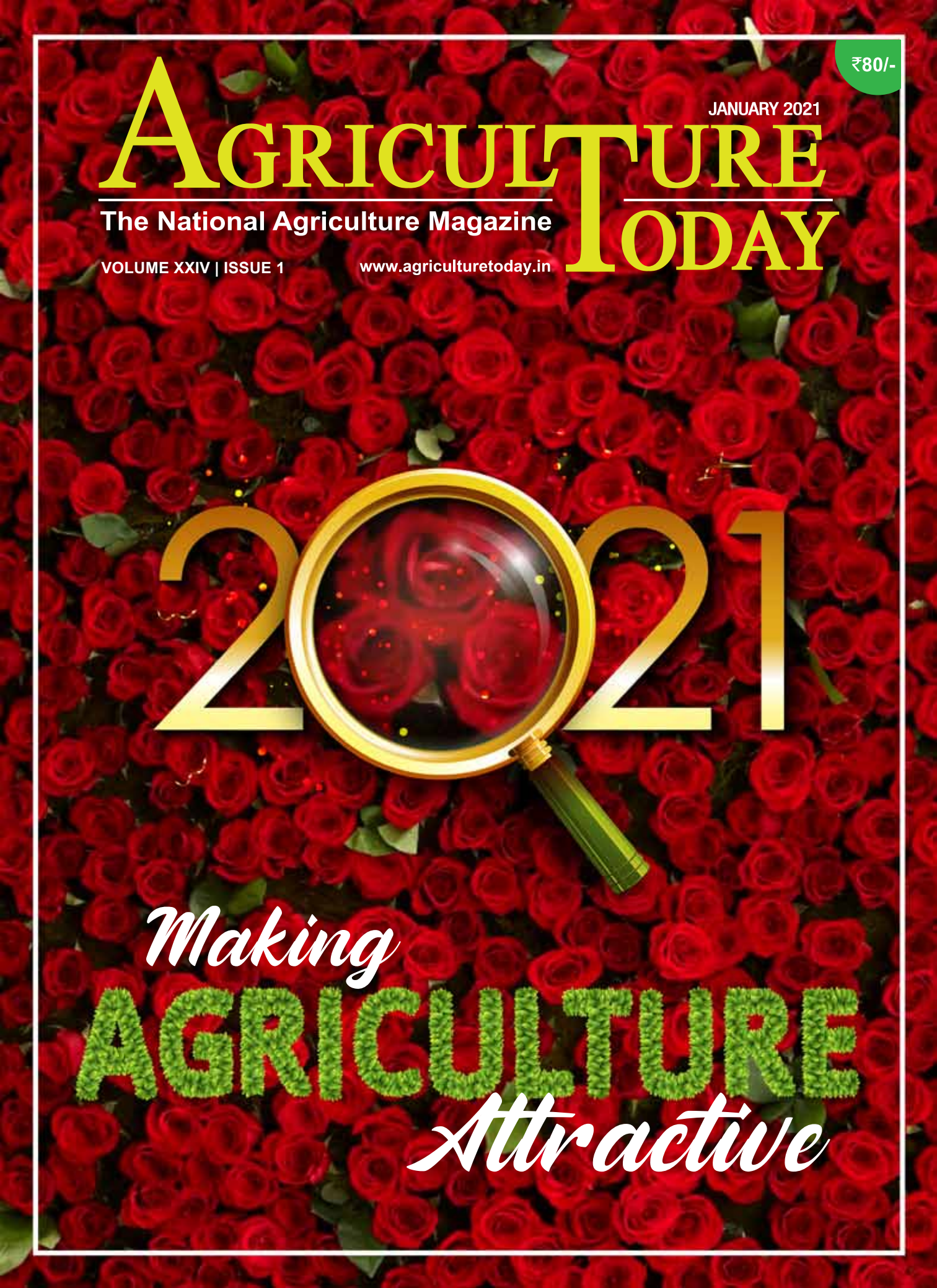

Making AGRICULTURE Attractive

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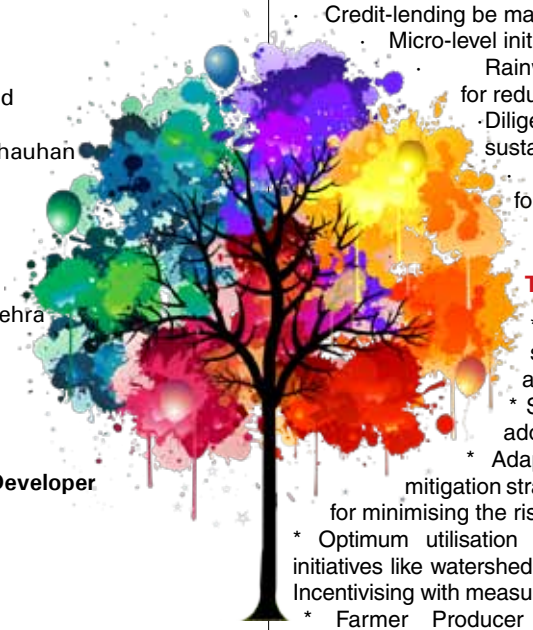
For the magic of new beginnings!

While the world slowly begins to reopen after the initial Covid lockdown, we're still wrapping our heads around its potential long-lasting effects. One thing that has likely changed forever: Role and importance of technology in our life. Adapting to this new normal, the agriculture industry has geared up to revolutionise its operations with new and existing technologies.

Now, the million-dollar question is… Will agriculture emerge as the saviour of our economy, post pandemic? What paradigm shifts will be required for this to happen? Here are some imperatives…

- Robust supply chain to link domestic & international markets
- Policy interventions for empowering farmers
- Farming be a profitable business driven by experienced strategists
- Farmers think and plan as farm entrepreneurs
- Bridging gaps between all stakeholders
- Dynamic promotion of sectors like horticulture, animal husbandry, fisheries
- Initiatives to encourage and promote integrated farming
- Credit-lending be made affordable
- Micro-level initiatives propelled for effective growth
- Rainwater harvesting and water conservation technologies for reducing input costs
- Diligent emphasis on soil health and crop rotation for sustainability
- Conscientious dialogue between all stakeholders for implementation of new farm bills



Trends expected to shape Indian Agriculture:

* Digital innovation in infrastructure development, supply chain management, quality control, traceability and other prominent aspects of the value chain
* Streamlining of policies and creation of incentives for adoption of innovation.
* Adaptability to climate change, effective climate risk mitigation strategy for challenging situations. Early warning systems for minimising the risk of erratic climate change events.
* Optimum utilisation of available water resources. Water management initiatives like watershed management, drip irrigation and precision agriculture. Incentivising with measures like loan waivers to farmers for judicious water use.
* Farmer Producer Organisations (FPOs) have the potential to give farmers, better bargaining powe, create a more transparent agri-market. Leveraging on the strengths of aggregation and consolidation, FPOs can help India's farmers to unite and create new growth paradigms.

Government bodies, private players, FPOs and the growing agriculture start-up community can together transform the sector's outlook. Aided by the digital drive, Indian Agriculture is headed towards the new agricultural technology revolution.

As Albert Einstein said, "Learn from yesterday, live for today, hope for tomorrow".

Greetings for a New Year, new hopes, new resolutions & new triumphs.

Mamta

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BETTER LIFE FARMING

Growing a Better Life

Pappu Singh, Smallholder Farmer in Uttar Pradesh, India

The 'Better Life Farming' alliance is a long-term partnership between Bayer, IFC (International Finance Corporation), Netafim, Yara, DeHaat and Big Basket. It aims at enabling smallholders like Pappu Singh to unlock their farming potential. With knowledge of good agricultural practices and access to the latest technologies, smallholder farmers have increased their crop yields, crop quality and achieved higher farm incomes, thus creating a better life for their families.

An important element of Better Life Farming is its agri-entrepreneurship model, which supports smallholders to run 'Better Life Farming' centers where they enable transfer of technology on seeds, crop protection, crop nutrition, drip irrigation, soil management, financial literacy etc. to other smallholder farmers. They will also deliver services such as market linkages, access to inputs and crop advisory.

We will continue to work with other like-minded partners to address smallholders' needs at every step of the agri value chain. If you are interested in collaborating with us, reach out at **www.betterlifefarming.com/contact**

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Scan this QR code to know more from Pappu Singh on how Better Life Farming has transformed his life and helped him grow his family farming business.

Scan for more information

DR. M.J. KHAN

Anatomy of Farmers Agitation - 10 Facts

The farmers' agitations that broke out in Punjab with the passage of three farm bills gained momentum with the formation of the 30-party coordination committee and with the support extended by political parties and certain stakeholders. The initial engagements of farmer leaders with the Government happened late and were informal in nature. The Government restricted itself to explaining benefits. Farmers insisted on written assurance on continuation of MSP and treating MSP as floor price. As no positive signals were seen, the farmers in Punjab backed by political and business interests decided to intensify the agitation and move the protest sites to Delhi. I have been involved in coordination with farmers' bodies. Here I list the 10 developments that led to the situation that we face today:

1. No consultation with farmers before or after the Ordinances or before tabling the bills in the House, and until September 30, 2020.

2. The adoption of the route of Ordinances for ordinary business matter; Bills not being referred to select committee for wider consultations.

3. Weak initial arguments of BJP spokespersons that this will help farmers a) sell anywhere b) store any quantities c) decide price themselves. Farmers enjoyed this freedom earlier too.

4. Government's wait and watch approach helped farmers expand the protests constituency to the Hindi belt of the Green Revolution area of Haryana and Western UP.

5. Use of force in Haryana garnered domestic and international support for farmers

6. First official invitation sent to disproportionately large number of 30 farmers unions and of Punjab alone. The meeting was on a subject that needed political view, but no Minister was present in the meeting.

7. As protests site shifted to Delhi, these gained massive media focus nationally and globally. The government then upscaled the meeting to a group of three ministers led by the Agriculture Minister.

8. The composition of meeting being disproportionate representation of one side and non inclusion of farmers voices which take balanced view or supported these bills.

9. Lack of effective articulation by BJP spokespersons about the benefits of legislations for small farmers, FPOs and agri start-ups.

10. At Vigyan Bhawan meetings, lack of broad representation of other key stakeholders such as FPOs, start-ups, trade, industry, states, farmer leaders from other states. This made the scope narrow and created deadlock.

The Government now has limited options to amicably resolve the crisis. Broad-basing the discussions to include other key stakeholders, involving state governments in consultation, accepting one or both key demands, making MSP the floor price and passing to the states the same formula as SAP for sugarcane, formation of agri reforms commission, suspending the legislation for six months to buy more time could be the solutions. Scrapping these Acts and converting them into Model Acts for States to adopt could be the last option. But it shall not be progressive. Market reforms are vital for unleashing the potential of farm sector for the benefit of farmers. All the experts and expert committees constituted during the last 25 years are unequivocal in their recommendations for widespread market reforms.

The author is Chairman of Indian Chamber of Food and Agriculture and can be reached at chairman@icfa.org.in

In The Midst of The Manthan

RAJNI SHALEEN CHOPRA

Indian Agriculture is in the midst of a manthan. Like the famed Samudra Manthan of Hindu mythology, this agricultural churning shall lead to vital and consequential impact.

How will our farmer double their yields without compromising the soil or ownership of their land? How will they market the produce from remotest villages without being exploited? How will India's smallholder farmers sell their surplus yield anywhere in the country, given the logistical nightmare they shall face?

The change is underway. Small-land-owning farmers do not need to go into the logistics of selling to far-off markets. Instead, the private sector is doing this job for them.

In Haryana, corporate players have set up godowns all along the Chandigarh-Hisar road. The corporate sector is going big into the purchase and sale of vegetables in some states. More private companies can set up storage facilities/silos and efficient supply chains to make the job of small scale farmers easier.

Need for Farmer Cooperatives

There is real and strong need to develop farm cooperatives (FPOs) across the nation. The FPOs shall make agriculture more organised and efficient. It is expected that the

FPOs will manage all aspects of farming, from planned sowing to precision cultivation to ensured marketing.

By being together, farmers shall not be manipulated either by big corporates or by mandis. FPOs shall allow farmers full control as they will be shareholders, and will not lose control of their farmland.

As FPOs take charge, they may overturn the market rules. The FPOs may choose that demand and supply should decide the prices for all crops. This may encourage better planning of what to sow and when. It is profitable to make choices, based on what consumers demand. Agriculture is serious business. What to grow cannot be based on herd mentality.

As a nation, we are not harvesting the current genetic potential of our varieties/hybrids in all crops. We are half of China and one-fourth of USA in most crops. Crop improvement that is happening today will deliver results only after three to five years. What we need to do today is get our yields from lesser acreage and free up land for other productive activities.

Mandi System Needs Improvement

The system of regulated mandis is in the hands of the government. Hence private investment is not forthcoming for handling, storing and transporting crops. In order to give choices to farmers and for developing more efficient supply chains, it is necessary to bring in private sector investments for developing marketing infrastructure including better handling of agriculture produce.

Spot electronic markets

Many agri analysts believe that the system of spot electronic markets is one of the biggest institutional reforms which is essential in the agriculture marketing system. Analysts advocate that this system, when institutionalised, will facilitate development of national price, trading monitoring and information system. This reform must be examined by the states. If found useful, it must be pushed aggressively.

DEMYSTIFYING AGRI MARKET REFORMS AND THE WAY FORWARD

ABOUT THE AUTHOR

Mr Ram Kaundinya is Director General, Federation of Seed Industry of India (FSII)

Agriculture has moved from a production driven system to a demand driven system. Connecting farmers with consumers is very critical which is now possible due to digital tools. Matching the demand and supply will ensure better prices for the farmers. Currently the agricultural supply chain is too long. Farmer gets hardly 30% of the consumer price. The Mandis, where the farmer has been mandated to sell his produce all along, are dominated by cartels of middlemen who have been exploiting the farmers. The MSP does not always prevail at Mandis. Many crops operate at market prices, determined by the demand and supply situation, both inside and outside the mandis.

Out of the 23 crops covered by MSP government mainly buys Rice and Wheat at MSP. Is it estimated that if the government buys all the 23 crops it will cost them Rs. 17 lakh crores annually!! Government procures about 70 million tons of food grains annually for public distribution system and welfare programmes – mostly from Punjab and Haryana. This assured outlet of rice and wheat made the farmers of Punjab and Haryana prosperous but

also dependent on this system. This resulted in over production of rice and wheat, depletion of water resources and reduced fertility of soils due to over use of fertilizers.

In this context the two new Acts that redefine the rules of agri commodity marketing in the country are welcome. They will reduce government's role in agri output markets and bring in private investments into this space. These reforms were recommended in the 'Report on Policies and Action Plan for a secure and sustainable agriculture' submitted to the Principal Scientific Adviser to the Government of India, by a committee headed by Dr RS Paroda in August 2019. Similar reforms were also suggested in "Getting Punjab back on high growth path: sources, drivers, policy lessons" submitted by Dr Ashok Gulati, Ranjana Roy and Siraj Hussain.

Here is a detailed analysis.

The Farm Produce Trade & Commerce (Promotion & Facilitation) Act 2020 (FPTC Act) gives freedom to the farmer to sell his produce anywhere in the country (Section 3). Private industry is allowed to set up mandis in villages. It also provides for an electronic trading platform which can be used by the farmers to sell to customers who are in far off markets (Section 5). Government's ENAM and other private electronic platforms will help the farmers with this. Quality assessment of the produce will also be digitized so that the farmer gets a fair assessment of the quality (Section 5(1). Farmer can sell at his farm gate and save on transportation costs. This will shorten the supply chain from the current 8-9 links to 2-3 and improve the share of the farmer in the consumer price to 50-60%.

Governments may upgrade APMC Mandis, which need better infrastructure, technology and modern storage facilities. The cartels of middlemen should be dismantled. Mandis will continue to play an important role in achieving a balance in the markets and in facilitating government procurement

The private mandis provide a market mechanism in addition to the APMC mandi system. It is not a replacement. When private airlines and private insurance companies were allowed those measures benefited the consumer. We can expect the same here.

Some concerns are expressed by some stakeholders. The apprehensions and the answers to them are given below.

1. MSP system will be abolished: The Government assured that MSP will continue as an administrative practice like before.

2. Procurement by government will stop: Govt has to procure 70 m tons of food grains every year through Mandis for PDS & welfare programmes.

3. Mandis will collapse since no farmer will sell in Mandis: Mandis may lose some revenue. Governments have to invest in upgrading Mandis who should reinvent themselves, become

more efficient, tech savvy with modern infrastructure and get rid of the cartels. This will make them competitive and modern. Procurement & MSP operations will still happen through Mandis and farmers will continue to use them.

4. Private buyers outside Mandi will not be paying Mandi tax – loss of revenue for states: As per Section 6 of the Act this can happen. The central government has to compensate the states for this loss or transactions in private mandis may have to be taxed.

5. Private buyers outside the Mandi will exploit by forcing farmers to sell at lower prices – farmers will not have capacity to negotiate – MSP should be made mandatory for those transactions: Competition among many private players which will give better prices to farmers. Making MSP mandatory will defeat the purpose of the reform and will keep private industry away from this system. Currently a lot of trade takes place below MSP in mandis and outside mandis.

The private mandis provide a market mechanism in addition to the APMC mandi system. It is not a replacement. When private airlines and private insurance companies were allowed those measures benefited the consumer. We can expect the same here

6. Fly by night operators will enter and exploit farmers, will not pay him and run away: Section 17(2) of the Act provides for registration of private buyers. This has to be set up by States.

7. No information about prices prevailing in private mandis outside the APMC Mandis leading to information asymmetry: Private digital e commerce platforms will have to be used along with ENAM to capture all transactions as per Section 7 of the Act. A new system of logging price information from Mandis & Private players on digital platforms is to be developed.

IV. Farmers (Empowerment & Protection) Agreement of Price Assurance & Farm Services Act 2020 (FAPAFS Act) makes it possible for the farmer to enter into forward contracts for his produce with processors, wholesalers, aggregators, large retailers, exporters etc., on a level playing field. This will facilitate contract farming. This is purely voluntary.

Section 5 of the Act gives minimum price assurance to farmers through the contract even before sowing of crops. In case of higher market price, farmers will

Promotion of contract farming will increase private investments in infrastructure, local processing facilities and generate rural employment. Large corporates will depend on small local players to bridge the last mile and help them in achieving large volumes. This will generate rural entrepreneurship and economic activity

be entitled to this price over and above the minimum price.

Transfers the risk of market unpredictability from the farmer to the sponsor (contractor). Reduces cost of marketing for farmers since the Sponsor has to pick up produce from farm gate as per Section 6(1) of the Act. Payment terms are specified under Section 6(3) of the Act.

The contracts can be linked to the flow of insurance and credit facilities for the farmer from financial institutions as per Section 9 of the Act. This will be a big benefit for the farmers.

The contracts have to be registered with a designated registration authority as per section 12 of the Act which ensures that all sponsors are held responsible for the contracts they sign.

Quality specifications of the inputs to be used and the output to be produced would be described in the contract as per Section 4(2) of the Act.

Production of any value added products like organic foods, nutrition fortified crops, etc have to be cultivated under contracts so that the identity preserved supply chain system can operate from farm to fork and farmers get higher incomes.

Promotion of contract farming will increase private investments in infrastructure, local processing facilities and generate rural employment. Large corporates will depend on small local players to bridge the last mile and provide services to the farmers and help corporates in achieving large volumes. This will help in generating rural entrepreneurship and economic activity

Some concerns are expressed by stakeholders. Here are the answers.

Shri Narendra Singh Tomar Minister of Agriculture & Farmers Welfare, Minister of Rural Development and Minister of Food Processing Industries, GOI

1. The contractors may not pay MSP for the produce: Mandating MSP will kill this initiative and will keep the private sector away. Sufficient price protection is provided under section 5 of the Act which prescribes that the guaranteed price has to be mentioned in the agreement and it should be benchmarked against the prevailing prices in the APMC Mandi.

2. Corporates will form price cartels and exploit the farmers: Private industry players have to compete with each other. Farmers and FPOs will have sufficient bargaining power with different private players. Section 5 provides protection to the farmers.

3. Farmers are not equipped to deal with large private corporates: FPOs will have adequate strength to negotiate contracts. Institutional mechanism may have to be put in place to help the farmers and FPOs.

4. Corporates will take away farmers land: Section 8 of the Act specifically prohibits any transfer including sale, lease or mortgage of farmers land or premises under the contract.

5. Dispute Settlement mechanism is inadequate: An elaborate dispute settlement mechanism is described under Sections 13, 14 and 15 in Chapter III. SDM & Appellate Authority (District Magistrate) are empowered to resolve disputes – no need for farmers to travel to courts and spend money.

It is important that these reforms succeed. However a level playing field has to be created between the public and private players with some safety net for the farmers. Here are some suggestions on creating the ecosystem.

1. Effective implementation of these Acts will require the joint effort

of the Central govt and the State governments. It is essential that the governments of all States and different political parties agree on implementing these Acts with full vigour. Appropriate consultations may be held with States and other political parties at the highest level in the Central government. Some of the states have made good progress with APMC reforms in the last five years and hence should be on board.

2. The implementation of the Act and setting up of necessary infrastructure by the government as well as by the private industry will take a few years. It would be good to give at least 2 years transition time to implement these Acts and meanwhile focus on the following:

a) Governments may announce a large fund to upgrade APMC Mandis, which need better infrastructure, technology and modern storage facilities. They are located at very good locations and should use that advantage. The cartels of middlemen should be dismantled in these Mandis. These mandis will continue to play an important role in achieving a balance in the markets and in facilitating procurement by the government.

b) Announce a major budget to conduct a large scale capacity building campaign for farmers and FPOs to educate them about the new laws, on making contracts, using digital platforms, etc. The entire country should be covered in the two year period.

c) Set up a national digital platform consisting of ENAM and selected private platforms so that this grid can be seamlessly used by farmers to sell their produce. Integrate quality assessment facilities on the same platform. However setting up physical aggregation centres and quality grading systems is also very important.

d) Encourage private industry to invest in setting up private mandis and other infrastructure during this two year period and scale up operations quickly after that. State level policy support, funding support from banks & Value chain strategies will facilitate this.

These reforms hold the key to the future of Indian agriculture and the farmers. It is time for all stakeholders to show flexibility and resolve the issues through a dialogue. It is in the interest of the Indian farmer to do so

e) State governments may set up an Agri Business Office in each district which will advise the farmers with trading, making contracts, sharing commercial knowledge and information and similar support activities.

f) Safety net of MSP may be needed for some of the farmers for this decade. This assurance may be given by the government in writing.

g) Set up a large fund to make FPOs effective. Each FPO may need some seed fund from the government and also help in setting up a professional leadership team for FPOs of certain minimum size. This will help in making the FPOs achieve critical mass in operations with good governance standards.

h) Set up a designated authority in each district for registration of all the contracts being entered into under section 12 of FAPAFS Act.

i) Announce massive incentive programmes for farmers to undertake crop diversification in Punjab and Haryana and take up cultivation of Oilseeds, Maize, Vegetables and other crops which are under demand.

j) Launch a major public education campaign about the reforms and create an appreciation for the need for reforms among common people.

The two Acts will need a few amendments to make them more effective. Here is a list that the government may consider.

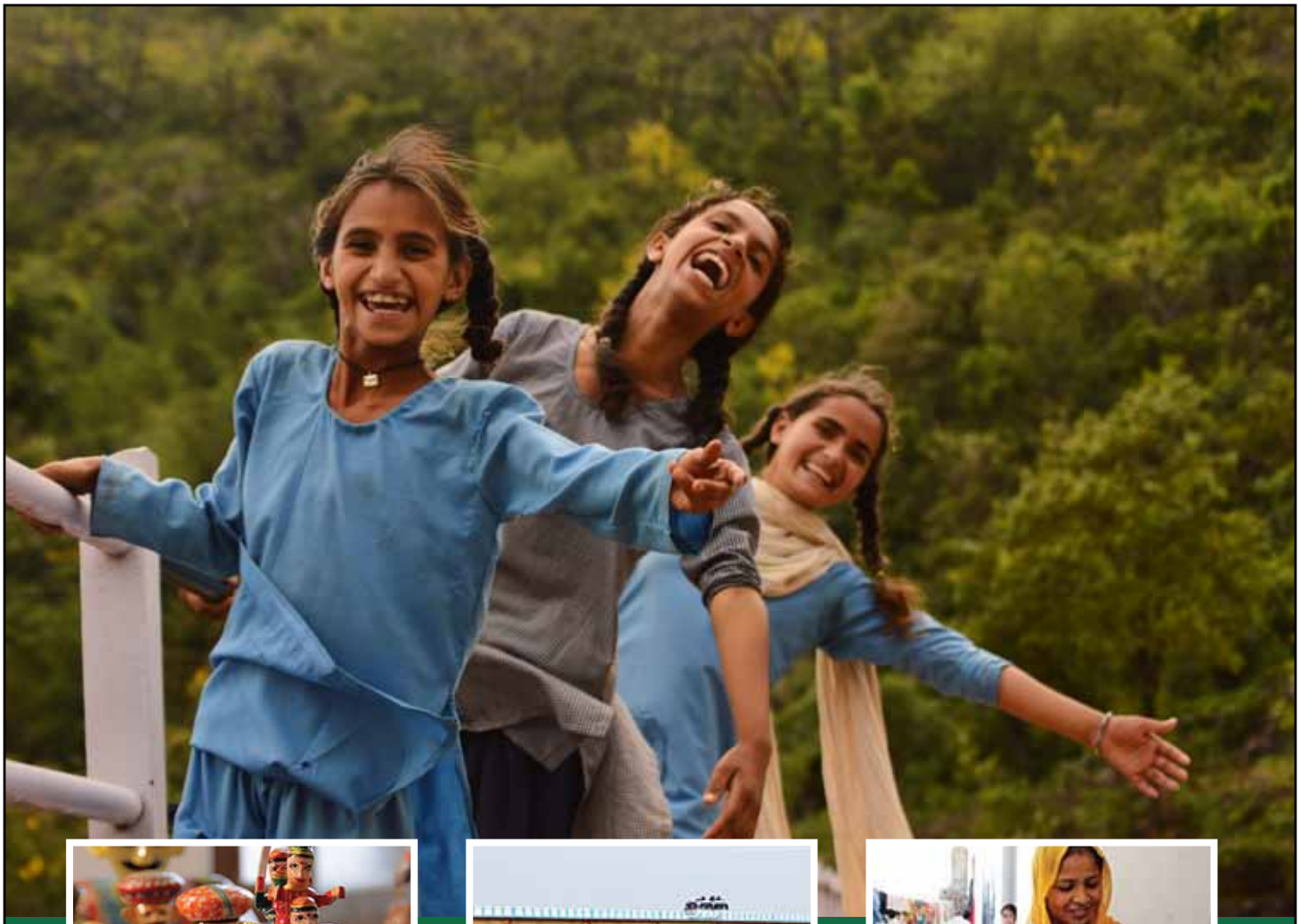
a) A regulatory body may be set up, under these Acts, to oversee the operation of the markets and to prevent any price cartelization by the private buyers in the markets. A fear of such a regulatory body is necessary to keep the private sector within reasonable boundaries of price, service and efficiencies.

b) Based on the powers provided under Section 4 of the FPTC Act, the Central government may set up a Digital registration system to register all the private buyers who are entering the market. a national registration number should be given to each buyer based on their background, track record, financial capacity, etc. The proposal in the Act that anyone with a PAN number can buy the produce from farmers is not adequate.

c) Dispute settlement mechanism as per Sections 13, 14 and 15 of Chapter III of the FAPAFS or Sections 8,9 and 10 of the FPTC Act is not adequate. The Act should give farmers the freedom to go to court if they are unhappy with the order of the SDM or the Appellate Authority.

d) Govt may stagger bringing different crops under the coverage of FPTC Act. It is not necessary to bring all crops under coverage immediately. Over a period of next 3-4 years crops can be brought under coverage in batches. This will make it a smooth process for farmers in different parts of the country and will not create a panic among them.

These reforms hold the key to the future of Indian agriculture and the farmers. It is time for all stakeholders to show flexibility and resolve the issues through a dialogue. It is in the interest of the Indian farmer to do so.



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AT Interview

INDIAN AGRICULTURE: SUPERPOWER

As the doyen of the agrochemical industry and a global leader what are your views on Indian agricultural sector?

India now ranks second largest in the world in agricultural production. The top three countries in the world in agricultural production are China> India> USA. India's agricultural production of $459 bn is almost double of the USA that supplied food grains to us to tide over food shortage and starvation in 1960s.

India's agricultural GDP expanded sluggishly rose from $25bn to $101bn, between 1970 till 2000 as the growth was cereals centric-mainly rice and wheat.

However, between 2001 and 2019, India's agricultural production leapfrogged over 400% from $101bn to $459bn driven largely by high value segments such as horticulture, dairy, poultry and inland fisheries.

Two-third of India's agricultural GDP now comes from Horticulture and Animal husbandry. The future of Indian agriculture is very bright.

What makes Indian agriculture vibrant and very different?

Like Indian culture, agriculture in India is highly diverse.

India's climate diversity, soil diversity, crop diversity and diet diversity are all interconnected. They work in harmony to make our agriculture holistic, broad based, strong and highly sustainable.

India is a multiproduct agricultural powerhouse. No other country grows and consumes as many food commodities as India. India's small sized family farms function 12 months a year as they practice a unique kind of mixed agri-horti-livestock farming.

Indian farmers are multiskilled. It is common in India to see food grain/vegetable/cotton farmers doubling as milk producers, goat, poultry keepers and aquaculturists.

How can Indian farmers' income be doubled as envisaged by the government?

We have adequate production of most agricultural commodities. Our focus should shift from production to marketing and increasing consumption within and outside the country.

In order to bring price stability in domestic market, we must export more. India's share in the world's agricultural export is just 2% i.e. $37 bn out of world agricultural export of $ 1780 bn.

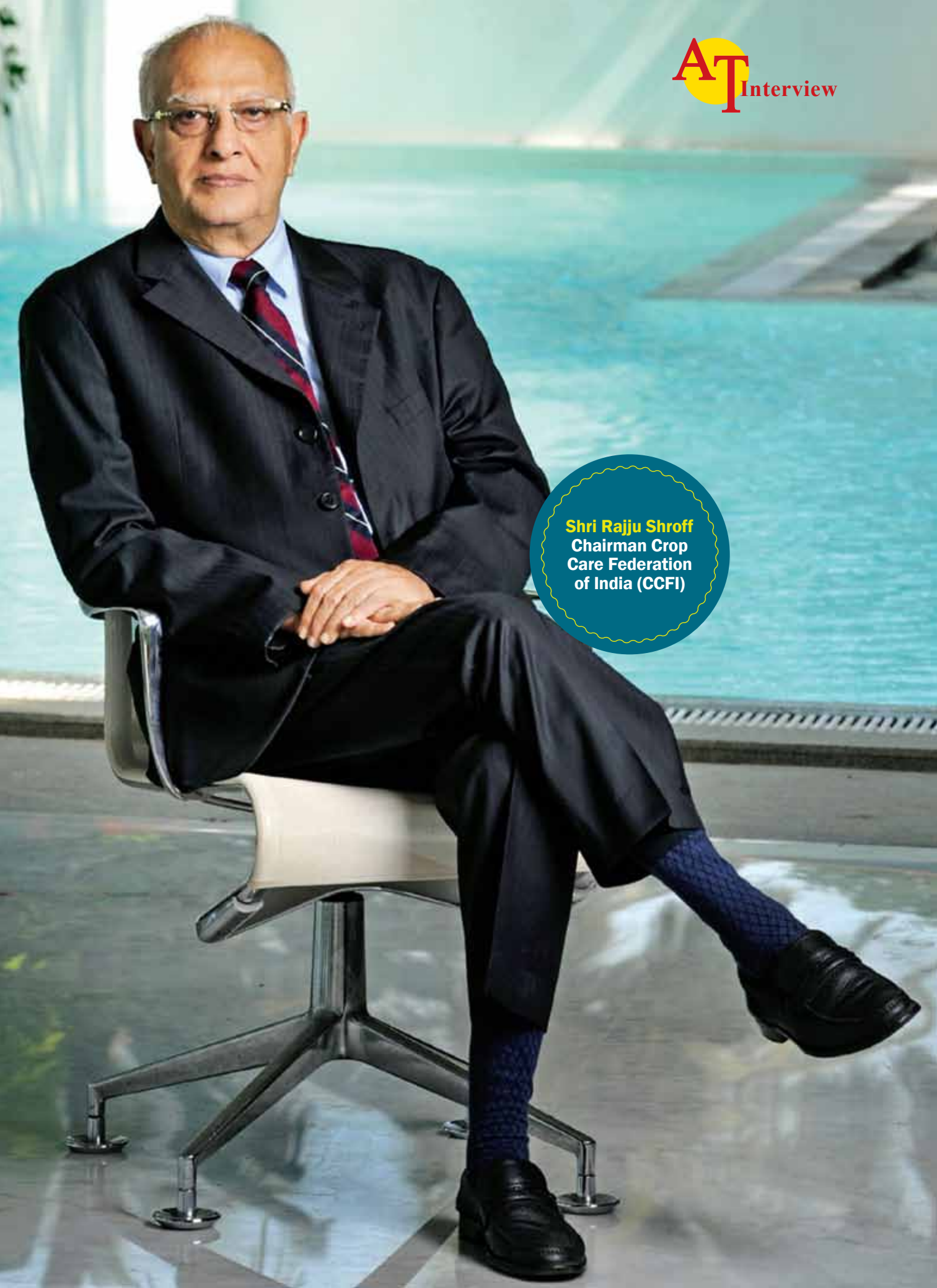
The country needs to push its agricultural exports to USD 100 billion by 2024 in order to double farmer's income. Indian agricultural sector must be recognized and promoted as an export intensive sector.

India is the second largest producer of fish in the world (13.4 million tons) a major part comes from inland water and aqua culture. This shows our water systems remain most conducive for aquatic life.

India's honey production increased from 10,000 tons to 120,000 tons in the past 15 years About 50% of India's honey is exported. The environmental activists have created an erroneous picture of Indian agriculture with negative narratives. This must be challenged and changed. The true progress of Indian agriculture must be widely published.

Did COVID-19 hinder the growth of Indian agriculture or agri-input industry in any way?

If there is one sector that has remained unaffected by Covid-19 induced lockdown, it is agricultural sector India. We had a bumper kharif harvest. I am confident the rabi season harvest will set



Shri Rajju Shroff
Chairman Crop Care Federation of India (CCFI)

another record.

As agriculture sector has remained relatively unaffected and registered growth, the agri input industry has also registered considerable growth.

It is noteworthy to mention here that India's agricultural export since April- Nov this year has registered significant growth of approximately 10 percent compared to the same period last year.

There are reports in the media alleging 50% of pesticides sold in India are spurious and sub-standard. Your views on this?

The Indian agrochemical industry has established a strong presence in the global markets in over 140 countries. Enabling policies and supportive regulatory systems would help the Indian industry to accelerate the export from the present $3.4 bn to $8bn in the next 3 years.

However, there are vested interests in the form of importers who do not want Indian industry to flourish. The importers want our country to be dependent on MNC in other countries. They are spreading disinformation that Indian industry is producing and selling spurious pesticides. They are the ones who allege that 50% of pesticides available in the country are spurious and sub-standard. This is completely false.

Information obtained under RTI Act shows that in the two years (between 2017-18 and 2018-19) various state govts. analyzed as many as 54,938 pesticides samples for quality. Out of this, more than 97% samples were found conforming to the quality standards. Only 2.8% were found to be not meeting quality standards.

Pesticides imports into India are already up by 25% in this fiscal when compared to last fiscal. This increase completely negates government's efforts under Atmanirbhar Bharat, Go vocal for local, Make in India etc. Our authorities must act immediately to check imports and promote domestic production.

What are your views on organic farming, zero budget natural farming, spiritual farming, etc.?

The agricultural production system in the world was 100% organic until 1960s when the world population was less than half of what it is today. The organic farming failed to enhance the crop yields to supply adequate food to the increasing population.

Food shortages and starvation deaths were common in India till 1960s, in the era of organic farming forcing our government to seek and accept food aids from foreign countries, notably the USA. It fetched us the infamous tag of "ship to mouth existence".

What a significant progress since then! India has now emerged as the second largest in agricultural production in the world. The application of science and adoption of intensive farming have made the difference. It is time to salute science, it is time to salute our farmers.

Remember, with all the hype, the area under organic agriculture as of 2019 in the world is only 1% of the total area under agriculture.

In other words, 99% of the world agriculture is under scientific farming. The trend will continue as long as the population is on the increase.

You have challenged the myths that link cancers to use of pesticides. How can the general public be made to understand this?

Widespread disinformation about pesticides misguides the general public as well as legal and regulatory authorities in India. Behind every disinformation campaign linking cancers to pesticides, there is a foreign funded activist NGO.

Yes, it is a myth to link cancer with use of pesticides. Cancers can result from multiple causes.

India ranks 172 in the world in Cancer rate as per the latest data released in November 2020 by the World Health Organization (WHO). Among the top ten countries with high cancer rate, six countries are in the European Union.

International Agency for Research on Cancer (IARC), a body of WHO, has published a list of 120 substances as known human carcinogens under Group-I. No pesticide currently in use figures in the Group I.

In India, the high cancer rates are in North Eastern states of Mizoram, Meghalaya, Arunachal Pradesh, Assam and Sikkim, which are not agriculture intensive states. Punjab (mischievously branded as cancer capital by foreign funded activists) stands as low as 24 in the list of states ranked by cancer rate in India.

In fact, Singapore, which has no agricultural activity, has 250% higher cancer rate as compared to India. Blaming agriculture for cancers is plain rumour mongering by foreign funded activist NGOs. Their ulterior motive is to tarnish the image of Indian agriculture, the second largest in the world.

India is a leader in production and export of generic pesticides similar to generic pharmaceutical drugs. How can India further increase its global presence?

Out of the global pesticide market of $65 bn, nearly 65% is of generic pesticides.

India is a leader both in generic pharmaceuticals and generic pesticides. When Indian generic pesticides enter global market, many companies in Europe and USA simply stop their production and begin to source from India as they can not compete with us on quality and price front.

India's pesticides industry can easily increase the exports to $8 bn in the next 3 years from the present level of $3.4 bn, if supported by enabling regulatory policies.

Arbitrary interpretation and implementation of Insecticides Act by authorities and regulatory uncertainty adversely affect domestic production and export of generic pesticides. We cannot run with chains tied to our feet.

The regulators must give up their bureaucratic "command and control" attitude and become facilitators in the interest of Indian farmers and industry.

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AGRICULTURE VISION 2021

ATMANIRBHAR KISAN PAVES THE WAY FOR ATMA NIRBHAR BHARAT

The pandemic has served up an opportunity to reshape our policies and work towards building *Atmanirbhar* Bharat. It is vital to strengthen the agriculture sector through various reforms, infusion of technology, modernisation and capital investment. Realizing the opportunity, the government has brought a slew of measures to revamp our agricultural ecosystem. The most important reform brought in by the government is the Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act, 2020. This will help to provide adequate choices to the farmer to sell produce at an attractive price, barrier-free inter-state trade and framework for e-trading of agriculture produce.

Another major reform is related to an amendment in the Essential Commodities Act 1955 to take out Agriculture foodstuffs including cereals, edible oils, oilseeds, pulses, onions and potato from its ambit. It means no requirement of stock limit in normal circumstances.

The third important legislation is The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020 which provides a legal framework for contract farming in India. Along with these legislations an Agri Infrastructure Fund with a corpus of Rs.1 lakh crore has been created for funding Agriculture Infrastructure Projects at farm-gate & aggregation points (Primary Agricultural Cooperative Societies, Farmers Producer Organisations (FPOs), agriculture entrepreneurs, start-ups, etc.). To add to these, a Rs.10,000 crore scheme for the formalisation of Micro Food Enterprises (MFE) has been initiated. This will help nearly 2 lakh MFEs to achieve technical up-gradation to attain Food Safety and Standard Authority of India (FSSAI) food standards, build brands and marketing. All these reforms have laid out the basic ground work to take agriculture on a new sustainable and prosperous path in the years ahead.

ABOUT THE AUTHOR

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Revamping Agriculture Supply Chain

The introduction of the three new farm Acts along with the Rs 1 lakh crore Agri Infrastructure fund and the scheme for formalisation of micro food-processing enterprises is likely to have a domino effect in improving the entire agriculture value chain right from farm to the fork. These measures are expected to usher a wave of private sector investments in cold storage, warehouses, processing and export creating opportunities that are waiting to be unlocked. The opening of the sector through these reforms will lead to farmers getting more freedom and an enhanced choice. It will also lead to infusing capital, adding advance inputs and introducing efficiency into the sector.

In this vision of revamping of agriculture value chains, Farmers Producer Organisations (FPOs) are expected to play a pivotal role. In this light, the recent announcement of setting up 10,000 FPOs is well-intentioned. Thus far, only a few FPOs are taking up activities up to their full potential. Most FPOs formed thus far have majorly focussed on input aggregation and are yet to realise their potential in collectivisation, value addition and marketing of agriculture produce.

The recent farm reforms will incentivise these FPOs to expand their scale of operations and partner with the upcoming agri-startups to create an efficient agriculture supply chain. Several large corporates, such as Hindustan Unilever, Godrej and ITC have also shown an increasing preference to trade with farmer collectives than the traders on whom they have traditionally had to rely on. The encouragement of corporates in FPOs may enhance the scope for contract farming and improve backward and forward linkages with industries.

To ensure that all parties uphold contract terms, it is necessary to frame contracts to incorporate insurance-based safety-net provisions, as well as provisions that allow farmers to share any unexpected gains due to market buoyancy. It is equally important to set-up dispute resolution mechanisms in the form of arbitration bodies at the district or sub-district levels, which are easy and cost-effective for

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both farmers and contracting entities. The liberalisation of the ECA, promotion of inter-state trade and contract farming provides an opportunity for FPOs to link directly with buyers or corporates across the country and also to develop more direct-to-consumer supply chains, and in the process, improve their incomes.

It is also important to ensure that agricultural expansion in the future is forward looking and inclusive. As per World Bank estimation, India has more than 140 million internal migrants. Due to the pandemic, large scale reverse migration took place. This might affect women farmers and gains achieved by them over the past decade. As per economic survey 2017-18, over 73 percent of rural women workers are working in agriculture sector. Reverse migration may push women to undertake the least paid and most menial agricultural tasks. In negotiating space for women, role of Women's self-help group (SHG) and NGOs become vital. SHG federations and village organizations can play a bigger role in providing the supply of inputs and ensure collection and marketing of produce.

Crop Diversification and Sustainable Agriculture

The new era also requires us to make sustainable choices for the future. In agriculture this requires rethinking our crop patterns such that agriculture tomorrow is not just productive, but also remunerative and resource efficient. Punjab, Haryana and Western UP were seen as the largest beneficiaries of green revolution. However, green revolution has severely impacted cropping pattern in Haryana and Punjab with most farmers cultivating government procured wheat and water guzzling paddy.

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Various agriculture reports, pertinently Johl committee reports of 1986 and 2002 highlighted that Punjab should diversify cropping pattern and switch over to pulses, oilseeds, fruits and vegetables in place of the traditional wheat-paddy cycle that is no longer remunerative for farmers and has also dried up the state's groundwater resources. Punjab State Farmers' Policy (2018) also found that after green revolution Punjab opted for paddy and wheat cultivation which has now become stagnant, uneconomical and unsustainable for farmers to produce these crops.

Although Punjab and Haryana are significant contributors in the nation's total foodgrains procurement, many see this as an opportunity for these states to de-stress themselves from the national food security burden and move towards an alternative cropping pattern, given that a host of complex issues – from farm distress to ecological crisis-have gripped their farm economy. Whereas the government claims diversification on over six lakh hectare, the ground reality is that the area under wheat and rice has increased during the last four years while the area under alternative crops such as maize, oilseeds and pulses has decreased.

It is high time that farmers of Punjab and Haryana should look beyond wheat and rice. New reforms will open the gate for private investment in these states and farmers need not rely on wheat and rice to get remunerative prices for their produce. Similarly, in other areas like Western and Central India where sugarcane is being cultivated despite the severe water crises in these regions, it is important that right incentives are provided so that crop diversification is adopted in these areas.

Ensuring Adequate Credit Availability in Agriculture

One of the problems that have emerged during the pandemic is credit for the *Kharif* season. With more than 30 million farmers who have received a moratorium on loans until August, 2020, the prospects for securing *Kharif* crop loans do not look bright. Banks rarely provide a second loan when an earlier one is outstanding. Once the lockdowns lift, banks

will be busy recovering loans that come out of moratorium and processing new proposals under the different packages. The loans for Kharif season are unlikely to get priority.

NABARD is creating additional infrastructure under RIDF to facilitate enhancement of credit flow in credit starved/ deficient districts in the states as identified by RBI. NABARD will provide credit under RIDF as a concessional financial support to the state governments. These measures will boost credit flow in credit-starved region which will eventually improve the agricultural growth in the region.

Adequate focus should be given to building other capabilities also to promote agricultural growth which include productivity increases, expansion of infrastructure, higher public expenditure on agriculture and allied services, effective extension services, sound institutions, and export competitiveness. The impact of GLC in agricultural growth would be more effective in the presence of mentioned non-credit growth ingredients. The weak contribution of credit to agricultural growth can also be addressed with proper targeting of agricultural credit to achieve the desired impact on agricultural growth.

Agriculture for the Future: Infusion of Technology in Agriculture

With the emerging applications of Artificial Intelligence (AI) in agriculture, it has become possible to reach solutions based on data that indicates weather conditions, type of harvest a crop would need, the type of soil most suitable, etc. GOI has adopted AI in schemes like Pradhan Mantri Fasal Bima Yojana (PMFBY) to reduce the time taken in settling claims of the farmers. With enhanced digitization and deeper smartphone penetration, the potential of applications for agriculture has increased manifold. There have been individual initiatives taken by some states that benefit farmers. For example, Punjab introduced 'Punjab Remote Sensing Centre (PRSC) that sensitizes farmers on crop residue burning and measuring air quality.

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The future of agriculture is precision or smart farming. In this context, use of drones has gained prominence. Another innovation which may have a long term bearing on the agriculture production and food consumption pattern has been the advent of plant based/ lab-grown meat. With rising awareness about environmentally sustainable and healthier food habits, a growing number of people are replacing a share of their meat intake with plant-based substitutes that seek to approximate the texture, flavour, and/or nutrient profiles of farmed meat using ingredients derived from pulses, grains, oils, and other plants and/or fungi. These products may soon be joined by cell-based meats grown from animal stem cells using tissue engineering techniques, which currently remain in the prototype stage of development.

Plant based/lab-grown meat is being promoted as a means of mitigating the environmental, animal welfare, and public health problems associated with farmed meat production and consumption. From an environmental perspective, plant-based substitutes can provide substantial benefits over farmed meat with substantial reduction in ecological footprint and Green House Gas emissions. This is an innovation which needs further research and can be explored as a viable option for creating a sustainable agriculture ecosystem in the future.

Bio fuels from agro waste

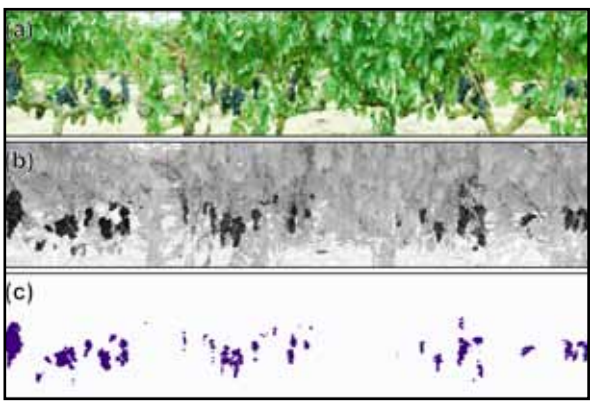
These offer ample opportunities to convert waster into wealth, prevents stubble burning and reduces import bill. Alternative energy systems by creating Solar as Third Crop requires urgent attention. Creating an Agri Stack on the lines of Indian Stack would give seamless connectivity of markets, service providers, processors to farmers. Blue Financing – dealing with water which is becoming scarcer day by day is another area of promise.

IMPROVING AGRICULTURE PRODUCTIVITY

ROLE OF HYPERSPECTRAL IMAGING TECHNOLOGY

Agriculture remains critical to India economic progress in the coming decades, despite its falling share in gross domestic product (GDP). Over the next few decades, both population growth and income growth will drive increases in demand for agricultural commodities. Population growth will lead to an overall increase in the demand for food. Income growth will have the effect of changing the composition of this demand. More demand is expected to accrue from horticulture crops (fruits & vegetables) and livestock products (dairy, meat, eggs etc). Apart from these effects, a shift is also underway towards increased demand for processed foods.

Catering to this increased demand can be possible through increasing productivity. This is because land availability for agriculture is unlikely to change in the coming decades. Indeed, land availability per farmer has



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Further intensification of inputs, without interventions promoting efficiency, may lead to substantial environmental degradation. With the effects of climate change beginning to be felt, the need of the hour is to promote farming that is both sustainable and resilient to the impact of climate change. One solution with potential to ensure both productivity and sustainability is agro-ecology. NITI Aayog has been taking the lead in the promotion of natural farming, a farming method that relies on locally sourced inputs leading to substantial reductions in input costs

only been shrinking in India. Average farm size stood at about 2.2 hectares in 1970-71. This reduced to 1.08 hectare in 2015-16. Consequently, the share of small and marginal farmers has continued to rise, coming in at 86% as per latest estimates. Therefore, any increase in agriculture production must come from increased land productivity, assuming that land constraints continue to hold in the future.

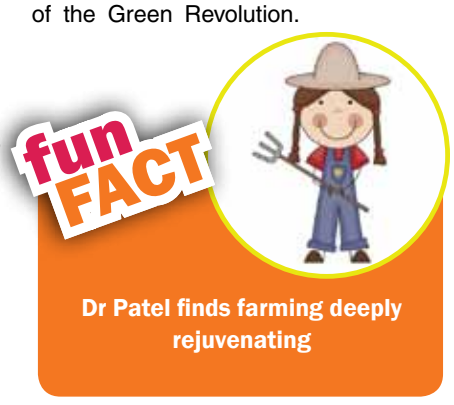
India has made significant strides in improving land productivity since the inception of the Green Revolution era policies. Take rice for instance. From yields of 864 kg per hectare in 1966-67, productivity has improved to 2,569 kg per hectare at the all-India level in 2018-19.

Bridging Yield Gaps is Vital – Both Domestically and Internationally

There exists considerable heterogeneity amongst states in terms of crop yield. For example, in 2018-19, Punjab's productivity stood at 4,132 kg per hectare, in comparison to Madhya Pradesh, where yields of rice were recorded at 1,880 kg per hectare. West Bengal, another large producer, recorded yield of 2,926 kg per hectare.

Such yield gaps also exist in other important crops such as wheat and pulses. Bridging crop yield gaps within India is highly important. This is possible through technological interventions and policy priority. At the same time, bridging the yield gap with international levels is another important priority. Large yield gaps exist in paddy cultivation when compared to the rest of the world. Similar gaps are witnessed in pulses as well. Therefore, India must bridge the productivity gap both amongst its states and also with the rest of the world.

One way to increase land productivity is through intensification of inputs, as we saw since the inception of the Green Revolution.



Dr Patel finds farming deeply rejuvenating

Expanded availability of quality seeds, irrigation facilities, adoption of chemical fertilisers, pesticides, along with a massive expansion of credit were the key areas of intervention through which land productivity was increased during the Green Revolution. One of the key reasons for Punjab and Haryana's high productivity numbers is that close to 100% of the cropped area is irrigated, assuring higher cropping intensity.

Consequently, increasing the area under assured irrigation has been a constant policy priority for the government. Yet, at an aggregate level, only 47% of India's area has assured irrigation, with the rest still depending on the monsoon. Expanding the use of chemical fertilisers has been another important policy priority, as we have seen an expansion of fertiliser use from

2.17 million metric tonnes (MMT) to 27.4 MMT, more than a tenfold increase. Pesticide consumption has also been increasing at a steady pace.

Challenges of Inefficiency of Input Use

However, over the years, inefficiency in input use crept in. In many areas, farmers resort to lopsided application of nitrogenous (N) fertilisers in comparison to phosphorus (P) and potassium (K). This lopsided application of fertiliser has serious implications for soil health and water quality. Studies have linked this imbalance to degrading soil health. The concern caused by degrading soil health prompted the launch of the soil health card (SHC) scheme.

Another important fact to note is that the crop response ratio in India has fallen from 12.1 kg of grain per kg of NPK in 1960-69 to 5.0 kg of grain per kg of NPK recently. This means that more doses of fertilisers are required to maintain the same level of productivity. Excess nitrogen ends up in the water. When oxidised, it turns into nitrate. This can lead to severe health hazards. Imbalance use of the pesticides have

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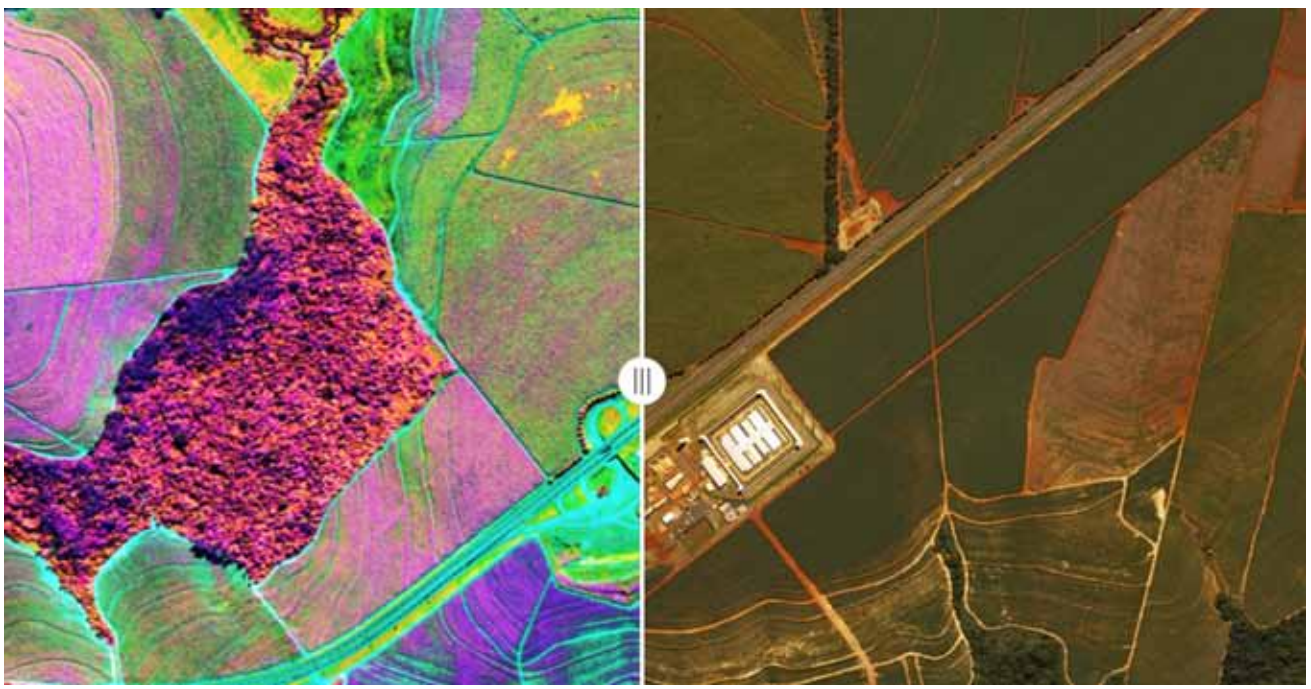

also been termed as carcinogenic, leading to further health issues down the value chain.

Groundwater Depletion

Nearly 90% of India's annual groundwater consumption comes from the agriculture sector. Over time groundwater became the predominant source of irrigation in India, rather than surface water. Nearly two-third of India's irrigated areas is being fed by groundwater. Combined with flood irrigation practices, India's water-use efficiency – especially in the agriculture sector – is among the lowest in the world. Rising demand from industry and domestic use is further exacerbating India's water problem. NITI Aayog's Composite Water Management Index (CWMI) has noted the alarming situation of groundwater depletion in the country. The government has focused on promoting micro-irrigation, and progress has been made after launch of PMKSY.

Threat of Environmental Degradation

Further intensification of inputs, without interventions promoting efficiency, may lead to substantial environmental degradation. With the effects of climate change beginning to be felt, the need of the hour is to promote farming that is both sustainable and resilient to the impact of climate change. One solution with potential to ensure both productivity and sustainability is agroecology. NITI Aayog has been taking the lead in the promotion of natural farming, a farming method that relies on locally sourced inputs leading to substantial reductions in input costs.

Natural farming promotes sustainability and boosts local biodiversity, an important aspect in the fight to adapt to and mitigate the impact of climate change. India can lead the way for the world in introducing a new paradigm for agriculture, which is sustainable, productive and remunerative to farmers

The practice holds promise for improving biological soil health and local biodiversity, enhancing the climate resilience for crops, contributing towards the Sustainable Development Goals (SDGs), and supporting the achievement of the Global Nutrition Targets 2025 of access to affordable and safe food. With intercropping as a core tenet of natural farming, an automatic diversification of production is encouraged through this method. Natural farming is a more efficient in water use as well. A study published in February 2020, covering five districts in Andhra Pradesh during the kharif season, found savings of 1,400-3,500 cubic metres of water per acre per paddy cropping period.

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AGRI REFORMS
THE WAY FORWARD FOR NAFED

Agriculture and allied activities are the primary source of income for around 58% of total population of India. Due to lack of adequate post harvest infrastructure and linkages for connecting farmers to markets, 15-20% of agricultural yield is wasted annually.

New Agri Reforms: Government's resolve to bring prosperity in farm sector

The Hon'ble Prime Minister is committed to doubling farmers' income and bringing prosperity to the farm sector. Understanding the role of infrastructure for agricultural development and need for linking farmers directly to the market, GOI has announced various schemes for farmers' welfare. The new agricultural laws aim to provide the farmers with better marketing opportunities along with post harvest and other infrastructure at their door step.

Scheme for creation of FPOs: In the Union Budget 2019-20, the government announced the formation of 10,000 new Farmer Producer Organisations (FPOs) to ensure economies of scale for farmers over the next five years. Department of Agriculture Cooperation and Farmers Welfare (DAC&FW) has approved a new scheme titled *Formation and Promotion of Farmer Produce Organizations* (FPOs) with a total budgetary provision of Rs 4,496 crore for five years (2019-20 to 2023-24) with further committed liability of Rs 2,369 crore from 2024-25 to 2027-28 towards handholding of each FPO for five years from its aggregation and formation.

Hon'ble Agriculture Minister Shri Narendra Singh Tomar inaugurating the Honey FPO Initiative of NAFED

Creation of Agri Infra Fund: Another important initiative of GOI is the Rs 1 lakh crore Agri Infrastructure Fund, wherein financing facility of Rs 1,00,000 crore will be provided for funding agriculture infrastructure projects at farm-gate and aggregation points. DAC&FW has formulated a Central Sector Scheme to mobilize medium-long term debt financing facility for investment in viable projects relating to post-harvest management Infrastructure and community farming assets through incentives and financial support. This facility targets all stakeholders in the agriculture ecosystem, particularly farmers, including FPOs, PACS, Marketing Cooperative Societies and Multipurpose Cooperative Societies.

NAFED's onion storage infrastructure

The improved marketing infrastructure will allow farmers to sell directly to a larger base of consumers and hence, increase value realization of their produce. With investments in logistics infrastructure, farmers will be able to sell in the market with reduced post-harvest losses and a smaller number of intermediaries. This will make farmers independent and improve their access to market.

With modern packaging and cold storage system access, farmers will be able to further decide when to sell in the

market and thereby improve realization for their produce. Community farming assets for improved productivity and optimization of inputs will result in substantial savings for farmers. The scheme will facilitate setting up and modernization of key elements of the value chain including Post Harvest Management Projects like: (i) Supply chain services including e-marketing platforms (ii) Warehouses (iii) Silos (iv) Pack houses (v) Assaying units (vi) Sorting & grading units (vii) Cold chains (viii) Logistics facilities (ix) Primary processing centers (x) Ripening chambers.

The scheme will promote viable projects for building community farming assets including (i) Organic inputs production (ii) Bio stimulant production units (iii) Infrastructure for smart and precision agriculture (iv) Projects identified for providing supply chain infrastructure for clusters of crops including export clusters (v) Projects promoted by Central/ State/Local Governments or their agencies under PPP for building community farming assets or post harvest management projects.

Farm Reforms: Opportunities for NAFED, FPOs, Member Cooperatives

To ensure long term sustenance, it is imperative for organizations to adapt themselves to the changing business environment and constantly explore new business opportunities. The farm reforms have paved the way for creation of business opportunities for NAFED and its member cooperatives with the overall aim of farmers' welfare. GOI is promoting the creation of FPOs and societies in view of their significant role in fulfilling the mission of implementing agricultural reforms in the country. Promotion and Formation of FPOs and societies is the first step for converting *Krishi* into *Atmanirbhar Krishi*.

NAFED is working closely with several FPOs and societies in Maharashtra and will work on similar lines in Odisha and Karnataka. In the current marketing ecosystem, the new agriculture policy and other reforms initiated by the Central government have created several opportunities for FPOs and our member societies. NAFED is now working with a different perspective and has devised plans to work towards linking producers directly with buyers. NAFED is working closely with several FPOs and societies in Maharashtra and will work on similar lines in Odisha and Karnataka.

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Mr Sanjeev Kumar Chadha
Managing Director, NAFED

NAFED
60 Years in Service

NAFED ventured into the creation of FPOs with the takeover of Federation of Indian Farmers Association (FIFA). FIFA, under the aegis of NAFED, shall focus to support FPOs registered under the Cooperatives Act and Companies Act by linking them to markets for their agriculture produce, providing them economies of scale for meeting their logistical and agriculture inputs' requirements along with several other benefits.

Inauguration of Honey FPOs: The Honey FPO Programme of NAFED was inaugurated by the Hon'ble Minister of Agriculture and Farmers' Welfare Shri Narendra Singh Tomar on November 26, 2020. Inaugurating the programme, the Hon'ble Minister said, "Despite having a huge potential of honey production in the country, the beekeeping industry is still underdeveloped. NAFED will address these issues by acting as an intermediary and filling up the gaps between the elements of the beekeeping supply chain and also ensure price remuneration to the beekeeping farmers. Through these Honey FPOs, NAFED will work for promotion of beekeeping as an occupation for unemployed women and tribal populations and uplift their livelihood".

Various FPO-related initiatives of NAFED are under implementation in Maharashtra. NAFED is planning to invest in Odisha by partnering with FPOs. FIFA has executed an agreement with Siksha 'O' Anusandhan University in Bhubaneswar for incubation and training facility. The agriculture portal e-kisan allows farmers to showcase their produce online to wholesalers to bid remotely and sell directly without depending on middlemen.

Creation of post harvest infrastructure by cooperative societies: Under the Agri Infra Fund Scheme, NAFED is seeking proposals from its member societies for creation of post harvest infrastructure like mandis, godowns etc. NAFED will provide handholding to societies for preparation, evaluation and appraisal of business plans/project proposals, sanction of funds, implementation etc. The creation of such infrastructure shall generate additional income for societies, provide benefits to members and other farmers in the region.

VISION FOR SOIL HEALTH 2021

CONCERNS AND OPPORTUNITIES

Soil is the most precious gift of nature to humankind which provides us the basic needs like food, nutrition and good environment. It is essential that the soil remains healthy so as to provide ecosystem services effectively and on a sustainable basis. Some attributes like fertility, compaction, bio-wealth and low erodibility are the indicators of good soil health. The soil organic carbon (SOC) is the basic foundation to support and sustain soil health. Often led by faulty land use and gross mismanagement/over-exploitation, the SOC content gets diminished. This sets in motion a vicious cycle of events that spark fall in soil health. Wearing down of soil health costs an annual loss of more than 20 million tons or 1% of the global annual foodgrain production. Worldwide, 1.5 billion people and 42% of the poorest of the poor live on degraded lands. Share of India in global degraded land area is about 10% and of population that thrives on degraded land is 17%.

Organic recycling is fundamental to improving and sustaining soil health. India has vast potential of organic waste resources, recycling of which is vital for supplementing plant nutrients and maintenance of soil health. Organic recycling in agriculture is limited in our country because of several competitive uses of crop residues, animal waste, etc. as well as burning of crop residues due to economies of scale. The Government of India has launched a mission on soil health and undertaken a massive effort to provide soil health cards to all farmers. It is critical to know as to how best the soil health information could be used to provide rational fertilizer recommendation on both spatial and temporal scales to the farmers ensuring sustained soil health. The hazards of soil degradation and presence of pollutants in the soil adversely affect the soil health. The issue concerning soil degradation and pollutants has not been addressed on a priority basis to save our farmland's capacity to produce food, feed, and fuel for the growing population.

Among different strategies for improving and sustaining soil health, balanced plant nutrition has a key role to play. The balanced fertilization as a prerequisite of high nutrient use efficiency has been well recognized for a long time. However, the acceptance and adoption of balanced fertilization at farmers' level is far from the expectation. The major is -

Dr RS Paroda

sues that restricted the adoption of balanced fertilization includes policy towards highly subsidized urea and lack of easily available and usable tools that can allow farmers and their advisors to implement balanced fertilization quickly in their fields.

The onslaught on soil quality is the act of all stakeholders – farmers, builders and common folks. The same stakeholders are the part of the protection and conservation programs too. Farmers are not adequately empowered with the right knowledge and know-how for sustainable soil health management. Also, there is lack of convergence and coordination of diverse R&D programs, interventions and investments spread across institutions, agencies and development departments which need to be welded together for time-bound output and impact.

Create an enabling environment for fertilizer use efficiency

- The scientists must work hand-in-hand with farmers to validate practicality of their findings on improving the conventional methods of fertilizer management. Also, the extension services need to be improved for adoption of efficient methods of fertilizer application and management.
- Evolve institutional mechanisms and prioritize investments for linking Integrated Farming Systems (IFS) and Sustainable Intensification (SI) options for improving soil health, human nutrition and to reduce environmental footprints.
- Reduce sole dependence on chemical fertilizer sources and enhance the use of organic manures so as to increase nutrient use efficiency and factor productivity.
- Support small farm mechanization for proper fertilizer placement to minimize gaseous and runoff losses of fertilizers, improve NUE, reduce environmental foot prints and increase farm productivity as well as income.
- Promote small scale industry for manufacturing appropriately designed fertilizer nutrient mixes by dry granulation (compaction)
- The agri-input dealerships need to be licensed only to those who undergo specialized vocational training for common field problem diagnostics and relevant agro-input management.
- Launch a scheme to incentivize good environmental services by the farmers/ farmer groups, who without sacrificing productivity maintain soil health through efficient nutrient management practices.

Mainstream organic recycling

- Maximize returns of various organic sources by: (a) evolving community/ village biogas units to replace dung as fuel, (b) enacting legislative measures that obligate total ban on burning of vegetative materials of all kinds, (c) adopting short duration multipurpose varieties of legumes as catch crops in cereal-cereal rotations, (d) popularizing conservation agriculture practices, (e) promoting the integrated soil and nutrient management practices, and (f) rewarding and incentivizing those who are adopting the above measures.
- Concerted efforts need to be made to prioritize investments and redesign interventions responding to farmers' specific needs and aspirations under conservation agriculture (CA).
- Adoption of CA be linked to utilizing leftover straw as mulch. In order that residue does not impede zero-till sowing operations, the support be extended to make available the necessary machinery for cutting and evenly spreading straw on the ground using straw spreader and Happy seeders for direct drilling. Such an arrangement could be in the form of custom-hire basis or on cooperative basis.
- There is an urgent need to target at least 10% replacement of chemical fertilizers by bio-fertilizers in the next 5 years for which there is need to strengthen quality standards, efficient production methods, shelf-life enhancing storage, and proper distribution and marketing.

Invest in arresting soil degradation

- Develop location and situation specific land use alternatives that are more competitive and less exploitative of natural resources than those currently in practice.
- With pre-identified indicators, quantitatively assess soil degradation and classify soils as per degree of severity. An integrated approach combining professional criterion and indigenous methods of soil health analysis and cure is seen to be more acceptable requiring less lag time.

(Source: The Trust for Advancement of Agricultural Sciences (TAAS)

AGRICULTURE
COULD IT BE A PROFESSION OF hope?

ABOUT THE AUTHOR

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Within the current decade we shall gain the dubious distinction of being the most populous nation in the world. We already have the largest rural population. We are also the biggest consumer base in the world. We are either global leaders or among the top three in the production of pulses, wheat, rice, jute, vegetables, fish etc. We have been the biggest milk producer for more than a decade now; and are close on the heels of the first position holder in egg and meat production.

In absolute terms we are huge, but low productivity plagues us, be it per hectare, per cattle/livestock, per unit of input or effort. Half the country's population is engaged in agriculture, and this includes livestock, but contributes a meagre less than 16% to the national GDP. This simple fact itself gives a clear idea of how low our productivity is, and what a lost opportunity it amounts to.

Multiple challenges

Small landholdings are an inherent impediment to higher productivity; 86% agriculture land holdings are less than 2 hectares. Some other challenges we face are poor farm infrastructure, limited value addition, inefficient markets and lack of access to credit. The reality of farming is harsh; it has become a thankless task. Today, agriculture is merely a basic food production system. IT is not valued as a profession. The farmer is wary

of any long term investment and hence content to live from harvest to harvest. Such risk aversion stands against the principles of growth. The end result is that the farmer manages to share only a small fraction of the end retail price of his produce, the bulk being cornered by the trader, processor, retailer and other such entities along the supply chain. Against this background, what scenarios should we work on?

Food security was the guiding principle of the green revolution. We now need to move on to income security and there on to prosperity through agriculture. The country has more than adequate surpluses to promote such a move. Our food production approach and system should move away from calorie-centric production to nutrition focused produce, an approach of looking beyond basic cereals. This would lend greater profitability to agriculture.

Our inability to look beyond green revolution gradually resulted in the onset of stagnation. The past success of this revolution has become a burden in the form of low value farm surpluses.

Agriculture needs Paradigm Shift

It is important to differentiate between food and agriculture. Food is one of the biggest items of household expenditure. The money flows more to value addition rather than agriculture. Dubling production does not necessarily mean doubling farmers' income. Contrast this with the white revolution. Operation Flood was farmer-focused rather than being technology centric and production obsessed. Milk production has been consistently growing at above 6% per annum compared to 2-3% of the crop sector. Milk producers obtain about 70% of the retail consumer price. Agriculture could do well through a paradigm shift in approach from production to value, a shift from quantity to quality, both of the produce and the life of the farmer. The model has been demonstrated effectively by the white revolution.

Rainbow revolution is an attractive nomenclature given to integrated development of agriculture encompassing cereal crops, horticulture, dairy, poultry, aquaculture, meat production etc. – seeing the whole rather than a narrow focus on farm crops. Besides meeting the rapidly growing consumption and demand of animal protein, it shall significantly enhance farmer income. Future policies and strategies of agriculture must involve all livestock, poultry and fisheries activities. The real potential of growth exists here.

A simple and desirable solution to profitability is reducing input costs and increasing the monetary value of the output, a basic tenet all businesses work upon. So should it be in agriculture, the mantra being to produce more with less – much like the call for "more crop per drop". Effective input controls would entail, inter alia, effective water management. At the other end of the spectrum would be output management by way of efficient supply chains and value addition.

Nearly 20% of our fruit and vegetables perish on account of poor supply chain, and a large quantity realises low returns due to lack of value addition. The situation in fish is no different. Various empirical studies indicate that in agriculture produce such as fruits, vegetables, milk etc. the return to the farmer could be as much as four times higher through value added products. A clear advice that investment in strengthening supply chains and building processing infrastructure should be accorded a high priority.

Suggested interventions

Possibilities are endless, so could be the suggested interventions. Some of the other important and decisive ones are as follows.

1. Reform the extension system. The research in new breeds, seeds, technology, practices etc. is still far out of reach of the farmer. He relies more upon his own traditional knowledge and experience rather than the extension system, which in any case is characterised by a complete disappearance.

2. Promote high growth and higher value commodities as we have already established the need to look beyond food security. This would also require facilitating crop diversification, and again the extension machinery's role becomes critical.

3. Shift from basic farming to efficient, productive and, above all, sustainable farming. Next generations should adopt it willingly as a profession not a burden.

Let us admit and recognise that existing thought and approach, and the solutions they offer are outdated and ineffective. We must also recognise that both agriculture and farmers have been captives of a narrow vision dictated by politics and populism, or by policy makers too distant from the soil. An honest vision should accord recognition to agriculture as a prime engine of economic growth and not merely a source of votes.

Vital AGRI EXTENSION Priorities

With the increasing population and demand for better quality and higher quantity of *food, fibre and feed*, performance pressure on farms is increasing. As per ICAR estimates, demand for food grains shall increase from 192 mt (2000) to 345 mt (2030). In the next 20 years, production of food grains needs to be increased at 5.5 mt annually.

The frontline extension system has been playing a critical role in dissemination of improved technologies and providing customised agro-advisories as well as services to the farmers. Our 721 Krishi Vigyan Kendras (KVKs) are regarded as an institutional innovation that effectively link agricultural research and extension at the district level. They play a key role in transfer of modern and emerging technologies in agriculture and allied sectors. This has led to increase in production and productivity, development of high value horticulture, livestock and fisheries, introduction of newer varieties for pulses and oilseeds. The effort of KVKs has resulted in increase in income of farmers and promotion of farm-based enterprises. KVKs should collaborate with state development agencies, NGOs and other stakeholders to provide technology training, advice on selecting crops for the coming season based on the availability of input, facilitate custom hiring and provide information about various GOI schemes. The following prioritized extension interventions should be emphasized for sustainable agricultural development and addressing agrarian challenges.

> Commodity Groups and Commodity Clusters can be formed for farmers to take advantage of aggregation of resources

Creation of National Level Farmers' Database for delivery of customised farm advisory: KVKs and other extension agencies send farm advisory through mobile messages and even through web portals. Most such messages are sent in bulk to the farmers of a whole region or district. They often fail because they are not farm specific and need based. Each locale, each farm, every farmer faces different problems. Hence generalized advisory is not helpful. A National Farmer Database will contain information on each farmer in the country with respect to location, land resources, crops cultivated and other relevant parameters. This shall

immensely help in agricultural research, extension and effective delivery of farm advisory.

Strengthening Technology Support Institutions: Technology support can be strengthened by establishing a four-way mode of communication – between labs, from land to lab and lab to land, and between farms. Every village can be facilitated by an ACABC to offer farmer doorstep service and generate employment in rural areas. The technical support of Farm Tele-Advisors needs strengthening. The number of KCC can be increased. Continuous capacity building of agricultural extension professionals in Agricultural Journalism deserves priority attention. Common Service Centres numbering 3.5 lakhs may be utilised to serve as 'Extension Delivery Points'. KVKs need to be strengthened to focus on income enhancing technologies in PPP mode (value addition, post-harvest, agri-business enterprises).

Agri-preneurship and Business Incubation through Skill Development of Rural Youth: Extension service can organise more buyer-seller meets to expand scope for direct selling by farmers, and explore scope for contract farming, creation of farmer producer

organisations and village producer organisations. ICAR schemes like Attracting and Retaining Youth in Agriculture (ARYA) and Student READY (Rural Entrepreneurship Awareness Development Yojana), along with GOI schemes like Skill India, Start-up India, Stand-up India, Pradhan Mantri Kaushal Vikas Yojana are playing a significant role in capacity building of the farming community, especially the rural youth. Through these inititiaves, successful agripreneurs can be developed in rural areas.

Post–production Infrastructure and Processes: Huge post-harvest losses can be reduced by establishing strong marketing networks and appropriate infrastructure. Storehouses, agricultural markets with easy access, proper sheds and storage facilities, cold chain facilities for transportation and storage of perishables like milk are essential to combat such losses. Effective grain storage with minimal grain losses can significantly contribute toward reducing overall food losses for smallholder farmers and have an immediate and significant impact on their livelihoods. Value addition and processing of farm produce can also reduce post-harvest loss and enhance farmers' income. Value Addition and Technology Incubation Centre in Agriculture (VATICA) has been conceptualized by ICAR to create a facility to provide incubation training to rural youth in processing and value addition. ICAR on its own funding support will create 3-4 units as model units in the KVK campuses.

Promotion of Cooperatives and Commodity Clusters for Quality Management and Control over Market: There are plenty of examples of successful cooperatives in India, like AMUL and Mother Dairy which operate at national level. Unfortunately, these success stories have remained confined only to the dairy sector. Similar cooperative structures should be promoted in other agricultural sectors to take advantage of aggregation of resources. Commodity Groups and Commodity Clusters can be formed for farmers. When small farmers are facilitated to organize groups, trained and guided properly, they can attain tremendous development goals to make the group self- reliant and self-sufficient. Linking primary producers with modern food supermarkets is seen as a way to improve rural livelihoods, especially small producers. It is important to ensure that the process of establishing linkages between corporates and primary producers is not exclusionary in nature and becomes a win-win deal for participants in the supply/value chain.

A robust and efficient extension system which is capable of meeting the evolving needs of farmers in the context of changing agricultural scenario is the need of the hour. It shall enhance farmers' income and also ensure sustainable growth of agricultural sector. It is time to strengthen the structural framework of extension system to fulfil its ever widening scope.

ABOUT THE AUTHORS

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Dr R Roy Burman is Principal Scientist (Agricultural Extension), ICAR-IARI, New Delhi

GREEN TECHNOLOGY PESTICIDES

MUST REACH ALL FARMERS

The role of crop protection solutions insures a farmer's investment on other inputs. It also ensures the food, nutrition, health, wealth and environment security of the nation. We need to strengthen our farmers by providing them latest technology i.e. green technology pesticides which are only used a few grams per hectare. The new technology pesticides are much safer for humans, animals and the environment. They minimize the burden of chemicals in agriculture and environment.

Our Government recently made a landmark move to allow drones to cover almost 70% of India's landmass. Spraying of agro-chemicals through drones will benefit the huge Indian farming community in dealing with the cyclical menace of insects, pests, fungus, weeds etc.

> Agrochemicals, especially pesticides are firefighting tools and the only option to control pest outbreaks

The government's vision is that of ensuring the reach of latest technology to even the most marginal farmers. For the dream of making India a US$5 trillion economy and agri-led, we need these technologies at the earliest.

ABOUT THE AUTHOR

Shri Ram Gopal Agarwal is the Group Chairman of Dhanuka Agritech Ltd.

Right technology, farmer-oriented policies and right price for the farmers are some of the ways to ensure their welfare

Major roadblocks

The genuine Crop protection sector is doing a yeoman's service for the farmers and the nation. There are major roadblocks such as the ones briefly mentioned below in realizing the true potential of Indian crop protection sector:

- India's need for new technology molecules which are currently stifled due to delay in implementation and related laws,
- Need to incorporate scientific recommendations in Pesticides Management Bill 2020 and draft it to meet the needs after post Covid situation.
- Challenge of spurious, counterfeit, illegal, smuggled bio pesticides laced with chemical pesticides and large scale grey market. Despite GOI action way back in 2010 (Govt. notification to eliminate such players), no further action has happened on the ground
- Complete overhaul of CIB&RC (Registration authority and Quality control systems) and state governments licensing system along with quality control systems which are absolutely redundant.
- Reforming the Central Insecticides Laboratory, regional and state pesticides testing laboratories which are the last defence before a pesticide reaches the farmer. We must make NABL accreditation mandatory.

Presently, India is the 4th largest producer of pesticides globally. Domestic Indian pesticides market was worth around 214 billion during 19-20. If GOI takes bold steps to address the challenges faced by the sector, I will second the Database Research & Markets report which projects the domestic Indian pesticides market to reach Rs 316 billion by 2024-25 at 8.1 pc CAGR.

As of today, the Indian pesticide export is approximately US$ 3 billion, with 50 pc export. Our export can go up to 60-65 pc and increase to US$ 6 billion by 2025 by framing the right policies, for which I am personally doing a lot of policy advocacy through FICCI, where I am the Chairman of the Sub-Committee on Crop Protection Chemicals.

Our farmers use the lowest pesticides in the world, yet face accusations of using pesticides indiscriminately. There is huge scope of growth of agriculture yield provided genuine new pesticides molecules are used appropriately in the prescribed manner.

New agri laws will empower farmers

It is essential for Indian agriculture to enhance productivity in diverse sectors. Our oil seeds, pulse crops and corn need attention. The reforms initiated by the Prime Minister and the three new agriculture laws shall empower Indian farmers in many ways. The most important reform is ensuring better marketing facilities for farmers.

GOI has taken a series of initiatives to execute and monitor the outreach of technologies, soil health card scheme, simplification of agriculture credit, PM Sinchayee Yojna, Paramparagat Krishi Vikas Yojna plus credit facilities strengthened. National Agricultural Market (eNAM) platform was created to provide direct market access to farmers by linking them to all major mandis of the country for better returns. There is need to address yield gaps in major crops such as paddy, sugarcane, cotton, pulses and oilseeds. These gaps are bridgeable with the planting high yielding varieties, stress (biotic and abiotic) tolerant varieties time to time demonstrated at farmers' fields based on agro-climatic zone and adopting timely

pest management operations. Extension workers must reach the doorsteps of the farmers with area and region-specific technologies. Micro irrigation through drip and sprinkler has proved to be effective both in terms of cost and output. A comprehensive fodder policy is necessary to address shortage of feed and fodder shortage and boost growth of livestock.

Revisiting infrastructure facilities

With better infrastructure, export will increase. Initiative for lease lined regulations will help in increase of export of horticulture crops. Horticulture is a major sector to double the income of the farmers. The demand of horticulture crops, spices and condiments along with medicinal plants and various herbs has increased after Covid, and will further grow. This will provide employment, nutritional food and also better income to the farmers.

Agriculture Produce Marketing

Agriculture market infrastructure scheme which provides market benefits to individual farmers, farmer organizations, cooperatives and Panchayati raj institutions helps in establishing agriculture market infrastructure. E-NAM (National Agriculture Market) is picking up, which ensures transparency in weighing, which ultimately benefits the farmers. Agri startups are bringing bright young minds with technology skills to the field of agriculture.

Judicious Use of Water: More Crop Per Drop

There are enough technologies which can increase water efficiency by 30-40 per cent. Unfortunately, water is not priced as an economic good, hence its use isn't efficient. For sugarcane and rice, use of drip irrigation and sprinkle irrigation can maximize water use efficiency. Probably it is time to price water. Judicious use of water, where drinking water is scarce, is the need of the hour. Growing groundnut in summer in arid areas like Jodhpur with 30 spray and taking water from 1000 feet or 1500 feet leaving no drinking water available is not justified. Agriculture has to be seen as a holistic industry for inclusive growth, not for one parameter.

Is Agriculture Possible Without Agro-Chemicals?

Many new pests, weeds and diseases have been reported to cause serious damage to crops, resulting in as much as 18% crop losses valued at Rs 90,000 crore. Agrochemicals, especially pesticides are firefighting tools and the only option to control pest outbreaks. The pesticide industry offers a wide variety of environment friendly agrochemicals for the benefit of farmers. In agriculture production pesticides along with other inputs like fertilizers etc. have contributed immensely. Pesticides helped in expression of full yield potential of fertilizer and irrigation responsive HYB's during green revolution and also now under Rainbow Agriculture.

Recently, India fought with the invasion of desert locust spread over 50,000 hectares in Rajasthan, Gujarat, M.P., U.P., Punjab and Maharashtra successfully by using insecticides when all other measures failed.

Improving Farm Productivity

The transfer of the technology and policies to farmers with small land holdings must happen in order to increase farm productivity. Raising fertility by improving the microclimate of the soil will enhance productivity. This includes enhancing microbial activity in soil by adding biomass. The normal pH helps in realizing the potential of cultivars. Use of potentially sound seeds with nutrient rich traits, efficient use of water, nitrogen and phosphorus products, micro-nutrients for total soil health, organic matter and the carbon economy of the soil system are all very important.

Many farmers use technologies in an inappropriate manner due to three reasons.

Awareness: Several farmers do not deploy agriculture best practices like right seed, crop rotation, inter-cropping, right plant density due to lack of awareness.

Affordability: Low income and small landholdings prevent several farmers from investing in new technologies, techniques and mechanized equipment like tractors, harvesters.

Availability: Several times farmers are not able to use quality inputs due to lack of availability in their regions.

Banking Sector for Current Credit Flow to Farm Sector

Credit is the key word in the farming sector. The SBI website has almost 20-25 types of loans for farmers. Right from "Kisaan Credit Cards" to "agriculture term loans" to gold loans, also agri-business loan, agri-clinic loan, agri-technology loan etc, everything is there. But then there are not enough entrepreneurs or many startups in the agriculture sector. Safe funding, investment – everything can be arranged by the bankers, and their role is very important.

Right technology, farmer-oriented policies and right price to the farmer is some of the ways to ensure farmer welfare. Subsidy is not the solution.

The UN General Assembly designated 2021 the International Year of Fruits and Vegetables (IYFV).

The IYFV 2021 is a unique opportunity to raise awareness on the important role of fruits and vegetables in human nutrition, food security and health and as well in achieving UN Sustainable Development Goals.

21ST CENTURY AN INFLECTION POINT FOR INDIA'S AGRICULTURE

It was by millions of years of evolution, that the first Homo species appeared on earth 3,50,000 years ago, and there were at least five of them. Over the time period that followed, the one species that survived finally is *Homo Sapiens*, to which the modern man belongs.

Dr Ashok Dalwai is CEO, National Rainfed Area Authority and Chairman, Empowered Body, Doubling Farmers' Income

The pre-agriculture forager man learnt to identify and collect consumable grains from the forest areas around 20,000 BCE. The next milestone in the civilizational march was 9,500 BCE, when man took to husbanding of crops and domestication of animals. These initiatives should be recognised as an inflection point in human history. This is what ensured mankind safer and surer access to food, enabling the growth of human settlements and evolution of the first civilizations.

India has been one of the 11 global hotspots that mark the beginnings of agriculture on earth. It was 10,000 years ago that the first seeds of agriculture were sown at a village, today called Mehragarh at the foothills of Bolan heights in Baluchistan. This grew into one of the largest human settlements between Indus and the Mediterranean. Beginning 7,000 BCE, there is also evidence of harvesting of rice and sedentary settlement at the present day Lahurdeva village of Sant Kabir Nagar district of Uttar Pradesh.

The early Harappan era (5,500 to 2,000 BCE) saw early agricultural settlements growing into towns. During 3,700 to 1,500 BCE, the practice of agriculture spread over different parts of India,

encompassing Eastern Rajasthan, Southern India, Vindhyan region of Central India and Swat Valley of Kashmir.

Thanks to diverse and conducive climate and soil systems, agriculture emerged as a robust primary economic activity over the last 10,000 years. It secured food, fodder and feed; generated jobs; supported agro-processing and other rural & cottage industries; and created wealth for the society. This period constitutes the civilizational past of India, anchored around the agriculture sector.

The Post-Independence Period

Beginning with 1947, when India gained independence and embarked upon a new era of socio-economic transformation and up to the current times, the period can be described as India's Present. Even during this period, it is agriculture that has been a major economic activity from the perspective of supporting livelihood. It was near 80 percent of the society that eked out its living from agriculture when India rolled out its first five-year plan in 1951. Even today, a high of 48 percent of the country's elephantine size of 1.30 billion population depends upon agriculture directly or indirectly. Supported by science and technology and facilitative policy framework, Indian farmers have transitioned the country from food deficiency in the 1960s to food sufficiency by 1970s, and finally to the current times challenged by food surplus.

Price Disequilibrium

Supply of agri-produce in excess of demand results in lower prices, to the disadvantage of farmer-producers. Such price disequilibrium in the market is a disincentive to farmers, as it causes low returns on investment and loss of potential income. The contemporary challenge to sustaining of agricultural production and profits for the farmers needs to be addressed by a comprehensive post-harvest management.

Farmers will need a market structure that is integrated over time and space, for them to harvest the price advantages. Monetisation comprising agri-logistics, processing and marketing efficiency can alone help the farmers to capture maximum value on their marketable surpluses

Monetisation of Agri-produce

Generally, one talks about the importance of remunerative prices on the farmers' produce to generate profits. While it is no gainsaying that transfer of higher real remunerative prices is good for the farmers, it should be borne in mind that this is only a necessary condition and does not meet the condition of sufficiency. Farmers need to sell all their marketable surpluses at best prices. This can be achieved by enabling the farmers to reach out their marketable surpluses without compromise of quality to the demand centres, which may be near or far from the farm gate. This suggests the need for appropriate agri-logistics comprising primary processing, storage and transportation systems for both perishable and non-perishable nature of agri-produce.

A robust and integrated agri-logistics system will convey the agri-produce from production zones to consumption zones in sync with supply-demand situation across the country, besides facilitating integration with global market. In effect, this helps in integrating physically dispersed spot markets to the advantage of farmers, and let them harvest the scope for remunerative price discovery. This is spatial integration of markets.

Simultaneously, farmers also need



to be supported in conquest of time, which beside space is an important element of marketing efficiency. All agri-produce when in surplus cannot be consumed locally or even in far-range consumption centres, immediately or within a reasonable period of time once harvested. The unconsumed produce is subject to decomposition, since agri-produce is a living organism.

It is therefore important that the period of sale is extended to find later day demand. This approach is enabled by subjecting the produce to agro-processing which includes both food and non-food processing. When the produce undergoes physico-chemical transformation on processing, the shelf life gets enhanced and suitable value can be captured on the raw produce of the farmers. The processed produce can travel over greater spatial distance, and also conquer time that normally results in food decomposition and food loss. This is integration of markets over time.

In sum, the farmers will need a market structure that is integrated over time and space, for them to harvest the price advantages. Monetisation comprising agri-logistics, processing and marketing efficiency can alone help the farmers to capture maximum value on their marketable surpluses.

Functional Expansion of Agricultural Markets

Having examined the critical role of expanding the market space over space and time, it would help to consider another aspect of creating new demands. Surpluses can be expected to arise from increasing productivity-linked production on the back of improved technology. This hints at the urgency of expanding the horizons beyond the conventional agri-markets for food, fodder and feed.

The country's production pattern can go beyond just food, fodder and fibre to also include industrial raw materials. An effective linkage between farms, industrial and energy sectors will be a win-win context

Agriculture since its beginning has been associated with food for the humans and the animals. The R&D, government policies and programmes have mostly been tailored to meet this requirement. However efficient the new market architecture is, it can be hit by a new challenge of surplus over demand unless the cafeteria of agri-produce is diversified. This leads one to the necessity of functional expansion of agri-produce, in contrast to the territorial expansion realised through an upgraded agri-logistics and processing.

The Future of Agriculture – Bio-economy

The world since the industrial revolution has been led by an economy whose wheels are rolled by the fossil resources, including fossil fuels like coal and petroleum products. In just 250 years, man has used most of the fossil resources built over millions of years by nature. Concomitantly, man-induced green-house gases (GHGs) have resulted in a climate change. There is now an urgent need for hitching the manufacturing and transport foundation of the economy to renewable sources. The modern science of processing makes it possible to adopt bio-economy, to generate bio-materials, bio-enzymes and bio-fuels.

The bio-economy will need bio-resources as feed stock. This demand can be met from the agricultural and forestry sectors, which are biological production systems. Here arises the much-needed opportunity for the agricultural production system to be reoriented to tap the new demand for bio-resources under bio-economy. The country's production pattern can go beyond just food, fodder and fibre to also include industrial raw materials. An effective linkage between farms, industrial and energy sectors will be a win-win context. While agri-produce will find a market in the industries and energy domains, the latter will find renewable sources of raw material, and result in lower output of GHGs.

The way forward for the agricultural sector of the country from the perspective of growth, and for the farmers from the perspective of their income-linked welfare rests in finding new markets for the agri-produce. It is, therefore, necessary to continuously work on positive disruptions and create territorially and functionally expanded markets for farmers' produce.

Agri-reforms at all stages including pre-production, production and post-production will become *sine-qua-non* in the 21st century.

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Technical Specifications

Flow Range	Nominal Flow	Max. Working Pressure	Connection	Gross Weight	Drain Size	Volume of Collection Chamber
m^3/hr	m^3/hr	kg/cm^2	Inch	kg	inch	litre
12-30	25	8	2	7.2	1	10
20-40	40	8	2-1/2			
40-60	50	8	3			

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THERE IS ONLY ONE MILK

BOVINE MILK

Post the success of Operation Flood in India, dairy and animal husbandry sector emerged as the primary source of income for about 10 crore rural households—comprising of either landless, small or marginal farmers. With a contribution of 4.2% in the National GDP and 28% in the agricultural GDP, dairying has become a tool for poverty alleviation, a means of having secured livelihood and an instrument of social change and empowerment in the lives of millions of rural households. Apart from being a source of sustainable income, dairying has always commanded a prominent place in our country's social and cultural heritage. This occupation has always had the power to unify millions of farmers across India and shielded them from the perils of various natural calamities like draught.

Valued at Rs. 8 lakh crores ($ 110 billion), milk is the largest agricultural crop of India, bigger than the value of Wheat, Paddy and Pulses put together. Milk and dairying are the means for doubling farmers' income in an agrarian economy like India.

Of late, many activists with the backing of certain lobbyists are promoting "plant based" products. They are denigrating milk and milk-based products on social media platforms. These pseudo activists have resorted to slanderous campaigns for planting the idea that consumption of milk and milk products are unhealthy and unethical. Propagation of such false claims regarding milk will result in a tarnished image of the dairy sector. It shall also impact farm gate pric-

ABOUT THE AUTHOR

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es received by the dairy farmers in the long run.

Let us scrutinize these false claims vis-à-vis reality and factual data.

Myth 1: Dairy is cruel to animals and Plant Based Beverages are an ethical alternative

Reality: Coming from the land of Lord Krishna, dairy farmers in India have imbibed an ideology that considers cattle as a part of their households. The nourishment, nutrition and health of cattle is priority for farmers. It is a myth that milking a bovine animal inflicts cruelty on it. The calves are fed with nutrient-rich colostrum and later with customized cattle feed based on its needs. The surplus milk extracted from the cow/buffalo is first used to fulfil the farmers' family needs. The remaining milk is used by the farmer for economic purposes. Amul has been carrying out animal care activities since inception.

Myth 2: Plant-based beverages are rich in nutrients such as proteins, healthy fats, variety of vitamins and minerals

Reality: It is scientifically proven that milk is a Superfood infused with high quality proteins that are beneficial for muscles, nutrient-rich fats, lactose that aids brain development, calcium for bone building and strength and a unique mix of digestive proteins which make it a superior alternative to plant-based beverages. Immunity is the buzzword for 2020; milk contains short and medium chain fatty acids that boost immunity. Milk can be consumed in its natural and raw form as compared to other plant-based alternatives are manufactured through a complicated and formulated process, with vegetable oils, added sugar, stabilizers, emulsifiers, artificial fortifications of minerals and vitamins, and artificial flavors to mask the grassy and beany flavour.

Myth 3: Plant Based Beverages are correctly labelling themselves as milk i.e. Almond Milk, Soya Milk, Oat Milk, Rice Milk, Walnut Milk, Hemp Milk etc

The earliest evidence of dairy product processing has been found by analysing residues on ancient pots

Reality: FSSAI regulations define milk as the normal mammary secretion derived from healthy milch animal without addition thereto or extraction therefrom, otherwise provided in these regulations and it shall be free from colostrum. Plant-based beverages that do not comply with the aforementioned definition of FSSAI are incorrectly and illegally labelled as milk. The irony here being that the companies that disparage milk are more than willing to label themselves as Almond milk or Soya Milk.

Myth 4: Plant based beverages are a sustainable economic business model in India

Reality: As per NSSO's report 2012-13, a farmers' income from the livestock sector in India is growing at a rate of 14.3%, four times higher than income from the cultivation sector (3.4%). Indian dairy farmers have always been aatmanirbhar. From an economic perspective, dairy farmers – the owners of dairy cooperatives - get 70-85% returns of the final market value of milk. Farmers cultivating Nuts and Soya – suppliers of MNCs - get merely 5-15% of the final value of the product. From the consumers' perspective, pure milk containing natural fat and nutrients is 200-300% cheaper than artificially formulated beverages. Promotion of plant-based beverages is a loss making proposition for the economic system of India and also a means of deceiving customers with misleading marketing gimmicks.

Myth 5: Plant based beverages are environment friendly

Reality: A significant chunk of crop residue is consumed by cattle as food. Otherwise this residue would be burnt and would raise carbon footprint. Cow dung is used as organic manure and as bio fuel in dry form.

The important institutions established under Dr. Kurien's inspiring leadership include GCMMF (Gujarat Cooperative Milk Marketing Federation Ltd) and NDDB (National Dairy Development Board). These played a significant role in shaping the dairy cooperative movement across the country and led to the replication of the Anand model of cooperative dairy. Indian farmers today are facing a threat from global multinational players who are selling plant extracts as milk products. Labelling plant-based products as milk deceives the end consumers. It also affects the livelihood of dairy farmers.

Additionally, the Indian market has caught the attention of milk surplus countries that are trying to dump cheap milk products here, impacting the income and aatmanirbharta of the Indian dairy farmers.

The solution is to stand together to ensure promotion and encouragement of real milk products (based on FSSAI's definition of milk). It is our responsibility to safeguard the livelihood and dignity of dairy farmers in India and also ensure that Indians have access to the real Superfood – Milk – at affordable prices.

VISIONING THE COLD CHAIN IN 2021

A surreal dream becomes a persuasive vision when it is rooted in some tractable ground realities. Some material dimensions slowly improved over years and were accelerated in this year gone by.

New pathways for the cold-chain sector have surfaced. There is renewed government support in the form of an agri-infrastructure fund. The government has made reforms in agri-marketing and essential commodities acts. There is fresh focus on organising the farmer-producers so that village communities can interlink clustered activities in an enterprise format.

Production alone is not seen as a sufficient condition. Long overdue emphasis on post-production activities is coming to fore. Farming can no longer be relegated merely to serfdom functions of cultivation, rearing, harvesting or catching of produce. The new favoured approach includes ensuring that production is translated into wholesome delivery at demand side. Production delivered, in-full, in-quality and in-time, is farming fulfilled; naturally demanding that agri-logistics is a secondary agricultural activity. This is where cold-chain becomes imperative, as it is the sole means to safely handle perishables in the post-production phase of their marketable life-cycle. By perishables, I include to mean all fresh produce with an inherent expiry – such as fruits, vegetables, meats, fish and milk. Their production, to varying degrees, is dependent on biological factors. But once harvested, they must connect with consumption within a predetermined time-line.

The Indian consumer has a deep-rooted preference for fresh produce, which is often seen to be more nutritious and aids the body's resilience to disease. The market for fresh meats, fish, milk,

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Capt./Prof. Pawanexh Kohli is former CEO of National Centre for Cold Chain Development (NCCD) cum Chief Advisor, Dept. of Agri-culture & Farmers Welfare. He is also Hon. Professor Post-harvest Logistics, University of Birmingham

fruits and vegetables ranks a high 90th percentile. This fact is to the advantage to associated Indian farmers. They do not need to access demand through any intermediary process that essentially delinks them from terminal market value, by creating a new product under new ownership. Cold-chains can connect and supply the farmer's fresh perishable produce to any demand centre. Cold-chain does not add value to the produce but adds value to the farmer-producer. Cold-chain itself is a value added service, where the basic unit of value (produce) is not tampered with, but is communicated to a time or place where the price is right!

This enabling premise was not visible in practice, and farmer-producers did not have recourse to such agri-logistics services. Delinked from direct access to a terminal wholesale market of their choice, farmers were forced to sell their produce at first instance and fetch the prevailing price. The agri reforms are aimed to rectify such anomalies. They lay the sub-structure on which cold-chain services can be built to empower farmers with logistics connectivity and market choice.

These options are common in other trades. Even small artisans and enterprises can avail a logistics service (say a courier) to dispatch their product to demand, invoiced in their name, with buyers paying the delivered price. This is also facilitated by the e-market platforms, where the manufacturer pays a fee for distribution and delivery. Thanks to the reforms and schemes last year, circumstances now exist – whence, if done right – such a producer-owner model of marketing can flourish for farmers. This vision for the cold-chain will be on track if in 5 years, 5 per cent of our farmers could sell into 5 different markets in that year. This will require organising the fresh produce supply chain at the first-mile, at village level, so that the entire perishables supply chain gets optimised and across all metrics.

Village-level aggregation platforms

The vision for 2021 is that many thousands of village level aggregation platforms, like milk pooling points, are created in the country. These are included in the national infrastructure pipeline, titled as GrAMs (gramin agricultural markets), with a target of having 22,000. Their primary function is to aggregate and package the produce, for dispatch to any market or store in the country, besides modernising local retail sales. These platforms will incorporate pre-cooling and short term storage, to stage onwards supply to the national market.

Concurrent to these, the porting development of reefer transport is envisioned – on road, rail and waterways. 2021 should bring the commencement of cold-chain networks, dotted with pack-houses at GrAMs and dynamically interlinked with various transport modes is the vision. A cold-chain that has a delivery bias, to progressively expand the marketing radius of the farmers that encompasses the world and stores only to buffer the trade. In my view, such development will be the foundation of a network will directly connect the Indian village with the global village.

As India marches ahead, it demands quality and new markets. The future of cold-chain in India is inevitably bright; albeit with the pangs of a new birthing and the lack of appropriate domain skills that it currently suffers. Realisation is setting in that agriculture is not just food for the living, but also feedstock for industry. There can be no industrialised world or smart city without assured linkages with agricultural regions. Much of the industrial world has progressed into a position where they increasingly rely on external supply of food and feedstock from agrarian states. As mankind progresses further, the agricultural sector will define such growth. Agricultural logistics will gain more geo-political and geo-strategic importance.

Cold-chain is the key enabler that links people disconnected from agriculture with their nutrition. Cold-chain is what will allow for productive growth in livestock, fishery and horticulture. Without cold-chain, surplus production is wasted, and with cold-chain the world is made accessible to the producers. Access means consumers, and that means gainful production. I see 2021 as the beginning of a future dotted with cold-chain networks, modelled in hubs and spokes, extending beyond our shores, communicating India's produce to global consumers.

Surreal or realistic – time will tell. Nevertheless it is possible, if recent reforms are taken as triggers to fast-track the development of a new value system. A new market architecture, where empowering logistics services are enabled for famers, is long overdue.

THE RISE OF DIGITAL PATHWAYS

SHAPING AGRI EDUCATION UNDER ICAR

Indian Council of Agricultural Research (ICAR) - National Agriculture Higher Education Program (NAHEP) has been promoting and embracing the digital transformation in agriculture education in country.

Only digital agriculture has the potential to enable the country to meet its dual goals. One, raise the income of smallholder farmers. Two, continue to strengthen the competitiveness of Indian agriculture. Digital agriculture means the usage of ICT and data ecosystems to support the development and delivery of timely, targeted information and services. The purpose is to make farming profitable and sustainable while delivering safe nutritious and affordable food for all.

ICAR commenced NAHEP with the assistance of World Bank (WB) in November 2017 with the objective to support participating Agricultural Universities (AUs) and ICAR in providing more relevant and higher quality education to students. This shall create a more skilled workforce that continuously improves the productivity of key sectors including agriculture. Overall, the project aims to develop resources and mechanism for supporting infrastructure, faculty and student advancement. It aims to provide means for better governance and management of agricultural universities. Hence, a holistic model shall be developed to raise the standard of current agricultural education system. It shall provides more jobs, be more entrepreneurship oriented and on par with global agriculture education standards.

The project is also a Multi-Global Practice collaboration (Agriculture and Education). It supports activities and results directly related to cross-cutting strategic areas of climate change, jobs and gender. About 58 Agriculture universities (AU) have been awarded with 18 projects under Institute Development Plan (IDP) 16 AUs under Centers for Advanced Agricultural Sciences and Technology (CAAST) 24 AUs under Innovation Grant (IG).

Among several digital initiatives under NAHEP, digitization of

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Dr RC Agrawal, National Director, National Agriculture Higher Education Program (NAHEP), Indian Council of Agricultural Research (ICAR)

classrooms and improved teaching methods using digital aids, e-module courses are worth noticing. The aim of these initiatives is to widen the horizon of the teaching scope and providing global level learning to the students. This improves the quality of education and helps the students to develop their skill sets to meet the new age industries. One such initiative supported under NAHEP is designing of an interactive and user-friendly e-content under IDP by G B Pant University at Pantnagar.

In order to strengthen the services and infrastructure needs of digital agriculture in National Agricultural Research and Education System (NARES), the existing Data Centre (ICAR-DC) built during 2012 is being strengthened with cloud computing infrastructure. Under NAHEP, the outreach of existing ICAR-DC is broadened to cover agriculture universities, enabling them to host their websites and IT solutions.

The ICAR-Disaster Recovery Centre (DRC) named KrishiMegh at NAARM, Hyderabad is equipped with advanced Artificial Intelligence/Deep learning software/ tool kits. It has been created with support from NAHEP. NARES - Cloud infrastructure and services with its constituents ICAR-DC at IASRI and ICAR-Krishi Megh at NAARM shall provide a robust and dynamic platform to meet the growing IT needs of the NARES system with the deployment of critical applications such as AI, e-Office, ICAR-ERP, Education Portal, KVK Portal, mobile apps, ICAR institute websites, Academic Management System, Alumni Portal, e-Courses of UG and PG level etc. Network integration between the ICAR-DRC, NAARM, Hyderabad and ICAR-DC, ICAR-IASRI will provide seamless access to the application services running on these centers to the users.

In order to provide online access of valuable resources such as books, journals, thesis, publications and report, a library management portal has been designed and launched by Prof. Jayashankar Telangana State Agricultural University, Hyderabad under IG component of NAHEP, wherein more than 2,00,000 items have been digitized so far.

NAHEP's initiatives shall continue to evolve and contribute towards Digital India to transform India into a digitally empowered society and knowledge economy

Digital agriculture is being actively promoted by partner AUs of NAHEP. Mahatma Phule Krishi Vidyapeeth, Rahuri has developed and adopted digital solutions and technologies to improve irrigation efficiency and timely assessment of soil health. The innovation 'Auto PIS' schedules precise irrigation based on censors. It does not need any human intervention.

With Auto PIS technology, farmers can save on electricity, water and labour cost. This shall increase crop productivity and contribute to better soil health. The Phule Soil Moisture Sensor helps farmers to understand soil health through moisture sensor and the need of nutrition, irrigation timing etc. Through these innovations, partner AU benefitted more than 6,000 farmers in Maharashtra.

Towards the contribution to digital agriculture, several mobile and web-based applications like Shukar Palan (Pig Farming) App, Artificial Insemination App, Dairy Manager developed by ICAR-Indian Veterinary Research Institute; mJhinga by ICAR-Central Institute of Fisheries Education, Mumbai are addressing the current needs of market and industry. Partner AUs have developed more than 25 mobile applications in emerging areas of agriculture and allied sectors.

Under Component 2 of NAHEP, ICAR-IASRI developed Academic Management Software (AU-AMS) and successfully implemented it in 18 AUs. ICAR-IASRI has developed AU-PIMS. This is a workflow-based system to create unified information base for research projects. This system facilitates information management and improved decision making. It shall check duplication in research projects in AUs.

In order to track the progress of various sub-projects, the Monitoring and Evaluation (M&E) team has developed the Project Monitoring and Tracking System (PMTS). This web application shall provide automated solution to users. This system is client/server based in which respondents fill or select suitable options. Each respondent has individual user credentials to login into the system. The key functionalities are to store data on server side of all the respondents, online monitoring of inputs/outputs and tracking, and feedback to PME cells to generate the various reports for decision-making levels.

NAHEP's initiatives shall continue to evolve and contribute towards Digital India to transform India into a digitally empowered society and knowledge economy.

THE ARGUMENT

FARMERS SHOULD TAKE CONTROL OF APMCs

ANNUAL INCREASE IN MSP HAS ENCOURAGED IMPORT, REDUCED EXPORT

New agri-trade laws have provided options to farmers to choose their buyer and the prices to sell their produce with or without commission. This freedom of trade gives bargaining power to farmers. In order to protect their monopoly on commission and other commercial interests, the commission agents and traders mobilised some farmer leaders to oppose the new agriculture laws. In order to build farmers' sympathy and support, they introduced the demand for legally mandated Minimum Support Price (MSP).

Farmers Poor, Commission Agents Rich

In the last 70 years, small and medium Indian farmers have largely remained poor. Middlemen and commission agents are among the richest people in the society. It is clear that the existing system is not benefiting small farmers. It is benefiting the middlemen. After 56 years of existence of APMC and FCI in Punjab and other protesting regions, farmers are still feeling helpless without FCI procurement and unable to stand on their own feet. This means something is seriously wrong with the system. Even after 56 years of tax payers regularly supporting the farmers through MSP, they have remained underdeveloped, and a few hundred have become rich at the cost of many million poor farmers. In which country will you find this?

There are views that the government assurances on MSP do not convince the farmers, because they are witness to the diminishing significance of the APMC mandis as the new farm laws came into force over the last few months. For example, out of 259 APMC mandis in Madhya Pradesh, 47 recorded zero business in October, and 143 saw trading drop by 50 per cent in the last six months. The solution proposed is to make MSP legally mandated and at higher rates.

Implications of this demand

In the market, consumers do not buy on the

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basis of emotions. When farmers are buyers of products, they too look at value for money. Are they not buying Chinese products in place of products of Indian products? Why so?

Points to consider

- Today, MSP of most Indian crops is higher than global market prices. That is why we are losing in the export market.
- Many APMC markets are getting less volume. The same traders are buying outside mandis because now they do not have to pay taxes.
- Farmers are selling outside APMC markets because they are getting better prices.
- If MSP is legally binding, what will be the liability of the government if private trade also develops a cartel and refuses to buy? Does the government have the budget to buy the produce from all farmers?
- No one is talking about the quality for MSP rates. Who will buy the material which is substandard? What should be the price for that material?
- MSP is an ever-increasing cost, with further demands to hike it. World markets are becoming cheaper. This will make the private sector import more, instead of buying from Indian farmers. Then who will buy the Indian produce? The classic case is edible oils. 70 pc of edible oil is imported. Sunflower crop has virtually vanished because it was unsustainable to compete with imported crops. Demand for sesame and groundnut oil has reduced drastically. What does this indicate?
- The sugar sector is suffering due to ever-increasing mandatory FRP. Now without subsidy, we cannot export. First pay subsidy to grow sugarcane. Then pay subsidy to export. Is this good economics? Is this good for the national economy? Whose money is getting blocked and who is benefiting?
- India was exporting 45 lakh tons of maize every year. Now it is less than 5 lakh tons due to rising MSP. Maize is 50 pc cheaper in the world market. Expensive maize means opening the floodgate for poultry imports. If poultry suffers, maize farmers will suffer more.
- In the last few years, imports have become cheaper. Our imports have grown at a faster rate than our exports. As the Indian rupee becomes stronger, imports will come cheaper.
- India had to quit RCEP because our agriculture cost of production is so high. Due to the ever-rising MSP, we cannot be part of any international trade agreement.
- The MSP formula proposed by the Swaminathan committee encourages inefficient production. Higher the cost of production, higher will be the MSP. Organic agriculture needs fewer resources and has a lower cost of production. It saves the environment and also consumers' health. According to CACP-based Swaminathan Formula, they should

get less MSP, because their cost of production is low because and they claim that there is no loss of productivity. Is this logical?

Way Forward

No one can ensure sustainable profit other than consumers. Most consumers are paying higher than MSP for all crops. It is not reaching the farmers.Who is keeping the farmers' share? Who is responsible for the leaks? These leaky pipelines should be changed with direct farmer-consumer interface. This was the demand of many farmers' bodies since industrial liberalization.

Possible options

1. Hand over all APMC markets to farmers. Farmer bodies should replace commission agents. This way, farmers will have full control of the market and pricing system in the APMC market and also outside. With full control of the market, farmers can decide the price based on consumers capacity to pay, like any other sector. Are state governments willing to help the farmers by giving them control of APMCs? Farmers are managing Amul and many similar companies. They can manage APMCs as well. Direct interaction with consumers will give them learning on which crops to grow, and which one to avoid.

2. While making any policy, keep an eye on the global market. With increasing MSP, there will be more imports and prices will crash sharply in India. The private sector will buy that crop which can be sold higher than the purchase price and after adding all overheads. They will prefer to import because they can do value addition to absorb the higher price in some cases.

India is part of the global economy. With rising cost of production, we will be further marginalised. Our agro-processing industries will also suffer because of rising costs. Exports will suffer, and imports will rise. So the main issue is how to make agriculture profitable for farmers and competitive for trade. We need better technologies, infrastructure, market intelligence and guidance for farmers.

In my personal view, MSP as a concept has not outlived its utility. In surplus commodity markets MSP approach will not work. Legally binding MSP will create more problems than solutions for all stakeholders, mainly farmers. Buyers have the choice of not buying expensive crops from Indian farmers, when imported items are cheaper. Annual increase in MSP will ensure more and more agro-commodity imports from cheaper suppliers.

Please learn from our own experiences. Why did Chinese product flood Indian markets? Why are MSMEs suffering? Indian consumers are buying Chinese products, but not Indian MSME products. Why?

I do not want Indian farmers to suffer. That is why I am opposing this move planted by commission agents. This move shall block the consumer-farmer direct interface facilitated by agriculture reforms. Only consumers can help farmers, not the government. Farmers must come forward as Cooperatives, FPOs or as any other collective organization. They must take charge of all APMC mandis and deal directly with buyers. The state government should hand over all APMCs to farmers. This will give full control of market prices to farmers.

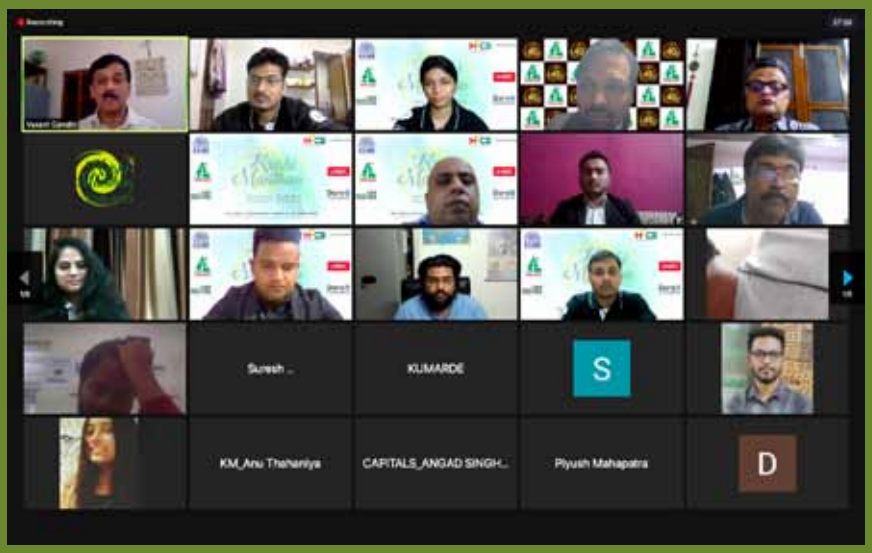
Unless farmers have direct control of APMCs, they will never get a fair share of prices paid by the consumers or buyers. Please think over this suggestion.

IIM Ahmedabad organizes Krishi Manthan

Annual Food and Agri Summit

Krishi Manthan, the annual Food and Agri summit at Indian Institute of Ahmedabad, was organized successfully on December 26-27, 2020. One of the largest of its kind, the conclave, previously known as Amaethon, has a strong legacy of over 15 years.

Conducted entirely in virtual mode due to the Coronavirus pandemic, the summit hosted more than 2100 participants from 310 colleges worldwide. The conclave put together an incredible line up of two speaker sessions, six workshops, nine events, and a panel discussion. The organizing team consisted of 30 students from PGP- Food & Agribusiness Management Program under Prof. Vasant Gandhi's guidance. Prof. Gandhi, Faculty Advisor of Krishi Manthan '20, provided the team with his valuable time, advice and support.



SPEAKERS

The summit boasted of pioneers in the Agriculture sector as prominent speakers, who provided the participants with their valuable insights. These included Dr. Vijay Paul Sharma (Chairman- Commission for Agricultural Costs & Prices, Ministry of Agriculture); Dr. Anil Gupta (IIMA Professor and Padma Shri Awardee), Dr. Harsh Kumar Bhanwala (Director CIFL & former Chairman NABARD), Mr. Arijit Guha Mazumder (R&D Director, Mondelez International), Mr. Kamlesh Kumar Sharma (Chief Public Affairs & Communication Officer, Hindustan Coca-Cola beverages) to name a few.

WORKSHOPS

With over 1500 registrations, the virtually conducted workshops provided the attendees an experience of real-time business scenario with unexpected problems and opportunities for the young business enthusiasts to learn from the able guidance of innovation leaders and corporate giants. Some noteworthy workshops were "Inclusive Grassroot Innovations and Agri-Entrepreneurship," "Fundamentals of Rural Finance and Financial Inclusion," "New approaches in sales and distribution of Food products and Beverages," "Blockchain and IoT applications in Agri & Food," "Market Research for Food & Agri Products and "Fundamentals of Commodity Trading and its applications in the futures market."

EVENTS AND COMPETITIONS

The events and competitions, both informal and formal, hosted some of the country's best minds who competed to prove their mettle. The events gave the competitors a challenge for every domain from strategy, advertisements and marketing, case studies, and business plans. With a participation of over 1100 individuals for the informal events, more than 3500 individuals for the formal events, and a prize money pool of Rs 3,00,000, the events tested the participants' strategic thinking, problem-solving and management skills to bring out their innovative entrepreneurial spirit.

Agriculture Today was the media partner for Krishi Manthan 2020.

DAIRY INDUSTRY

SWEET SUCCESS, ROBUST GROWTH

India has been the leading producer and consumer of dairy products worldwide since 1998, with sustained growth in the availability of milk and milk products. Dairy activities form an essential part of the rural Indian economy, serving as an important source of employment and income. However, the milk production per animal is significantly low as compared to the other major dairy producers.

Moreover, nearly all of the dairy produce in India is consumed domestically, with the majority of it being sold as fluid milk. On account of this, the Indian dairy industry holds tremendous potential for value-addition and overall development.

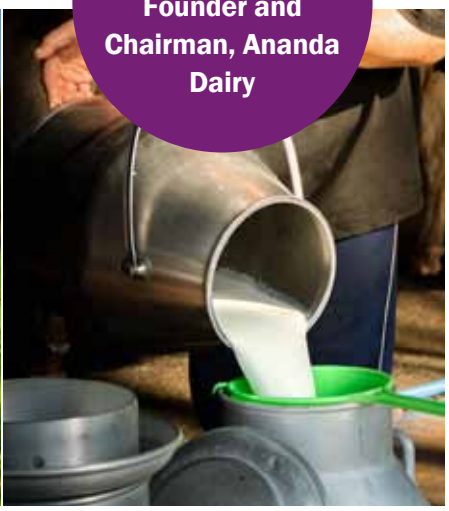
According to an Edelweiss report, India's dairy industry is worth Rs 5.4 trillion by value, having grown at 15 per cent CAGR during 2010-16. Going ahead, the dairy industry is expected to maintain 15 per cent CAGR over 2016-20, and attain value of Rs 9.4 trillion on rising consumerism.

India has progressed from being deficient in milk production at 20 million MT in 1970 to currently the world's largest milk producer at more than 200 million MT. World-famous brands want to enter the Indian market considering the huge demand for dairy here. Indian dairy brands are becoming global. FDI is also visible in this business segment.

Mr Radhey Shyam Dixit is Founder and Chairman, Ananda Dairy

Importance of dairy sector in India

Dairy farming is among the oldest businesses in India. It provides families with



access to more nutritious food. Subsistence dairy farming provides fresh milk and is a source of basic income for the family. It also provides the family with value-added products such as yogurt and cheese. These products have the potential to provide higher source of revenue.

Dairying is an important source of subsidiary income to small/marginal farmers and agricultural labourers. The manure from animals provides a good source of organic matter for improving soil fertility and crop yields. Dairy farming is now one of the major occupations around mega urban centres, where the demand for milk is high. The current milk production is 200 million MT, which is growing at a rate of 3-4 per cent per annum. Milk consumption in India is increasing at the rate of 6 per cent per annum.

Products in dairy sector

The major products in the dairy sector are Milk, Flavoured Milk, UHT Milk, Goat Milk, Camel Milk, A2 Milk, Organic Milk, Curd, Probiotic Products, Flavoured and Frozen Yoghurt, Buttermilk, Lassi, Ghee, Butter, Cheese, Paneer, Cream, Khoya, Dairy Whiteners, Skimmed Milk Powder, Ice Cream, Sweet Condensed Milk, Dairy Sweets and Whey.

Opportunities On the Rise in Indian Dairy Sector

For years, the dairy industry was focussed only on cow and buffalo milk and milk-based products. Rising Internet penetration and increasing consumer awareness have upended this long-standing norm. Today, consumers are increasingly inclined towards better, healthier alternatives such as camel milk, goat milk or donkey milk.

For instance, it has become common knowledge that camel milk does not contain A1 casein and beta-lacto globulin. Hence camel milk is fit to be consumed by those suffering from milk allergies and people who are lactose- intolerant. Camel milk is also gaining popularity since it aids digestion, improves gut health, may prevent high blood pressure and may even help ease the symptoms of autism in children. Goat and donkey milk are also gaining favour among health enthusiasts as they are light on the stomach and packed with essential nutrients.

Mr Dixit is into yoga and meditation. His appearance in the Ananda promotional videos is a class apart. In a series of animated videos, Mr Dixit has been featured in diverse roles, including as the much-loved police officer in Bollywood blockbuster *Sholay*

Niche dairy products such as flavoured camel milk powder, camel milk-based skin care products or goat milk ghee will definitely attract more consumers in 2021. Also, there will be growing demand for healthy, A2, chemical-free and organic milk.

Consumption pattern in India

The consumption pattern of dairy products in India is unique as compared to some Western countries. It has been noticed that Indian consumers are increasingly getting health-conscious. The value-added dairy products industry is seeing marginal growth. Change in consumer mindsets has led to various changes in the dairy sector. Lifestyle alterations have led to an increase in the demand for value-added dairy products as compared to just the base product – liquid milk. As the spending capacity of Indians is increasing, so is their willingness to buy healthy super foods, which we like to call as value-added products. Value-added products in the dairy industry include cheese, paneer, ghee, yoghurt, probiotic drinks etc.

There is a major increase in the demand for milk in India, partly due to the growing population. Our population is expected to count 1.5 billion by 2035. People are attracted towards healthy food in one pack, which can be fulfilled by the dairy products.

Scope for Indian Dairy Sector

There are immense opportunities in the Indian dairy sector, which also lead to much scope for improvement. In India, average herd size is small. Hence mega milk processing houses should encourage farmers to opt for organic growth in farms, viz. more output from same animals. In addition, dairy companies should focus on farmers' needs, and provide them with the required equipment and services. Efforts must be made to improve the quality of milk. The country must collectively aim for nil residual effect of pesticides and antibiotics in milk.

Challenges for Indian Dairy Sector

The Indian dairy industry faces challenges like availability of green fodder, global warming, maintenance of unproductive animals, extension services for dairying, forward integration for better pricing, lack of common services for milking, AI, silage, hydroponics, bio gas, clean milk Production, preventive health and nutrition etc.

Economics

As of 2018, India is the leading milk producing country in the world, accounting for more than 19% of the global market share. The milk processing industry in India is expected to expand at a compound annual growth rate (CAGR) of more than 14.8% between FY 2018 and FY 2023. It is expected to reach Rs 2,458.7 bn in FY 2023.

Niche dairy products such as flavoured camel milk powder, camel milk-based skin care products or goat milk ghee will attract more consumers in 2021. Also, there will be growing demand for healthy, A2, chemical-free and organic milk

TRANSFORMATION OF AGRI-MARKETING ECOSYSTEM IN INDIA

Almost 111 million farmers are registered for the Pradhan Mantri Kisan Samman Nidhi (PM-Kisan). As per the Agriculture census of 2015-16, India has 146 million holdings which is a rise from 138 million in 2010-11. India has 7,000 odd APMC mandis (2477 principal regulated markets and 4843 sub-market yards for giving market access to farmers. The density of regulated markets varies from 118 sq. km. in Punjab to 11,214 sq. km. in Meghalaya. As per National Farmers Commission 2004, a regulated market should be available to farmers within a radius of 5 km. Not enough effort has been made in developing infrastructure for collection at the farm gate. The result is that we process less than 10% of our food production and lose approximately Rs 90,000 crore annually (various studies mention a range of figures). Immense wastage of produce is caused by a fragmented and discontinuous cold chain.

Out of 36 states and union territories, 18 states have enacted reforms allowing establishment of personal market yards/ private markets. Nineteen states have enacted reforms allowing direct purchase of agricultural produce from agriculturists by B2B players. Twenty states have en-

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Sunil Khairnar founded ISAP, Agriwatch, ILF. He has working for 25 years in the agribusiness, commodities and development sector in India. He has mentored social entrepreneurs and impact start-ups

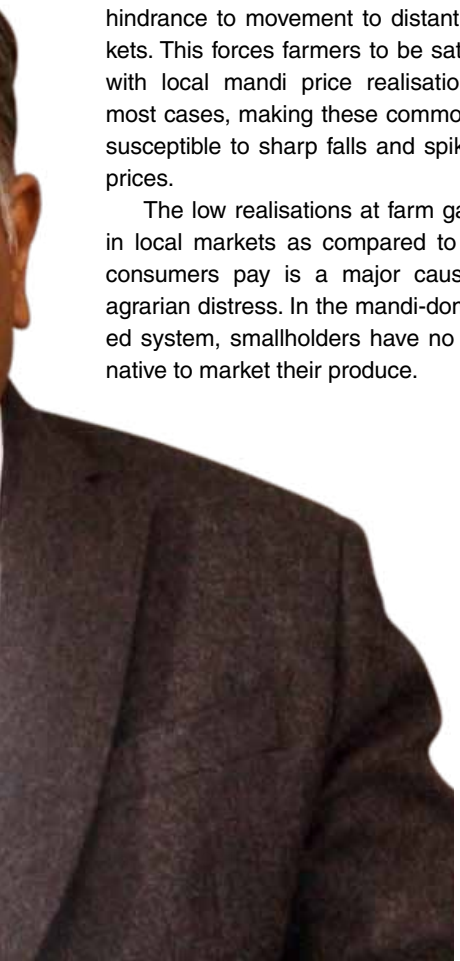
acted contract farming acts. Most states have exempted levy of taxes and costs on sale of fruits and vegetables.

Successive expert committees have recommended reform within the mandi system, enabling framework for contract farming and bringing clarity to the conditions under which the Essential Commodities Act might be invoked.

Causes for agrarian distress

Indian farmer incomes have been held back through restrictive also as prescriptive trade policies that focused on ensuring managed lower prices of agricultural commodities to consumers across classes. Skewed terms of trade of agriculture vis a vis other sectors have depressed the incomes and wealth of farming communities. Myriad marketing regulations have resulted in local optima for prices in markets across states. Interstate barriers created by APMC restrictions have reduced income opportunities for farmers from surplus regions in various commodities. In vegetables, for example, the shortage of storage and distribution network on scale means hindrance to movement to distant markets. This forces farmers to be satisfied with local mandi price realisations in most cases, making these commodities susceptible to sharp falls and spikes in prices.

The low realisations at farm gate or in local markets as compared to what consumers pay is a major cause for agrarian distress. In the mandi-dominated system, smallholders have no alternative to market their produce.



I spend my leisure time by reading books, doing meditation, walking and day dreaming about conceptual solutions for various development issues

Path-Breaking Reforms in Indian Agriculture

The path-breaking reforms include The Farmers' Produce Trade and Commerce (Promotion & Facilitation) Act (FPTCA), 2020, The Farmers (Empowerment & Protection) Agreement on Price Assurance and Farm Services Act (FAPAFSA), 2020, Liberalization of control orders under the Essential Commodities Act, 1955, Agriculture Infrastructure Fund (AIF), 2020 and the release and execution of operational guidelines for promotion of 10,000 FPOs. The model leasing act which was released by Niti Ayog in 2016 and the Agriculture Export Policy 2018 of the Ministry of Commerce & Industry which focuses on commodity clusters for exports were highly progressive steps in reforms for the agriculture sector.

Implications for Farmers and FPOs

FPTCA gives direct access to buyers/processors to reach farmers directly outside the APMC Mandi. This shall help farmers to realize better price of their produce, especially for commodities not covered under MSP. Competition in buying from the farmers shall also mean better services for the farmers, and prevention of practices that are natural outcomes of monopolistic structures.

With improved market linkages post FPTCA and FAPAFSA, we'll also see a shift in what our farmers produce. Direct engagement with agribusinesses shall lead to increased understanding of market demand and price patterns. Farmers will focus on growing crops with higher market price. This will reduce our dependency on imports.

Digital platforms will increase with participation by FPOs who shall understand the fundamentals of creating contracts, agricultural commodity markets, price forecasting etc. Post reforms, there shall be increased volumes of production and post-production (eNWR) institutional credit. This can financially strengthen farmers (crop, livestock & fishery) and help negotiate distress sale.

There is scope for FPOs to act as an intermediary/aggregator between the smallholder farmers and the buyers. Terms of the agreement may include the time of supply, quantity and quality of the produce, grade, standards and price etc. The Act has safeguards for farmers, insurance compensation, the infrastructure and equipment used at the farm land etc. FAPAFSA will provide an enormous boost to growing of horticultural

crops for table purposes, also as special varieties for domestic and international markets. This will lead to enhancement of incomes at the hands of the farmers and risk mitigation, since the businesses getting into contract farming agreement will offer inputs, Good Agriculture Practices, advisories and monitoring also as Fixed Price Contracts. This will provide an assured income to the farmer.

This move also will encourage firms to take investments decisions in agriculture infrastructure – storage, food processing, research and development, and harvest.

Agriculture Infrastructure Fund (AIF) will facilitate the development of infrastructure at farmgate, like collection centres and pre-processing facilities. A continued drive on aggregating farmers through FPOs will increase their negotiation power and develop community assets under AIF. Funds for farming and fisheries sector have also been launched to diversify the sources of farmer income.

FPOs are expected to participate in a big way in processing of agriculture produce at the extent of primary processing (simple farm gate practices like cleaning, sizing, packaging, etc); and also secondary processing (basic processing, packaging & branding). FPO Operations and Management jobs will become aspirational for educated rural youth.

It is expected that the FPO movement will convert into a mass movement with thousands of commercial start-ups in this sector.

> Around 10,000- plus Grameen Agriculture Mandis and 10,000 private mandis shall be set up all over India over over the next 5-6 years as a result of these reforms. This shall contribute significantly in reducing food wastage

Implication for emergence of private markets

I estimate that a minimum of around 10,000- plus Grameen Agriculture Mandis and 10,000 private mandis shall be set up all over India over over the next 5-6 years as a result of these reforms. This shall contribute significantly in reducing food wastages.

Private mandis will be close to the production clusters. They will be more efficient, automated and mechanised than the APMC markets and will be equipped with facilities of sorting, grading, pack house etc. This may change the whole dynamics of the agriculture value chain. It shall enhance worth realization significantly and reduce food wastage. These steps shall minimise post-harvest handling losses, which are currently 15-25 percent thanks to multiple handling. We estimate a saving of USD 25-30 billion annually. Farmers, consumers, trade – all stakeholders shall benefit.

NAFED has already launched a concept called NAFED e-KisanMandi (NeKM) in partnership with FPO organisations in multiple geographies, where these jointly managed mandis would be coming up. NeKM is a structured pan national solution to the market access challenge being faced by farmers over many decades and will create a unified market platform. NeKM is electronic Trading Platform with Physical Infra-structure at each proposed location in partnership with local FPO (FPCs and Cooperatives) and respective CBBOs/Federations/Aggregators to be integrated with a National Level Digital Marketing Platform. The physical infra-structure will include digital platform with auctioning facility, pack-house (including sorting-grading, packing and pre-cooling facilities), warehouse and cold storages if required. NAFED has announced plans to set up these markets all over India in partnership with FPOs and Cooperatives with 50 identified locations for rolling out markets in the short term.

The NAFED template can be rolled out by other bodies and entities of the Govt of India or even those of state Govts. Because of such initiatives India will move towards One Nation One Market. APMC mandis have a fragmented

With well- thought out reforms and initiatives, India has moved decisively towards creation of a world-class agriculture ecosystem which will benefit farmers, consumers, wholesalers, processors, and start-ups

approach. Unified markets shall give higher incomes to farmers with efficiencies arising out of logistics and primary processing. There will be greater competition amongst buyers in the form of contract farming. This shall lead to higher incomes of farmers.

Implications for Agri Startups

These reforms will create opportunities for start-ups from supply chain, warehousing to logistics and e-commerce. FPOs or farmers are expected to enter into agreements with farm service providers.

Several agri-tech startups are operating in this space. Some startups are trying to reduce friction in trading of agricultural commodities by developing AI-based system of grading and assaying. Many new firms use cutting-edge technologies including cloud, big data, AI and blockchain to bring traceability, slash food wastage and help farmers increase their operational efficiencies and crop yields.

Agtech start-ups shall also help their clientele like financial institutions, government entities, agribusiness companies and b2b buyers to analyse and interpret data to derive real-time actionable insights on standing crops to enable flow of credit, insurance and other services to farmers.

Innovative start-up business models will attract more investor money and may achieve scale and improve productivity. Improvement in post-harvest management will reduce wastage. Digital marketplaces will increase reach and market linkages.

Agribusiness Companies, Trade Efficiency, Exports

As India's productivity levels converge to global best practices, we can emerge as a major player in global food supply chains. With the new reforms, an enabling environment shall be created to enable India to become a food export powerhouse with investment by the private sector. Focus on commodity clusters will lead to USD 100 billion dollar agricultural exports per year within 5-6 years.

While promoting the export of agri-commodities, the reforms shall enable companies, traders, and farmers to store the commodities when prices are low and sell when they get remunerative prices.

The reforms also will provide a chance to agribusinesses to create consistent supply and standardised variety by direct procurement from farmers, run their operations more efficiently, and boost export volumes and share of food processing. This may also help eliminate other system inefficiencies like high intermediary and logistics costs. There are many samples of agribusinesses working with farmers resulting in higher farmer income and development of agri-businesses.

With developments in contract farming, we can expect private sector investments into secondary agriculture including high-end processing. This can involve complex processing technologies for an enormous range of products including cereals, pulses, oilseeds, new crops, organic produce, herbal and medicinal plants. This shall give a boost to processed foods and industrial products from agriculture produce, enabling further value addition by growers and processors within the agriculture sector.

Non-farm jobs, agri entrepreneurship, employment

Food-processing industries and processing of commercial products out of agriculture produce will create rural non-farm jobs. With many farmers trying new farming models and crop diversification, we'll see a higher number of agri-entrepreneurs, specialists and professionals in farming, storage, finance, quality, transport, aggregation, branding, technology, and marketing.

Private sector investments within the agriculture sector will create new jobs in allied sectors like logistics service providers, warehouse operators and processing unit staff.

With well- thought out reforms and initiatives, India has moved decisively towards creation of a world-class agriculture ecosystem which will benefit farmers, consumers, wholesalers, processors, and start-ups. Development of backward and forward linkages shall be enabled by these reforms. India will have One Nation One Market, because the concept of unified markets will take shape in the years ahead.

UTTARAKHAND COOPERATIVE DEVELOPMENT PROGRAMME (UKCDP)

SANKALP SE SIDDHI: DOUBLE FARMERS' INCOME BY 2022

Cooperatives have the potential to play a significant role in agriculture and allied sectors for enhanced welfare of farmers. The co-operatives in Uttarakhand have been made Multi-Purpose Primary Societies. The state has a three-tier cooperative structure with state federations at the apex, district central cooperatives at the district level, and primary agriculture cooperative at the bottom of the hierarchy.

The Central Sector Integrated Scheme on Agricultural Cooperation (CSISAC) of National Cooperative Development Corporation (NCDC) is being implemented in the state. With this, the co-operatives structures and the specialised co-operatives shall be strengthened to act as the force multiplier for increasing farmers' income.

In order to double the farmers' income, the department aims to align and channelize the state's efforts. It plans to assess co-operative interventions in diverse agri sectors viz. Co-operative banks, Multipurpose Primary Agriculture Cooperative Societies (MPACS), Sheep & Goat, Dairy, Fisheries, Agriculture, Horticulture and allied sectors. The key stakeholders in the project are Department of Cooperative Societies, Uttarakhand and NCDC.

Background

The rural economy in Uttarakhand, especially in the hilly regions, is marked by disaggregated farming, marginal land holding patterns, and low access to organised markets for farm products. The supply chain logistics are absent or not being utilised well. The farmers resort to subsistence farming or sell in local markets at extremely low prices. Uttarakhand Co-operative Federation aims to play the catalytic role of enabling market access for the farm products of Uttarakhand.

ICDP envisages the following advancements in agriculture and the allied sectors through a strengthened co-operative movement:

1. Co-operative Collective Farming (CCF): Co-operative Collective Farming to enhance the scale of farming activities and result in much higher returns for individual farmers. The Yamuna Valley Initiative on collective farming for off-season

vegetables resulted in reverse migration, and very good price realisations at farm level.

2. Cooperative-Cooperative Partnership (CCP): Two or more PACS could form joint ventures to complement their capabilities for streamlined resource utilisation and enhanced returns on investments. For instance, with Aromatics and Herbs, the on-going initiative by the nodal agency at state level, entrepreneurs shall be identified. JVs shall be established between groups formed by the Centre for Aromatic Plants (CAP) and the respective PACS in identified clusters.

3. Co-operative-Corporate Partnership (CCP): Mobilisation of private capital for efficient-outcomes based on best practices from the industry.

4. ICDP shall significantly mitigate distress migration from the state, in particular from the hilly regions due to provisions for viable business activities with market access based on local economic fundamentals.

5. Significant employment creation in agriculture and allied sectors, and higher contribution to state GSDP.

6. The envisaged interventions across value chain with the market linkages shall result in viable and sustainable business models.

7. Enhanced visibility of farm products and brands of Uttarakhand. ICDP presents a unique opportunity to create positioning of the farm products and allied sector products from Uttarakhand.

Uttarakhand is taking the lead in efforts to double farmers' income and transform the rural economy of the state through interventions of the Department of Cooperative Societies. The project aims for holistic development in agriculture and allied sectors. Opportunities have been identified as per the needs of the sector.

DR R MEENAKSHI SUNDARAM, IAS
SECRETARY COOPERATIVES, UTTARAKHAND

8. In an effort to align with the flagship initiative of Start-up India by the Hon'ble Prime minister, ICDP initiative provides fund for promoting innovative, viable and sustainable business activities according to local economic fundamentals at PACS level.

9. The initiative in its commitment towards gender equality promotes participation from women and has all-women societies in relevant sectors.

The Bakraw Brand

Through the Uttarakhand Sheep Goat and Rabbit Farmers Co- Operative Federation, USGCF. We have identified 222 beneficiaries in Almora and 190 beneficiaries in Rudraprayag. We have given 1469 female goats and 331 male goats to them. More farmers are being empowered in Someshwar, Bageshwar and Pauri region.

For giving fresh, hygienic traceable meat to the people of Uttarakhand, we have started our meat selling activity, BAKRAW. This shall contribute directly to farmers livelihood improvement. We also have our own Meat on Wheels concept. A value chain has been established. Farmers are getting the right price for their produce, and consumers are happy too.

Uttarakhand Apple Federation

Since 18th century, Harsil apples have been popular globally. The Uttarakhand government is set to launch an ambitious apple project to develop the hill state as a major apple growing hub.

Silage Making

Seeds are provided to farmers. Through this initiative, farmers are able to sow multiple vegetables, silage and corn. Within six months, farmers are able to produce different types of crops. The income of the farmers was Rs 32000-34000 per acre earlier. It has increased to Rs 60000-62000 per acre. In future, farmers will be able to produce crops three times in a year. The requirement of dairy farmers for silage shall be fulfilled. The project aims to deliver silage to other states too.

A processing unit has been set up for separation of silage at mass scale, transferring the silage to the respective co-operative dairy and the farmers involved in animal husbandry. Silage is also made available to the Silage Cooperative Federation and Dairy Cooperative Federation.

(Ms Neelam Bhatt Shilswal, General Manager, Information & Broadcast, UKCDP, Uttarakhand)

MANTRA FOR SUCCESS
FOCUS ON AREAS OF CORE COMPETENCY

From a pushover industry to a critical backbone industry for Indian agriculture, our seed industry has moved miles in the last couple of decades. The size of the Indian seed industry has grown to Rs. 2500 crore. Our industry has matured with multiple innovations, focused strategies and targeted investments.

India is poised to be the seed ball of the world. We have got the power of research, human resource and infrastructure. Hyderabad has one of the largest investments in the seed industry globally. It is the most concentrated seed hub in the world. Hyderabad houses the highest number of seed companies, processing plants, dryers, cold storages, research farms, warehouses etc in the vicinity of 100 kilometers.

Time has come for the Indian seed industry to focus on the areas of our core competency. Like the Fortune 500 companies of the world, we must delegate the non-core tasks to the professionals. They can deliver a better job. The Indian seed industry must focus on the best research output and critical human resource. These shall add high value to the company.

Like the Fortune 500 companies of the world, we must outsource the non-core tasks to the professionals. They can deliver a better job. The Indian seed industry must focus on the best research output and critical human resource. These shall add high value to the company

The new Seed Bill is coming up. New technologies are in the pipeline. Time has come for the industry to focus on vision that drives the company's growth. There has to be a shift away from the non-core activities. There are many non-core activities like seed processing plants, cold storages, warehouses, seed testing laboratories, biotechnology laboratories, logistics, production, GOT evaluation etc. In developed countries, the industry largely depends on non-core players for the delivery of these activities, so that they can focus on the growth of their company.

For example, small seed companies in India don't have proper seed testing laboratories. If they stick to their areas of core competency, they shall take the services of some qualified professionals. In this way, the company will have access to the best seed testing laboratory. The company itself shall focus on delivering what is needed for the seed industry. Commercially, it makes better sense to outsource, instead of going in for a high capital investment plan.

Investing the capital in core activities of the seed company provides larger value than investing capital in non core activities of the company. Here is another example. Many companies don't have proper germplasm banks for long term storage beyond 20 years. In such a scenario, outsourcing the germplasm bank shall make sound economic sense for the company. Setting up a germplasm bank requires a high level of technical knowhow and high capital investment infrastructure. Time has come to protect the germplasm in common germplasm banks for the next few decades.

Even seed testing laboratories are inadequate in India. Small and medium seed companies face dearth of quality manpower. Many companies don't have technical knowhow for cutting edge seed testing methodologies. We at Gubba are thinking innovative solutions like artificial intelligence, graphical analysis etc. These solutions deliver data in tailor made formats that will add real value to the research and development department of the seed company.

ABOUT THE AUTHOR

Mr Gubba Kiran, CEO of Gubba Cold Storage, is regarded as the face of Gubba for the Indian seed industry. He has led the company into efficient service in cold storage preservation. He has been instrumental in creating the Gubba brand from 0.7 million cubic feet to one of India's biggest cold storage companies with presence on 11 million cubic feet. He has played a key role in educating pharmaceutical companies in preserving critical products at Gubba

There are very few NABL accredited seed labs in India. Hiring high-end quality manpower will significantly add to the costs faced by the company. In this context, small seed companies tend to compromise on quality. They do not take into account the long-term financial impact upon the total supply chain.

Seed laboratories and biotech laboratories are non-core sectors of the seed industry. At the same time, these two are the pillars to ascertain the supply of quality seed to the farmers. Testing can ensure one's inventory plan in advance. It can also save the company from losses. To stay in the competition and retain one's place, one must obey government rules on quality seed. It is of utmost importance to deliver quality seed to the market.

A germplasm bank is like preserving life for lifetimes. Seed companies can save their precious innovations for a longer period of time if they opt for germplasm banks. Hence seed companies must focus on the R&D to create and innovate. Saving in germplasm banks can be outsourced to the experts in that sector.

Whenever I am stressed, I speak to my wife, daughter, my parents, my cousins or some close friends. I clean up my favourite spaces in the house. Sometimes I watch a movie or TV shows. I like to connect with people. I try to empower them in various ways. I also love to sit in my garden to relax

OPPORTUNITIES AND CHALLENGES FOR POULTRY

The size of India's human and animal population is almost the same. While the population of India is around 137 crores based on Worldometer elaboration of the latest United Nations data, the livestock and poultry population is around 138 crores (20th Livestock Census).

Production of agricultural crops has been rising at a rate of 1.5 to 2 percent per annum while eggs and broilers has been rising at a rate of 8 to 10 percent per annum. The total Poultry in the country is 851.81 million in 2019, increased by 16.8 per cent. The total Backyard Poultry in the country is 317.07 million in 2019, increased by 45.8 per cent; the total Commercial Poultry in the country is 534.74 million in 2019, increased by 4.5

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per cent over the previous Census.

10 lakh poultry farmers produce around 851.8 million birds annually. Poultry contributes Rs 1.3 lakh crore to the national GDP. The poultry market is predominantly fresh meat. Processed meat accounts for just 5 to 10 percent, depending on the geography. India is currently the fourth largest poultry producer in volume terms, though per capita consumption is still one of the lowest in the world.

The total broiler market size was estimated at 4.7 million tons (carcass weight), translating into volume growth of approximately 2% during 2019. At per capita meat consumption of 3.4 kg per annum, total broiler meat market size was over Rs. 85,000 crore in terms of retail price.

The domestic table egg production for 2019 was estimated at 109 billion eggs, translating to per capita egg consumption of 80 eggs per annum, market size of over Rs. 45,000 crore.

The Crash

Covid impacted various sectors in India. Among the worst affected is the poultry sector, losing USD $1.5 million per day due to lower prices. Rumours associated with the consumption of chicken, sharp decline in demand, realization and profitability put a dent in sales and placed the poultry industry in a pickle. The present projected loss of the poultry industry is around Rs. 22,000 crore.

Over the past few months, millions of small poultry farmers across the country were left reeling after sales crashed 80% over false claims that chickens are carriers of coronavirus.

The Way Forward

So what is the way forward? India's median age is 28. India's population became the world's youngest during 2020. More than two thirds of the population is eligible to work. Effective skill development programs for rearing poultry and producing diverse value-added products by small vendors to cater to the local needs will effectively aid the PM's call for Local to Global. The New Normal will present new challenges and opportunities in the poultry sector. The pandemic is a wakeup call for India to be self reliant or Atma Nirbhar in all areas including poultry.

Few industries offer as much scope for rural entrepreneurship with relatively low investment and short gestation periods as poultry. The present adversity can be viewed as an opportunity to create new and expand existing markets

Unfortunately, this promising sector has been facing many challenges since 2011. The following are the major constraints faced by the Poultry sector:

- Feed cost,
- Genetic Improvement
- Bio-security Measures
- Avian Influenza (AI)
- Anti Microbial Residue (AMR)

The Covid lockdown impacted the domestic poultry industry severely. It was perhaps the worst hit in recent times. The industry incurred large net losses due to sharp decline in demand, realization and profitability. The spread of misinformation on social media heavily impacted consumption. The government countered the misinformation, but the losses between January and March 2020 amounted to USD 236 million. The sale of poultry meat went down a staggering 80 percent, and prices for poultry meat were halved. Over a million small poultry farmers and over half a million persons working in the sector became unemployed. This also impacted feed producers, because poultry farmers cancelled orders. Some farmers even buried their chickens alive. The sector provides direct benefit to more than 10 million maize and soya farmers. Poultry farming offers direct and indirect employment to over 50 million in poultry production, trading, feed manufacturing, agriculture crops, logistics, exports and others.

During this adverse period, the government and the industry came together to discuss consumer awareness, and improve consumption to gain consumer confidence. The poultry industry recovered a little following the clarification issued by the Government, the media and poultry professionals that eating chicken was safe. Still, issues relating to interstate movement of eggs and chicken in various parts of the country hurt the sector. Currently, consumer fear linking chicken with Covid is much lower. The main challenge for the past weeks has been logistics and keeping the shops open for the consumer. Presently, the logistics issue has been addressed in at least 60% of the country.

Few industries offer as much scope for rural entrepreneurship with relatively low investment and short gestation periods as poultry. The present adversity can therefore be viewed as an opportunity to create new and expand existing markets. It may therefore not come as a surprise that GOI recently announced USD 2.1 billion infrastructure fund to provide interest subvention of up to 3 per cent to private players for setting up dairy, poultry and meat processing units. This fund will be used to increase production, boost exports and create jobs. This leads to the following opportunities for investments in the poultry sector:

* Cold chains and Refrigerated Transport
* Skilling and Training
* Supply of feed additives and pre-mixes (perhaps even insect feed, as suggested in Omnivore Vision 2030)
* Supply Processing Machinery
* New technologies for maintaining the farms using AI and IOT
* Traceability using Block Chain technology

2021: EXPECT HAPPY TIDINGS

The lockdown caused by Covid left the farm sector with low sentiment, shortage of labour and farm equipment and demand fragmentation. The road ahead was full of challenges and blurred, with supply chains taking a massive hit as people started hoarding food grain, cereals and staples.

According to the November data released by the National Statistical Office, agriculture appeared to be one of the few bright spots for the second straight quarter. Amid a grim GDP performance, agriculture clocked a growth of 3.4 percent at constant prices in the July- September quarter. According to NITI Aayog, agriculture could be the silver lining for the Indian economy. It is estimated to grow at a rate of 3 pc for 2020-21. Record sowing during the Kharif season is likely to boost farm income, and eventually support the agricultural economy amidst the pandemic. Early indications show a healthy start to the procurement season that began in October, said a report by ICRA. It looks like there will be record procurement this year.

Good monsoons to improve harvest in 2021

Rainfall in India is capricious and causes

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Mr Raju Kapoor is Director, Industry & Public Affairs, FMC India. He has diverse experience in sectors like Crop Protection, Fertilizers, PGRs, Seeds, Animal Nutrition and Health products. Mr Kapoor has built, grown and turned around various businesses over his career. He has been actively involved in the areas of Public Policy, communication, marketing, supply chain management and general business management

a lot of damage to soil and agricultural produce. Water management is a key element to consider when predicting the state of output. Water resources saw tremendous improvement due to the decent monsoon, lockdown and Covid's impact on refreshing water bodies. For maximum crop production, every year monsoon is analyzed and predicted. There is assumption of another good monsoon in 2021 which is expected to have a direct impact on the harvest in the year.

The strong Rabi sowings so far combined with well-provided water reservoirs is likely to give a big boost to winter crops. This season, there is likely to be further increase in the area under pulses and oilseeds apart from wheat, supported by better productivity. Increased MSP may lead to improved price realizations and income for the farmers, which is directly dependent on the extent of procurement done by government agencies. Hence government investment will be further beneficial for farmers.

Technology driving towards smart agriculture

For a nation heavily dependent on agriculture, government policies coupled with disruptive technology are proving to be a boon. There has been adoption of technology in terms of improved seeds, irrigation techniques, crop diversification, seed quality, newer pesticides and value chains. Technology still remains underutilized when it comes to climate prediction, water information, geo and mobile based farming, broad market data information and automation of farming using robots.

The adoption of technology in agriculture can help in addressing the growing demands. For instance, big data can help farmers with the information to produce high quality crops, boost harvest, predict possible risk and increase efficiency. The efficacy of precision farming is furthering the use of AI. The advent of Nano Science has been helpful in providing data to the farmers through smart delivery systems and nano sensors, to ascertain whether disruptions are optimizing use of water resources and reducing wastage.

fun FACT

Mr Kapoor likes to define himself as a Photographer, Spiritualist and Philanthropist

The next big wave in agriculture is expected to be with use of drones. They are immensely useful in soil and field planning, seedpod planning, crop monitoring and protection and controlling weed, pests, insects and locusts.

Government reforms and policy

As winds of change blew across other sectors and boosted the economy, rural India and the farm sector remained untouched for a long time. Policy Reforms largely skipped the agriculture sector. Now, agriculture is fast becoming a mainstream sunrise industry. It is great to see the Indian government focussing on reforms in agriculture.

Various government schemes may put more money at the hands of the farmers which they may gainfully deploy for adopting new technology adoptions. Recently, the government allowed ICRISAT to use drones for agricultural research, apart from use to control locust attacks. Expanding the use of drones for agriculture will be very positive for the sector. It will help to further leverage the use of drones for various farming jobs.

Positive predictions to accelerate growth

With a slew of reforms and favourable climatic predations, 2021 could be a critical and decisive year for India's farming community, and may pave the way for the future. Global commodity prices are looking up post COVID as countries are stocking more to cover disruptions.

Crops like soybean may see a jump in prices. Horticultural crops may be biggest beneficiaries of the Agri-Infra funds, and may cover more crop area. Inputs companies should see another good year with seeds, pesticides and fertilizer companies consolidating the gains made this year.

The government is likely to bring more incentives and promote investments in agriculture and related infrastructure. It is also expected that the government may bring pesticides regulatory policy reforms that will help support introduction of newer pesticides in the country. One expects similar focus on mechanization in the coming years, supported by better market end policies and infrastructure, and build up of FPO infrastructure. We should expect uptick in the introduction of precision farming techniques research and introduction in 2021.

With positive global commodity prices, better policy focus, financial incentives and technology facilitation, 2021 could well turn out to be the special year we all have been waiting for, with strong growth in agriculture.

FARMERS ENGULFED IN VICIOUS CIRCLE OF DOUBTS

On June 5, the Centre introduced three ordinances in the name of agrarian reforms. These were passed as law in the monsoon session of the Parliament. Farmers across the country are angry about these laws. Their agitation on Delhi border has been going on since November 26. The reason is that these laws pander to the interests of the industrialists.

The government claims that these three laws are going to change the direction of agriculture and the situation of farmers. There has been demand for improvement in the condition of our farmers for decades. Governments kept giving us bundles of promises and announcements, but the economic condition of the farmers has not improved. Now the government is talking about improving agriculture through these laws.

The demand and advocacy of new agricultural policy has also been done. When Shri Narendra Modi's government came to the power in 2014, there was hope that the wishes of the farmers will be fulfilled. It did not happen. The government announced that by 2022, the income of farmers would be doubled. How? There was no answer to this.

In response to this question, the Centre brought in three laws relating to agrarian reform: Agricultural Produce Trade and Commerce (Promotion and Facilitation) Act, 2020, Amendment Act of Essential Commodities Act, 1955 and the Farmers (Protection and Empowerment) Agreement on Price Assurance and The Agricultural Services

ABOUT THE AUTHOR

Dr Rajaram Tripathi is National Convenor, All India Farmers Federation (AIFA)

Act. Since then, these laws are being questioned. For almost a month, farmers are on the streets and protesting.

Farmer organizations not consulted

The government has its own arguments in favour of these laws. The farmers consider them "anti-farmer". The most surprising thing is that for introducing these laws for agricultural reform, the government did not consult any farmer organization. It consulted business organizations only. In such a situation, it can be easily guessed whether this law will be corporate-friendly or farmer-friendly. There are some fundamental questions about these laws – such as end of MSP, end of government mandis. There is also the fear of going into the hands of industrialists of agriculture and their interference in agriculture.

In view of the protest, Prime Minister Narendra Modi has said that the price of the commodity in the open market will be market-controlled and the cash crops will benefit more in the market. The farmer has the option to sell his crop anywhere.

The government is talking about one nation, one market. It has said that it shall continue to purchase paddy and wheat from farmers as before, and the MSP system will continue. Farmers are apprehensive that this is a conspiracy to end the MSP system. If the government's intention is clear, then MSP should be part of the law.

> The mandi system will be almost destroyed by this law. This will harm the farmers, while the middlemen and the corporates shall benefit. They will buy from farmers outside the market at a quarter of the price. MSP shall hold no value. What will happen to the subsistence of millions of people working in the market? There is no mention of this

Even if we accept these populist arguments of the government, many questions make us farmers apprehensive and afraid. The mandi system will be almost destroyed by this law. This will harm the farmers, while the middlemen and the corporates shall benefit. They will buy from farmers outside the market at a quarter of the price. MSP shall hold no value. What will happen to the subsistence of millions of people working in the market? There is no mention of this.

The Bihar experiment was a failure

A similar system was introduced in Bihar in 2006. It was expected to bring about revolutionary changes. Even after 14 years, the farmers of Bihar are wandering to sell wheat or paddy. After the removal of the Essential Commodities Act 1955, traders will be able to hoard these crops and control inflation. In a way, this gives the control of the economy in the hands of the capitalists. There are more than 80% small and medium farmers in India holding 2 to 4 acres of land. These laws will hurt them. The big capitalists will buy land from the contract farming and will get the contract farming done from the farmers, by which they will take the land from the farmers at one and a half price.

In case of disputes, farmers shall not get justice from the court, while the corporate have an army of lawyers. Regarding contract farming, it is being feared that thousands of companies will come to market in the coming years to sell fertilizers and seeds to farmers in the name of contract farming, and at the time of purchasing the crop. They will cheat the farmers. The government will have to set up a regulator to regulate contract farming so that the interests of farmers can be protected.

The matter of doubling farmers' income by 2022 seems meaningless. Now the farmers do not expect anything good from the government. They are full of apprehensions.

‘MSP must be guaranteed to farmers’

We’re finally about to leave the dreadful 2020 behind! This year was stacked with natural and man-made disasters, economic and mental collapse, and the untimely and unnecessary deaths of hundreds of thousands. No wonder we are all waiting for the year to end and find some peace of mind that it will all be over soon – and that 2021 will be better.

Humanity clearly showed its strengths throughout the difficulties. Random people helped each other. Support groups lifted those who were struggling with challenges. Agriculture is not something that can stall temporarily. No matter what happens to the world, it has to go on. There was an increase in demand for agricultural produce during the lockdown. Fortunately, despite the panic buying, markets were well-stocked thanks to our farmers, who supplied freshly-harvested fruits and vegetables, cereals and milk products. They are among the heroes of this pandemic.

We demand that the government respect the dedication of the farmers and withdraw the three new farm laws. MSP should be guaranteed to us. Buying the produce below MSP should be made into a punishable offence. It will be difficult for farmers with small land holdings to survive in the coming times. We request the government to set up cottage industry training centers in rural areas to train the youth and provide them with new opportunities and platforms to set up small scale industries.

The government should also come up with better insurance cover plans to help farmers fight natural calamities. More and more ways for renewable resources of energy should be made easily accessible to all the farmers – big or small – at subsidised rates. We are also looking forward to better road connectivity in all parts of the country so that it is convenient to carry the produce to markets.

Jai jawan jai kisan

Ch Yudhvir Singh
Bharat Kisan Union (BKU)

BACKYARD POULTRY AN EFFECTIVE WAY TO INCREASE RURAL INCOME

PARVINDER SINGH CHAUHAN
Bureau Chief - Rajasthan
Agriculture Today Group

Indian farmers need to increase their income. Hence they must adopt allied agriculture activities and modern farming techniques.

Backyard poultry farming is a highly promising option for crop farmers to increase their income. It is a highly potent tool for the upliftment of farmers.

Poultry requires low initial investment. Sales are easy, and the return on investment does not take long. In this way, poultry boosts family income. It enables better utilization of family labour. Looking after poultry is simple and easy, and can be handled by most family members.

Backyard Poultry production can cater the nutritional requirements of the family. Poultry also serves as the family's ATM. This is because as per family needs, the birds can be sold at any time and one can have cash in hand.

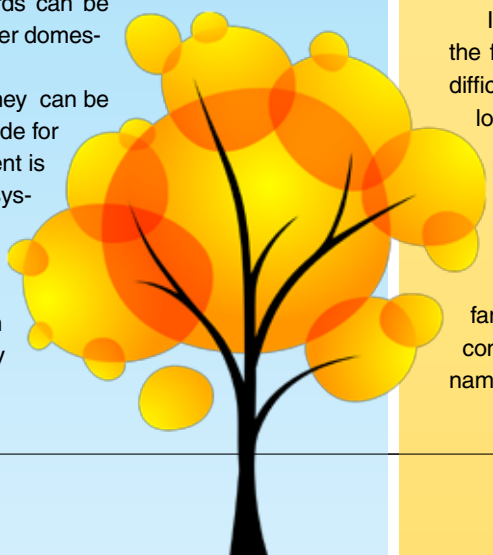
The quality of chicken and eggs is better in backyard poultry. This is because farmers can practice organic poultry farming this way. Birds are raised in a zero-stress environment. Consumers are willing to pay higher prices for better quality desi chicken meat or egg.

The birds' manure can be used as organic fertilizer. In order to promote backyard poultry, the government provides farmers with vaccinated chicks free or for a minimal amount.

For backyard poultry, the farmer does not need to make any special shed for the birds. These birds can be raised in the shed provided for other domestic animals.

specific shed for these birds they can be reared in the shed which are made for their own animals ,so no investment is required in housing and feeding systems for these birds.

In backyard poultry farming, chances for loss are very low. By adopting desi techniques, we can increase the number of birds by natural hatching.



FARMERS HAVE BEEN MISLED BY NEGATIVE FORCES

NARENDRA SINGH MEHRA
Bureau Chief - Uttarakhand
Agriculture Today Group

2021 holds immense promise for the agriculture sector. Even before the onset of 2021, we could see signs of positive changes This year, we shall see the constructive results of those reforms.

It is unfortunate that 2020 had a highly destabilizing impact on the global economy. Covid also had a negative impact on India's rural economy.

It is sad that farmers have been used as a weapon by forces that want to destabilize India. These forces made the farmers dance to their tunes. They were successful in projecting India in a wrong light before the world. The involvement of the farmers in this sinister conspiracy is a blot on the agriculture sector. It will take time for this blot to wash off.

PM Modi's announcement to double farmers' income by 2022 is a highly significant milestone for the nation. The reforms announced by PM Modi cut through bureaucratic red-tapism and the status quo in policy making.

The farmer has been awaiting self-reliance and prosperity for 72 years.

If measures are not taken to improve the lot of the farmers, then the coming times shall be very difficult for them. Farmers suffered due to Covid lockdown. Now they have been ensnared by negative forces.

We know that nothing is cent percent right or wrong. The Advisors of PM Modi led him to make laws in the favour of agri-businessmen who exploit farmers. The farmers were instigated against these laws. The conspiracy of this protest has been given the name of farmers' agitation.

FARMERS CAN BENEFIT BY LEARNING FROM COVID LESSONS

AGRI RAKESH KUMAR
Bureau Chief - Himachal Pradesh
Agriculture Today Group

Post the learning and lessons of Covid, 2021 shall prove to be a time of golden opportunities for those farmers or FPOs who shall supply nutritious cereals, millets, organic fruits, vegetables, milk and milk products, honey, herbs directly to the consumers as per their needs and budget. Farmers can process many fruits and vegetables at low cost for the value addition of these products.

After Covid, there is a high degree of awareness among consumers regarding immunity-building potential and purity of food products. Farmers must form FPOs for efficient and cost-effective functioning. Unless farmers take 100 per cent ownership of the food chain, they shall not be able to make 100 per cent profit.

Wake up farmers. Wake up consumers. If the farmers and consumers come together, they shall collectively flourish, and the country shall have a bright and prosperous future.

TRADITIONAL FARMING PRACTICES VITAL

SATISH BABU GADDE
Andhra Pradesh

With the onset of the New Year, there are new hopes all over the world. Indian farmers begin the New Year with the new hopes of higher yields and good profits. Farmers have adopted latest technologies, machinery and the gains from scientific research. These have helped them in achieving the desired yields and also made their work easier. But over the years, farmers seem to have forgotten the basics of farming such as improving the fertility of soil, or improving the resistance of crops from pests. These are met to some extent by using chemical fertilizer and pesticides. But the use of these chemicals at the current rate will put the whole human life, environment and Mother Earth in trouble. The so called "Mysterious Disease" in Eluru, Andhra Pradesh is the warning of the troubles we can anticipate.

Agricultural experts and also the farmers must rethink the practices being followed, and analyze the consequences of continuing them. The New Year is the time when farmers must rethink their practices, and the government must rethink the policies – from the lessons learnt in the past few decades, and also from 2020. Human life and the environment must be the priority. The most effective way of achieving this will be by following the footsteps of our forefathers i.e. traditional farming techniques.

"We sold a reasonable chunk of our expected crop by purchasing Put options. We can now concentrate on crop care activities for better yields. Put Option is really a game-changing tool for farmers."

-- Devraj Faujdar,
CEO, Deeg Wheat and Mustard Producer Company Limited, Deeg (Bharatpur), Rajasthan

"NCDEX is new to us. I attended some workshops to understand how the Futures market works. But Put Option is a dream product enabling us to fix our price at the time of sowing. When I told my member farmers that we can fix the sale price for our mustard now itself, they couldn't believe it. We seized the opportunity and sold a reasonable chunk of our expected crop by purchasing Put options. Free from worries of likely fall in prices, we can now concentrate on crop care activities to ensure better yields. Put Option is really a game-changing tool for farmers."

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"सरकार द्वारा उत्तराखंड सहित सभी राज्यों के किसानों को जैविक खेती और आयुर्वेदिक खेती का लाभ दिलाने के लिए व्यापक योजना बनाई गई है। गंगा जी के दोनों ओर पेड़ पौधे लगाने के साथ ही ऑर्गेनिक फार्मिंग से जुड़ा कॉरिडोर भी विकसित किया जा रहा है"

- श्री नरेन्द्र मोदी, माननीय प्रधानमंत्री (उत्तराखण्ड में नमामि गंगे परियोजनाओं के लोकार्पण के अवसर पर)

Sustainable Agriculture is an important sector in Arth Ganga

SIGNIFICANCE OF ORGANIC FARMING, HORTICULTURE AND MEDICINAL PLANTATION

- Creates Livelihood
- Maintains Soil Quality
- Cost of production is minimised
- Increases yield of crops
- Reduces Soil erosion
- Reduction in pollution due to fertilisers and chemicals

ORGANIC FARMING

- Development of pilot clusters in Uttarakhand, Uttar Pradesh, Bihar and Jharkhand
- Organic farming is being taken up in 50 Hectares of Land in 7 districts of Uttarakhand and 35,000 Hectares in 11 Districts of Uttar Pradesh
- Development of sustainable Agrispaces in Munger,Bihar by IUCN

HORTICULTURE

- Agroforestry implementation in Uttar Pradesh, Jharkhand and Bihar
- Plantation of 3,000 Rudraksh saplings in mid Himalayas, Uttarakhand by INTACH with CSR support from HCL
- Integrated action plan by Uttar Pradesh for 27 districts with a cost of Rs. 3878 Lakh
- Development of 76 Ganga nurseries and plantation of 55,69,200 trees

MEDICINAL PLANTATION

- Promotion for cultivation of medicinal plants in Uttar Pradesh
- Cultivation in 10 districts along Ganga on 2500 Hectare in 180 Gram Panchayats
- Development of 17 large and 50 small cluster level nurseries

FORESTRY INTERVENTIONS

- 26764 Hectare area planted by State Forest Departments
- Intensive plantation drives through Vriksharopan Abhiyan

National Mission for Clean Ganga
Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti
Government of India

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