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Pave the Way for Daughters of the Soil

The dream of socio-economic empowerment of women in India will not be complete without empowering those who are an integral part of India's rural landscape... the ones whose day starts before sunrise and continues after sunset. These are women farmers who have been struggling to establish their identity at grass root level due to patriarchal traditions and gender-based discrimination.

Women play a significant role because Indian agriculture is largely a household enterprise...yet they remain confined as workers. Farm tools are primarily designed for male farmers. Women are left to use traditional tools resulting in low efficiency, drudgery, occupational health risks and low income. Their contributions fall under indirect material income and go unacknowledged in decision making. Illiteracy, lack of knowledge, improper training and less opportunity for skill development worsen their subdued existence. Hence getting loans, participating in mandi panchayats, assessing and deciding the crop patterns, bargaining for MSPs, loans and subsidies continue to remain male activities.

Women have to be empowered for their rights, access to land, leadership, opportunities and choices to promulgate sustainable societal growth

The way forward

• Skill development and training in field operations, conservation of biodiversity, organic farming etc
• Designing of tools for women that are tailored to local conditions
• Education on modern agricultural techniques
• Providing information on soil, plant & animal health
• Creation of self-help groups for financial support and for generation of employment
• Projection of successful women & acknowledgement of their contribution in economic terms
• Providing financial powers by making appropriate changes in legal, financial, and educational systems
• Creating opportunities for income-generating activities along with agriculture
• Participation in policy making that involve rural women

These voices need to be heard at both the policy and implementation levels if we are to realize the dream of a progressive India. Closing the gender gap is essential in order to accelerate the pace of growth in the agriculture sector. Agribusinesses can play a critical role in bridging the gender gap in Indian agriculture.

Happy Reading
CROP PROTECTION

FARMERS MUST ALWAYS GET GENUINE PRODUCTS

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ICFA signs up with Amazon AWS Educate
To empower future talent with cloud computing skills to drive innovations in Agriculture

Indian Chamber of Food and Agriculture (ICFA), an apex think tank, policy research and trade facilitation body, and resource center for the food and agricultural sector in India, has signed up to adopt the AWS Educate global program to build deep technology cloud computing skills with students in the agricultural engineering and sciences domain.

AWS Educate is Amazon’s initiative to provide students comprehensive resources for building skills in the cloud. Working with the AWS Educate program, ICFA has developed a framework that infuses cloud computing technologies in agricultural engineering and sciences curriculum, with an aim to provide students the knowledge of advanced technologies, and enable them to deliver continued and systematic innovation in the field of agriculture.

The new curriculum designed by ICFA and the AWS Educate program integrates emerging technological concepts with the fundamentals of agriculture. It shall be offered to students as certificate courses through leading universities in India offering agricultural engineering and sciences programs. The new certificate courses will provide students an understanding of cloud computing, machine learning (ML), artificial intelligence (AI), voice technology, and robotics, and equip them to apply their learning in the field. Students will gain from practical learning experiences through case studies that give them a better understanding of challenges in agriculture, and how technology-led approaches can enable agricultural practices that are more profitable, efficient, and environment friendly. All students who enroll for the certificate courses will join the AWS Educate program, and receive AWS Promotional Credits to gain real-world, hands-on experience using AWS Cloud technology.

“About 15 percent of India’s GDP is dependent on agriculture. Smart agriculture using cloud technology will play a significant role in transforming farming practices, enabling farmers to adopt modern methods for more informed decisions to achieve superior agricultural outcomes,” said Dr. MJ Khan, Chairman ICFA. “By adopting AWS Educate, we are taking a proactive approach in developing students with advanced cloud computing skills to build highly scalable and innovative farming solutions that will help drive India’s economic growth.”

“Technologies such as cloud computing, machine learning and Internet of Things (IoT) are accelerating innovation in the field of agriculture, and contributing to higher crop productivity, a safer and more productive food supply chain, and better preservation of natural resources, thereby enabling better outcomes for farmers,” said Rahul Sharma, President, India and South Asia Public Sector, Amazon Internet Services Private Limited. “We are excited to align with ICFA’s vision to help students of agriculture develop cloud technology skills through AWS Educate, and contribute to the development of one of India’s most important sectors.”

ICFA will introduce the new certificate courses on the applications of cloud computing, ML, AI, robotics and remote sensing for the academic year 2020-21 through leading universities in India that offer programs in agricultural engineering and sciences. The program will be offered initially to 10 universities and later rolled out to all major universities, who are partners in National Higher Education Project of ICAR.
Vishal Bhardwaj, the celebrated Bollywood filmmaker, introduced Indians to the word chutzpah in his 2014 hit Haider. The word is pronounced as hutz-pah or hootz-pah. The meaning: supreme self-confidence or audacity, usually used approvingly.

I was reminded of this word when I saw the Ananda advertisements over the last two months. In these dismal Covid times when the industry mood is despondent, the six Ananda animation videos are refreshing and cool, with strong positive messaging. Ananda Founder and CMD Mr Radhey Shyam Dixit is the prime character of the animation series. This is perhaps for the first time that the CMD of an organization has been featured in an advertisement campaign as an animated character. His willingness to be featured so is chutzpah.

The campaign is a hit on social media. Mr Dixit said Ananda had been conceptualising the campaign for some months and rolled it during the pandemic to effectively convey the brand message and strengthen the bond of connectivity between consumers and farmers. Ananda plans to release one video every week. The animated character of Mr Dixit is now the face of the brand. There is evident wisdom in this, Mr Dixit admits cheekily. There is no huge cost associated with a celebrity. The messaging comes from the source of the brand. And there is no fear of the personal fortunes of the celebrity impacting the brand negatively. Mr Dixit says happy dairy farmers and happy cattle are central to Ananda – hence their inclusion in the ad campaign.

The government recently announced an Animal Husbandry Infrastructure Development Fund (AHIDF) of Rs 15000 crore. In the organized dairy sector, a sizable part of the final value of the dairy output flows back to farmers. Growth in this sector can have significant direct impact on farmers’ income. The size of the dairy market and farmers’ realization from milk sales is closely linked with development of organized off-take by cooperative and private dairies. Thus, investment incentivization in AHIDF will leverage private investment and motivate farmers to invest more in inputs, pushing higher productivity and farmer income. AHIDF shall also boost direct and indirect livelihood creation in the dairy sector.

Mr Dixit is enthused that with AHIDF, for the first time the government is focusing on boosting private dairies along with cooperatives. “The entrepreneur puts his life and soul into his organization to make it succeed, and provides employment to more and more people. I am grateful that with Atma Nirbhar Bharat, the government will support the private dairy industry too. This support system is essential for growth. It will aid the growth of the Indian dairy sector, and shall benefit the nation,” he said.
The Pesticides Industry supports our Agricultural economy and crop production since its inception. It played an essential role in ushering in the Green Revolution. Pesticides supported India’s high yielding varieties and hybrids by shielding them from pest and diseases, so they were able to realize their yield potential. Pesticides are an integral part of the Integrated Pest Management (IPM) Program of GOI, state governments and state agricultural universities. The industry is committed to provide value-added solutions to farmers through on-farm demonstrations and on-the-spot knowledge-sharing. The focus is on developing strategies from plant protection chemicals and addressing immediate needs the farmers. This will help in realizing the dream of our Hon’ble Prime Minister Shri Narendra Modi of doubling farmers’ income by 2022-23.

Due to the changing climate and adversaries, the incidence of pests, diseases and weeds is increasing alarmingly. Many new pests, weeds and diseases have been reported to cause serious damage to crops, resulting in huge losses. The 37th Parliamentary Standing Committee in 2002 under the Ministry of Chemicals and Fertilizers estimated these losses at 18%, amounting to ₹90,000 crore. The losses have increased over the years.

The pesticide industry is making all out efforts to make quality agrochemicals available to farmers to fight these dreadful pests. Numerous challenges along with stringent regulations faced by the industry slow down the development of new farmer-friendly agrochemicals.

Spurious products are harming crops
Pesticides have a direct impact on agricultural economy and food security. The presence

ABOUT THE AUTHOR

Mr RG Agarwal is Chairman of the Dhanuka Group
of spurious, fake, illegal or duplicate pesticides in the market result in losses of yield and farmers’ income. These spurious pesticides come from different sources, either by compromising Central Insecticide Board & Registration Committee (CIB&RC) approved pesticides guidelines or Illegal import via wrong declarations. There are more than 6,000 agro-chemical companies in India. Most of them are not running as per the guidelines of CIB&RC which allows prosecution – but it isn’t happening.

If a taskforce is made to review and visit the premises and infrastructure of these 6,000 companies and action is taken against those companies who are not following the guidelines and are supplying spurious products, the rampant sale of such fake chemicals as pesticides or pesticide-laced biopesticides/bio-stimulants can be controlled.

The production of wheat is suffering badly because most weeds have developed resistance due to use of spurious chemicals or chemical-laced bio-pesticides, applied in less than required dose. BPH in paddy has developed resistance, and there are many other such examples. A large number of local manufacturers are selling various products as bio-pesticides/bio-stimulants in Andhra Pradesh, Karnataka, Gujarat, Haryana, Uttar Pradesh, Chhattisgarh, West Bengal, Bihar and other states for many years. These so-called bio-pesticides have shown strong pesticidal properties and are being sold to control lepidopterans and sucking pests. They don’t have any credible or research-based authenticity. The back-door business has grown enormously as the manufacturers of such products are offering attractive prices to dealers with high margin of profit.

According to estimates of the Indian Pesticide Industry, over 30% of plant protection chemicals sold in India are not registered, fake, sub-standard, misbranded, counterfeit, unapproved and illegitimate pesticides, bio-pesticides and bio-stimulants. They are developed bypassing regulations and field trials. These spurious products are sold with the strong nexus of manufacturers, retailers and the local administration.

The magnitude of the problem can be assessed from the fact that the market size of spurious pesticides was worth Rs 3,200 crore of total pesticides market of Rs 16,900 crore in 2002, as per Tata Strategic Management Group (TSMG) and FICCI report. The report estimates the proportion of counterfeit pesticides as high as 40% in 2019. The use of such pesticides is growing at about...
GOI is proposing to impose 20% import duty on formulation imports of agro chemicals/pesticides from the current 10% in order to control import from China. We recommend that instead of increase, it should be decreased from 10% to either 0 or 5%.

Above: A clipping from ET where Shri Rajnath Singh as Union Home Minister stated that the money generated from Illegal trade is used for terror and gangster financing

20% every year. Uttar Pradesh, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Haryana and West Bengal are among the worst-affected States. As per research done by Indian Institute of Public Administration with the help of Ministry of Consumer Affairs, 58% of agri inputs are fake in rural India.

Indian farmers are mostly guided by retailers who follow unethical and illegal practices. They lure the farmers in an illusion of cost-effective solutions to purchase non genuine plant protection chemicals. Most farmers purchase spurious pesticides thinking that they are purchasing the original product.

**Problems due to Spurious/Sub-standard pesticides**

1. Due to ineffectiveness of these products in controlling pests, crops suffer yield losses
2. Financial loss, indebtedness, distress to farmers
3. These products contaminate the fields and environment due to over-use in quest of adequate protection against pests. The unmonitored toxic ingredients lead to soil degradation, ground and surface water contamination, imbalance of natural flora and fauna and negative health impact on humans and animals
4. Inadequate plant protection impacts national food security
5. They generate unwanted residue on fruits, vegetables and other food commodities
6. They corner major market share of pesticide industry
7. There is a major revenue loss to GOI in the form of GST and other taxes

**Efforts to control menace**

The current scenario of spurious pesticides is alarming. On August 1, the industry in cooperation of local authorities organized four raids to identify fraudsters selling spurious pesticides. The first raid was organized by SRIRA AGRO in Ajitgarh, Rajasthan; the second by Syngenta in Guntur, AP; the third by Dhanuka and PI at Mathura, UP and the fourth by PI at Badaun, UP.

Such raids are organized regularly by responsible players in the pesticides industry whose brands are duplicated as they are high quality and in great demand among farmers. The surveys conducted by the Ministry of Consumer Affairs report the presence of spurious pesticides in huge quantities in the market. In spite of the industry’s various representations to the Centre and states, serious action has not been taken against such culprits. Due to the negligence of Agriculture and Police Department as well as the Public Prosecutor, such culprits are released by the court and they start such business again.

The weak national enforcement system, inadequate judicial framework,
lack of punitive measures and penalties, ease to import and trade across borders and failure to inspect pesticide manufacturing units and dealers as per Insecticides Act & Rules are among the numerous reasons which support proliferation of spurious pesticides.

Govt must review policy
In the second week of August, raids were conducted by ED (Finance Dept.) at various places including premises of government officials and bank officials. Hawala transfer of Rs. 1000 crore approximately to China was caught. GOI is proposing to impose 20% import duty on formulation imports of agro chemicals/pesticides from the current 10% to control import from China. We recommend that instead of increase, it should be decreased from 10% to either 0 or 5%. If this increase in import duty on formulation imports of agro chemicals/pesticides is unfortunately done, China will be rewarded. No formulations are imported from China and mainly technical are imported, some from the official route and majorly from the unofficial route, by transferring funds through Hawala. Reduction in BCD from 10% to either 0 or 5% will allow newer molecules to be imported in India so that they can serve the need of dealing with newer varieties of pests and other insects which develop resistance to older varieties of pesticides.

As a remedial measure, MOA&FW, GOI, must constitute a Task Force on illegal pesticides to standardize interpretation of various provisions of Insecticide Act 1968; standardize sampling procedures and improve working and quality of testing laboratories; national register for certified reference standards. Stringent action must be taken against those involved in supplying spurious or illegal pesticides and bio-pesticides/bio-products laced with pesticides. State laboratories must be upgraded for quality check and accredited with NABL. As per the Indian Agriculture Export Policy, a policy measure could be required in India if alternative pesticides are available. Registration of new pesticides by CIB&RC may take months and may force use of pesticides which have been banned/ found obsolete in importing countries. CIB&RC may consider deploying cutting edge technologies to ensure delivery of quality pesticides. GOI should ensure that farmers get quality products to improve productivity and reduce crop losses.

Challenges
Due to lack of proper communication with farmers, the pesticide industry is finding it difficult to reach farmers. The multiplicity of languages and dialects, reluctance in adopting new technologies and new products pose major challenges for the industry and also the farmers. They fear crop loss and are sceptical of new products. This makes popularisation of new genuine pesticides difficult amongst farmers. The nexus between retailers and distributors must be broken. They are taking advantage of the situation by pushing spurious products. Lack of adequate technical expertise also makes product understanding difficult for farmers.

The scientific community, leaders and stakeholders in agriculture must come forward and raise this issue in the interest of the farming community and prosperity of the nation.
AGRICULTURE TODAY

September 2020

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Violation of Insecticide Act 1968 and Insecticide Policy 1977 is rampant all over the country. In February 2020, Karnataka Secretary Agriculture wrote to Joint Directors Agriculture, alarmed about sale of unregistered bio-products adulterated with pesticides. He stated: “It has been noticed that unregistered bio-products adulterated with Registered Pesticides have been sold by violating Insecticide Act 1968 and Insecticide Policy 1977. Samples of such products have been analyzed and found contents of various insecticides…These companies are doing injustice to the public and farmers and we need to take stringent action against them.” He urged the department to instruct dealers to stop selling products of such fraudulent companies.

In May 2020, Commissioner Agriculture Karnataka again directed all Joint Directors Agriculture regarding the sale of unregistered bio-pesticides mixed with insecticides. He noted that despite specified directions, District Inspectors had not initiated punitive action against the violators. “In a few districts notices have been issued and cases filed but necessary actions have not been taken…You are hereby instructed to study each case carefully and initiate suitable action on those companies… Submit details on the action taken against Inspectors who have not taken this issue seriously and shown negligence in discharging their duties.”

Sadly, the situation is similar in the other states.

Rajasthan efforts to control sale of fake insecticides

A few years ago, Rajasthan started the system of compiling the data of sampling for the last five years — company-wise, and samples passed or failed. After studying and analysing these reports, it was observed that maximum sampling was done from leading good companies. From fly by night operators and providers of spurious products, hardly any sampling was done, defeating the purpose of quality control as specified in Insecticide Act. I analysed the Rajasthan data. If such reports are requested from other states under RTI, perhaps a similar picture shall emerge.

As per information provided by Commissioner of Agriculture, Rajasthan, a total of 74 manufacturing licenses were issued which were valid in Rajasthan. The data below is for samples from from 2014-15 and 2018-19, from companies to which manufacturing licenses were issued. Examine how sampling was done.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>No. of Companies</th>
<th>No. of Samples drawn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28 companies</td>
<td>0 samples drawn</td>
</tr>
<tr>
<td>2</td>
<td>17 companies</td>
<td>Between 1 to 10 samples drawn</td>
</tr>
<tr>
<td>3</td>
<td>17 companies</td>
<td>Between 10 to 100 samples drawn</td>
</tr>
<tr>
<td>4</td>
<td>12 companies</td>
<td>More than 100 samples drawn</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74 companies</strong></td>
<td></td>
</tr>
</tbody>
</table>

The Insecticide Act, 1968 and Rules 1971 say that Insecticide Inspector should visit every factory minimum twice a year and draw the samples. The table reveals that from 12 companies, more than 100 samples were drawn. Most samples passed. There is provision that whenever the inspector has doubt regarding quality, he should draw the samples and send them to the laboratory for analysis. The question is: Why did the inspecting officer (IO) have doubt about these 12 companies only? As per official data, the IO had no doubt or suspicion regarding 28 companies from which no sampling was done for five years.

When I was Chairman of CCFI in 2005, we collected information under RTI from all states. At that time, 1250 manufacturing licenses were issued by various states all over the country. After analysis of sampling data taken under RTI, we found that 90% samples were taken from the top 100 companies only.

RG Agarwal

Analysis
SPIC NEEMGOLD

Neem Gold is a botanical pesticide derived from Neem by selective extraction process with the active ingredient Azadirachtin and other triterpenoids viz. salannin, Nimbin etc. Neem Gold is an eco-friendly insect and mite control agent, easily bio-degradable. No residual effect and safe to insect predators and pollinators. Neemgold is very much suitable to control all types of pests. Neemgold is a totally water soluble concentrate with a minimum of 300ppm of Azadirachtin – A stabilized with novel emulsifiers.

SPIC CYTOZYME

SPIC Cytozyme is a biologically derived heterogeneous protein – hydrolysate and is composed of plant growth promoting substances such as Auxin, Cytokinins, Gibberlins, Enzyme precursors and biologically activated chelated micronutrients. SPIC Cytozyme improve physiological efficiency of crops by stimulating the hormonal and enzymatic activities and increasing the nutrient use efficiency. It gives greater initiation of flowering, better retention of blooms, faster maturity of fruit, uniform fruit size and improved quality of the produce.

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PESTICIDE MANAGEMENT BILL
REFORMS, BROAD VISION ESSENTIAL

Pesticide Management Bill, 2020 (PMB) is a replacement of 50 years old insecticide act of 1968. When a new Act is to be introduced, one expects various reforms and a broad vision. PMB should give us the assurance of the following:

a) Make in India
b) Made in India for the world
c) Ease of doing business
d) Aim should be “doubling of farmers income”
e) Tremendous push for exports to make Indian production more competitive/economical
f) Increase competition to reduce cost to the farmer
g) Fast track registrations to domestic R & D based manufacturing companies
h) Reduce dependence on imported, technicals & stop import of formulations
i) Register TECHNICAL 1st (as was happening for 40+ years, & do not register formulation directly)

In its present shape, PMB is a huge disappointment. It shall bring back Inspector Raj. Some of the major areas of concern are as follows:

1) Import of formulation is killing the Indian industry and does not provide level playing field. Imported formulation may contain unregulated components. These may be of low quality, of expired material with unknown impurities, may contain toxins which are carcinogenic. the Indian government cannot check manufacturing facilities in factories abroad or take production samples

2) Generic pesticide manufacturers are being treated as ‘second grade citizens’. How can conditions be different for Indian manufacturers when they offer products with the same chemistry, bio-efficacy, toxicology, safety profile etc.

3) Uncertainty about registration guidelines. These must be provided simultaneously

4) Too many arbitrary criteria to grant registration. Registration is always granted on the criteria of safety and efficacy. If regulators have to decide about parameters like necessity, end-use, risk involved and safer alternatives, every investor will be suspicious on and may not invest in pesticide manufacturing

5) No time for grant/denial of registration. The current Act says that registration should be granted within one year of application, while no time limit has been prescribed. For industries every action is time-bound.

6) Double whammy – licence to be revoked with conviction of an offence. If a single product fails (even if testing is in doubt), it is unfair to revoke licence of the manufacturing facilities because of one offence, while the person is already punished either by fine/penalty or jail term

7) Summons are issued to directors of company in the very first instance of offence. Most large companies have
13) Arbitrariness of review process: Defined framework or guidelines and procedure is required for product re-review/ban. Giving such wide power to RC can be misused.

**Ban on 27 pesticides**
1) Almost all these pesticides are being used in sizeable quantities in most countries including USA, Brazil, China, Australia, New Zealand etc. Many are also used in Europe. Why does India want to ban them?
2) The Govt. had requested for various tests and trials. Reports on more than 97% products have been submitted to GOI.
3) India exports almost these pesticides worth Rs 4500 crores to various countries. China will grab this business if we ban these pesticides.
4) These are very economical, efficacious and safe products being used for 20-25 years or more.
5) Does GOI have a proven alternative for these pesticides? Are these economical for farmers?
6) The government wants to double farmer income by reducing input cost, but the action is opposite here.

**Punjab ban on nine pesticides**
1) Punjab has said that these nine pesticides cannot be used for Basmati rice only. Then why is the government asking shops not to keep or sell these pesticides?
2) The reason given by the government is MRL. But GOI has not provided any data in this regard.
3) These pesticides have been registered after detailed studies of toxicity, bio-efficacy and other safety factors including MRL.
4) It is important to note that the MRL cannot be high if pesticides are used judiciously. The same pesticides are being used for 10-15 years.
5) Since the government is unable to control proper and judicious use of these pesticides, they are penalising the industry and farmers.

Deepak Shah, Chairman, Sulphur Mills

Sulphur Mills is in the business for last 45 years. It has been the pioneer in various new technologies, and most recently of introducing micro encapsulation (CS), Spray dried WDGs and suspension concentrate (SC). We recently introduced “suspo emulsion & ZC Formulations.”

We are the world’s largest manufacturers of sulphur WDG & various other agro-chemical WDGs with capacity of 100,000 MT/Year, with state of the art six modern manufacturing plants located strategically.

We acquired the technical manufacturing plant of Rotam Agro Chemical in 2018. We are world leaders for environmentally friendly and safe formulations. We have an all-India distribution network with 8,000 distributors, sales and marketing staff of over 600.

We export to more than 80 countries, mainly to US, Europe, Brazil, etc. We have our dedicated R&D Centre with DSIR & NABL certification.

We have to our credit more than 200 international patents mainly in USA, China, Europe, Japan, Australia, New Zealand etc.
Respected Modi ji
Manipur’s paddy cultivation is almost entirely dependent on rain. Manipur received 41% deficit in rainfall in June 2019. Farmers were left lamenting over possible loss of crops despite hard work and investment, and faced a gloomy year without enough rice to meet family’s requirement of grains. In many instances farmers are tenants and they have the obligation of giving the landlord annual rent in kind or cash. Farmers are in need of a special package for the rainfall deficit. Although Khuga Multipurpose Project has been commissioned, the benefit of irrigation is yet to be available as last mile channels are not completed. I request the PM to allocate sufficient funds for projects related to management of irrigation facilities, to meet irrigation requirement of farms.

DR THANGJAM SUBHALAXSHMI
ATG National Correspondent, Manipur

Respected Modi ji
Lemon is widely cultivated in Assam. During the lockdown period, a farmer of Kakopothar of Assam had to throw 50,000 lemons grown in his orchard. He could not sell the produce due to lockdown restrictions. Due to the weight of the lemons, the branches started breaking. The farmer neither had market linkages to sell, nor the infrastructure to store his produce. In Guwahati, lemons sell for Rs 5 a piece. The farm lost Rs 2.50 lakh. There are many, many farmers who face similar challenges. Please help them.

JYOTI BIKAsh NATH
ATG National Correspondent, Guwahati, Assam

Respected Modi ji
Paddy Straw Management is a very serious issue in Punjab. Harvesting of paddy will start in September end. Farmers usually burn paddy residue because it is an easy and cost effective method. They must be provided with a viable alternative. The government provides subsidy on agricultural equipment. But the price at which listed companies provide equipment is much higher than the actual cost. Farmers purchase implements from the local market at a very reasonable price. The rates for listed companies must be reduced so that farmers can avail the subsidy. Paddy has heavy water consumption. Many districts in Punjab are facing severe water shortage. Agriculture universities and the Agriculture Dept are urging farmers to grow maize instead of paddy. Farmers want to grow maize as a kharif crop, but the MSP is almost half as compared to paddy. This discourages farmers.

RAJVEER SINGH BRAR
ATG National Correspondent, Punjab

Respected Modi ji
The loan to be extended to farmers through Kisan Credit Card has become a source of loot for government officers. In Rajasthan, the KCC loan is a completely offline process. The farmer has to run from the patwari to the advocate to the bank and then the tehsil office. Bribe has to be paid at each level. If the farmer does not grease their palms, he is made to run from pillar to post till he has no option left. For a higher loan per acre, more bribe has to be paid or the file is not cleared. Please make KCC loan online under the umbrella of Digital India. Please issue guidelines that the loan must be provided within a specific timeline.

HANUMAN CHOUDHARY
ATG National Correspondent, Rajasthan

Respected Modi ji
Continuous heavy rain in August led to severe losses for farmers in Telangana. Moong was ready but farmers were unable to harvest it. The seed turned to germination, leading to 100 percent loss for farmers. Heavy rainfall caused the cotton crop to wilt. Paddy was washed away. Telangana is not part of PM Fasal Bima Yojna. Farmers are distressed because they shall not be able to claim crop damage. Soil health card scheme is not being implemented properly. The officials concerned are not paying heed to proper parameters of soil health. As a result, small and marginal farmers are unable to benefit from the scheme. The scheme must be linked to MNREGA and sampling should be done diligently. Nearly 50 pc farmers do not own land. They cannot benefit from KCC. Banks are not interested to provide loan to poor farmers. Then how will farmers invest in their land?

JAYPAL REDDY
State Head of ATG Bureau, Telangana
Respected Modi ji
Karnataka has implemented several schemes for the benefit of farmers. The state has established specialized departments for all fields of agriculture, to help farmers. All departments seek documents from farmers for providing benefits under any scheme. Farmers end up submitting multiple sets of documents to different departments every year. A well-organized, centralized database for farmers will ensure that they don’t have to run from pillar to post for availing benefits. This will reduce loads of paperwork in departments too. The software application Farmer Registration & Unified Beneficiary Information System developed by the state can be utilized for the common database.

SANTOSH LANGAR
State Head of ATG Bureau, Karnataka

Respected Modi ji
Mini super markets must be opened in villages, towns and cities to sell agri products. Farmers who excel in a particular field should be encouraged to establish themselves as a brand. Additionally, anybody who purchases agri produce below MSP must be punished by law. The government must open more grading and packing units so that farmers can get the right produce for quality, and can reach international markets also. Horticulture must be encouraged. It gives a fillip to farmer income.

BIJENDER DALAL
State Head of ATG Bureau, Haryana

Respected Modi ji
Agriculture in Bihar needs structural transformations so that farmers are given an enabling policy environment. MSP must be specified for all crops and diligently followed. The government should end the system of subsidies and help the farmer through DBT.

GIRENDRA NARAYAN
State Head of ATG Bureau, Bihar

Respected Modi ji
Organic farming in Uttarakhand seems to be functioning on the basis of some magical figures. With these fabricated statistics, the state can fool the Centre and get accolades in big government functions. But the real status of organic farming and the pitiable situation of the farmer can be seen only in the fields. The Centre must set up a high-level committee which must investigate into the ground truth where organic farming is concerned.

NARENDER MEHRA
State Head of ATG Bureau, Uttar Pradesh

Respected Modi ji
Lakhs of farmers in India do not own land. They have not been able to benefit from Kisan Samman Nidhi. The government must reach out to them in some way. Extension activities of the government must be strengthened. Women farmers have about 75 percent share in agricultural work. They must be acknowledged for their hard work with due respect and cooperation. The gap between the agricultural scientists and the farmers must be bridged in order to benefit Indian agriculture.

DR SHASHIKANT SINGH
ATG National Correspondent, Uttar Pradesh
India’s vast swathe of 141 million hectares (ha.) of arable land is cultivated by an equally gargantuan 120 million number of agriculturists. This high density of cultivators has resulted into land division and fragmentation with 86 percent of holdings dropping under small (2 or less than 2 ha.) and marginal (1 or less than 1 ha.) categories of land classification.

India crossed the hump of food insecurity by 1971, thanks to infusion of new seed technology, agronomic practices, effective extension, and price support in the year 1965. It was a seven-year miracle that lifted Vehicle for economic, social movement

FPOs
THE GAME CHANGER

FPOs introduce horizontal cooperation among small and marginal farmers and balance the economic asymmetry in the food supply chain. Farmers gain better access to market, exercise more efficient contractual leverage to sell produce or buy inputs, and achieve higher productivity from better access to technology and services.

ABOUT THE AUTHOR
Dr Ashok Dalwai is CEO, NRAA and Chairman, DFI Empowered Body, Ministry of Agriculture, GOI. Views are personal and that of the author
our country from a shameful position of 'Ship to Mouth'. Thereafter, our farming system has only progressed into greater output and diversified array of agricultural commodities. This combined with poor agri-logistics has over the last about decade and a half led to supply-demand imbalance, causing low market prices and poor returns.

Parallelly, the production component of the agricultural chain has also come to reflect declining marginal rates of returns across a basket of commodities, thanks to degrading state of soil and water.

In response to this complex of challenges, the Government has sought to transit agriculture from production-centricity to income-centricity, which was envisioned by the Prime Minister in February 2016 as doubling farmers’ income by 2022. An income approach necessitates transformation of agriculture sector into agri-business, which entails it to run on the principles of profit. It is no gainsaying that profit is a function of volume of production, cost of production and monetisation of the produce. What this simple equation suggests is the importance of imparting scales of operation all along the agricultural value chain, with a view to achieving the desired level of efficiency.

The scale of operation is predicated upon the size of business. Studies suggest that small farms are not inefficient in management. It is their small volumes of production and turnover that lets them down when it comes to earning net profits. This is obviously a structural weakness that needs to be addressed if farmers’ average income is to be enhanced.

Socialist Paradigm
The Indian Constitution and our democracy commit the nation to greatest good of all. The government is focussed on Antyodaya – Welfare of the Last Man. Land ownership is of paramount importance and is considered as an asset of immense value. It is in a way a Stock in which the farmers vest their family value. Our land management Acts have responded to this by distributing surplus land to the landless, and protecting land ownership.

This leaves the country with the only choice of promoting Farmer Producers Organisations (FPOs) for the purpose of realising aggregation of land parcels, without compromising land ownership. Mobilisation of farmers into FPOs facilitates operation of agriculture at all three stages – pre-production, production, and post-production segments – in an efficient manner. Collective management that now becomes possible will embellish it with scales of operation. The Committee on Doubling Farmers’ Income (DFI) laying dividend by FPOs recommended to mobilise at least 7,000 by 2022, and to scale up thereafter.

FPOs In India
The experience of cooperatives in Indian agriculture or even that of the Collectives in the then communist USSR and China has not been very encouraging, particularly at the production stage. A cooperative action, therefore, at production stage can incentivise a farmer only when he continues to be an owner of his holding, and is driven by the idea of profit, as propounded by Adam Smith. Similar incentives for the farmers can be expected at the post-production stage through efficient transaction cost in conducting various operations like harvesting, storage, transportation etc.

Based on the learnings from operating cooperatives, India decided to try a new model of FPOs, wherein the spirit of cooperation is blended with the management efficiency of a professional company. This resulted in amending the Indian Companies Act, 1956 by inserting Part IX A, which enabled mobilisation of farmers into Farmer Producers Companies (FPCs).

It is now legally possible to register three different types of FPOs, namely as a Society under the Society Registration Act; or as a Cooperative vide the State or Central Cooperatives Act; or as a Company under the Companies Act, 1956.

Initiatives in India
The Government of India has found it most appropriate to mobilize farmers around FPCs, and has tasked the Small Farmers Agribusiness Consortium (SFAC) to do so. The Ministry of Agriculture issued Policy and Process Guidelines in 2013 which articulate the vision, mission and guidelines. An FPO can be
defined as:

“Any entity that has been formed by and is controlled by farmer producers in a specific sector for realising horizontal cooperation, with a view to pursuing jointly one or more of the objectives.”

The guidelines advocate the FPOs to adopt the values of self-help, self-responsibility, democracy, equality and solidarity. The members are expected to honour the ethical values of honesty, openness, social responsibility and caring for others. More specifically, the seven principles are:

- Voluntary and Open membership
- Democratic farmer member control - governance
- Farmer-member economic participation – one vote per shareholder
- Autonomy and Independence – no external interference
- Education, training and information
- Cooperation among FPOs (regional, national and global level federation)
- Concern for the community – go beyond financials and build social capital

Benefits that accrue from FPOs

There are several benefits that will accrue to various stakeholders as a result of collective management and operation of scales of economy. These include:

- Clusterization of production and consolidation of supply
- Planning & adjusting of production to demand – fork to farm in contrast to farm to fork
- Optimisation of production costs and stabilising produce price
- Improvement in farm gate level agri-logistics and marketing efficiency
- Promotion of best practices and effective transfer of technology – extension
- Adoption of best practices, that accelerate the pace of scale-up
- Efficiency in primary processing and use of co-products for generation of additional jobs & incomes under the rubric of secondary agriculture
- Operating risk management tools – both financial and technological
- Undertaking of research & development activities (R&D)

Though the farmers constitute the starting point of a food supply chain
Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik district, has registered outstanding success. Over just about a decade, this FPO of small and marginal farmers has become the top grape exporter of the country. Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik district, has registered outstanding success. Over just about a decade, this FPO of small and marginal farmers has become the top grape exporter of the country. Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik district, has registered outstanding success. Over just about a decade, this FPO of small and marginal farmers has become the top grape exporter of the country. Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik district, has registered outstanding success. Over just about a decade, this FPO of small and marginal farmers has become the top grape exporter of the country. Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik district, has registered outstanding success. Over just about a decade, this FPO of small and marginal farmers has become the top grape exporter of the country.

Global Experience with FPOs
Global experience, more particularly that of European Union (EU) which has worked with FPOs since 1990s is extremely encouraging. On an average, EU has mobilised 254 Producer Organisations (POs) for every 1 million farm holdings. An evaluation of their performance demonstrates that they are as efficient as Investor Owned Firms (IOFs), though FPOs are called upon to reconcile the varying interests of their members and the overall corporate goals. A positive correlation between PO membership and farmers’ income has been observed. The apple growers in Poland as PO-members were seen to be fetching cents 5/kg higher than non-members. In Brittany, France, 90 percent of tomato producers are members of recognised POs. The EU POs were also found to be consumer-friendly, offering them sale concessions. These illustrate the value of mobilising farmers into groups for joint operation.

In India, where SFAC and NABARD, (as also SHGs/FIGs of Ministry of Rural Development) have promoted FPOs, there are several cases of outstanding success. It would be worth quoting the case of Sahyadri, a Grape Growers FPO mobilised by the young Vilas Shinde in Nashik District. Over just about a decade, this FPO of small and marginal farmers in a poorly endowed region has grown to arrogate to itself the top place among the grape exporters of the country.

Atma Nirbhar Bharat (ANB)
The 2020 ANB announcement of the Government is a comprehensive package for transforming the country’s agriculture, comprising reforms and capital investments. The Government targets to promote 10,000 FPOs by 2024, and offers a fairer package of support along with credit guarantee on bank loans. The Operational Guidelines issued by the Ministry of Agriculture and FW rightly focus on training and orientation, so as to instil in the FPOs, values of seven principles and business culture. The leadership in this regard will come from SFAC, NABARD and NCDC. They will be supported by various national academies/institutions, as also the state governments whose pro-active support is well recognised.

Considering that farmers mobilisation and produce aggregation are a key to scale-based agricultural efficiency, FPOs will have to become a default norm in Indian agriculture encompassing field crops, horticulture, animal husbandry and fishery and aquaculture sectors. Arithmetically, at the rate of one FPO for every 1,000 ha., while the country may need 141,000 of them, it will not be so practically. As we progress with the targeted 10,000 FPOs and evolve the spirit of cooperation and management practices, we should be setting a goal of 30,000 FPOs by 2030, each covering larger membership and area/activities.

This is a task, nay a philosophy that can be achieved only by creating a movement of farmers themselves, who need to appreciate the current challenges of disaggregated production. They must visualise to harvest the strength that comes from horizontal cooperation of members and vertical integration of the value chain. Concomitantly and beyond the financial, a socially beneficial spin-off is the trust and social capital that the country will come to enjoy at peoples’ level.
Keet Saksharta Mission (KSM) of Jind has redefined crop protection through pest identification. The basic premise of this much-lauded initiative is that plants are inhabited by friendly and unfriendly insects. Man may assume that all insects on a plant are harmful, but this is not the case. KSM found that plants use insects as per their need at different stages of the crop. KSM has taken it upon itself to educate farmers about how to use this knowledge to maximize the gains on the farm.

The initiative is led by villagers – most of them women. The group has charted a new path in the field of pest detection and management. These farmers do not use any kind of pesticide in crops. They have found a technique for controlling pests with natural pest management. After many years of study, these farmers have identified various insects and pests in the crops through observation. With rigorous follow-up, they have also studied whether the insects are harmful or beneficial.

Dr Surendra Dalal, who was posted as Agricultural Development Officer in this village, was the man who inspired this mission. Now, KSM helps farmers by providing insect experts to identifying pests on their fields.

So far, KSM has identified 161 carnivorous and 43 vegetarian pests. Some of the insects and pests are listed below, along with information on their effect on the crop.

Shri Suresh Ahlawat, who has been at the forefront of this mission, says that the group has identified about 200 pests/insects and no chemicals were used to...
control them. “The way to control them is proper moisture and balanced nutrient to the plant,” he says.

KSM believes that pesticides should be given to plants after determining the economic threshold level (ETL). If the effect of damaging insects is below ETL, no chemical is used. These farmers believe that excessive use of urea or chemical fertilizers is the reason behind pests/diseases in crops. Therefore, they use all such inputs judiciously. In Shri Ahlawat’s village, no pesticide or chemical is used.

The group runs online blogs named Prabhat Keet Paathshala and Mahila Kisaan Khet Pathshala. Information relating to challenges faced in pest management and insects behavior is updated regularly. The villagers have formed a
### Vegetarian (harmful) Insects/pests

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Insect/pest Name</th>
<th>Scientific name</th>
<th>Life cycle</th>
<th>Effect on crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>American Bollworm</td>
<td>Helicoverpa armigera</td>
<td>20-35 days</td>
<td>Feed on cotton foliage, bolls; spreads faeces on boll, infect it.</td>
</tr>
<tr>
<td>2.</td>
<td>Mealy bug</td>
<td>Pseudococcidae</td>
<td>30-60 days</td>
<td>Suck sap; root and plants become yellowish, weak</td>
</tr>
<tr>
<td>3.</td>
<td>White Fly (safed makkhi)</td>
<td>Aleyrodidae</td>
<td>About 40 days</td>
<td>Injure plant by sucking juice, cause leaves to yellow, shrivel</td>
</tr>
<tr>
<td>4.</td>
<td>Thrips (churada)</td>
<td>Thysanoptera</td>
<td>Up to 45 days</td>
<td>Puncture plant cells; leaves pale, discolour and twisted</td>
</tr>
<tr>
<td>5.</td>
<td>Grass hopper</td>
<td>Caelifera</td>
<td>30-40 days</td>
<td>Consume leaf, damage crops</td>
</tr>
<tr>
<td>6.</td>
<td>Gary weevil</td>
<td>Anthonomus grandis</td>
<td>Appx. 22 days</td>
<td>Destroys crops by eating buds, laying eggs in flower/fruit</td>
</tr>
<tr>
<td>7.</td>
<td>Asian cotton leaf worm</td>
<td>Spodoptera litura</td>
<td>25 days</td>
<td>Severely damage host plant by vicious eating habits; larva damages crops like cotton, tobacco, beet, chickpea</td>
</tr>
<tr>
<td>8.</td>
<td>Looper (kundalak)</td>
<td>Chrysodeixis eriosoma</td>
<td>30-35 days</td>
<td>Main damage at larva stage. Feed on underside of leaf, defoliate plants, damage flower, fruit</td>
</tr>
</tbody>
</table>

committee in the memory of Dr Dalal. It’s motto is: Keetnashako ke bina kheti sambhav hai, lekin keeto ke bina kheti sambhav nahi hai (agriculture is possible without insecticides but not possible without insects).

Shri Ahlawat advises that monitoring of pests in a field should be done from 8 am to 10 am. The following is the method advised by him.

1. Monitor 9 leaves of new plants in fields (three leaves each of lower, middle and top part of the plant)

2. Identifying the carnivores (beneficial) and vegetarian (harmful) pests, list them

3. Check ETL. Spray pesticide only if level is above limit

4. Share data collected by farmers in a group, derive average, work accordingly for best result

### Challenges

Shri Ahlawat remembers the days when people used to mock them and no government help was available. Dr Dalal, who was the ADO at the village, recognised the value of his work, provided useful tools and also some financial aid.

Shri Ahlawat said that due to the conservative nature of the society, earlier women did not have freedom to work with men. But on the request of Dr Dalal, women came together and actively participated in the mission. More and more people joined them. Mahila Kisan Khet Pathshala and Prabhat Keet Pathshala now work with a large number of volunteers. Smt Savita Malik leads the Mahila Kisan Khet Pathshala.

### Future plans

KSM has received wide appreciation and publicity. He has submitted many reports and proposals to GOI, Haryana government and ICAR, New Delhi. KSM wants to awareness of insects to all farmers. According to them pesticides are the enemies, not pests. They have also innovated on fertilizer application. They do not apply urea directly. A mix of urea (2.5 kg), DAP (2.5 kg) and zinc sulfate (0.5 kg) is used with water. Farmers say they have received positive results with this.

### Online classes post Covid

KSM has started online farm field classes post Covid in order to make the region pesticide-free.
TRANSFORMING INDIA Through Agriculture

- Use of fertilizer and green manure according to Soil Test Report
- Insured crop under Crop Insurance
- Rain Water Harvesting and Drip & Sprinkler Irrigation
- Seed Treatment and use of Hybrid Seeds

Dhanuka Agritech Limited
14th Floor, Building 5A, Cyber City, DLF Phase III Gurugram-122002, Haryana, India
Phone +91 124 3839 500 Fax +91 124 3839 888
E-mail: headoffice@dhanuka.com Website: www.dhanuka.com
Agriculture has a very important place in the making of Atma Nirbhar India. A joint consultation mechanism of the farmers, industrialists and the government is essential to check indiscriminate use of agro-chemicals for crop protection and also be mindful of their side effects.

In the name of crop protection in modern farming, the use of poison-containing chemicals was promoted in the name of scientific recommendations. But hidden behind the promotion of agro-chemicals is a huge international trade network running into trillions of dollars. For crop protection, the focus was solely on chemicals. The system of natural control of pests was completely ignored.

Poison-containing chemicals were classified as medicine for plants and sold to farmers.

The work of companies is not only the trade of chemicals, but also to create more and more profits. For this purpose, they first create the disease and then treat the disease to make profits.

The result is before us. In the name of crop protection, the sale of poisonous chemicals increased. The pests developed higher resistance. In order to deal with them, the proportion of chemicals was further increased.

ABOUT THE AUTHOR

Padma Shri Bharat Bhushan Tyagi is a farmer and educator at Bulandshahr, UP. He was awarded the Padma Shri in 2019. He organises weekly training for farmers at Bulandshahr and has trained over 80,000 farmers. He is also a recipient of Progressive Farmer Award by Prime Minister Shri Narendra Modi.
THE JOURNEY OF PADMA SHRI BHARAT BHUSAN TYAGI
Progressive farmer Shri Bharat Bhushan Tyagi, a resident of Bihata village of Siana Tehsil in Bulandshahar district, has inspired a very large number of farmers through his unique ways of undertaking organic farming. Shri Tyagi realized that it was challenge for farmers to switch to organic farming. Their major cause of concern was that after opting for organic farming, their income would drop and profits would get further squeezed.

For many years now, Shri Tyagi has changed the perspective of farmers towards organic farming. By hand-holding thousands of farmers, Shri Tyagi has proved that organic farming is not a daunting task but a way to maximize land yield and profits. Such a large number of farmers have benefitted from his training that now, farmers not only from India but also from abroad come to him to learn about organic management of their farms. His focus is always on the key learning that farmers must be aatm nirbhar.

Shri Tyagi provides free facilities to the farmers during the period of training. It is because of such selfless service that he was awarded with the prestigious Padma Shri award by President Ramnath Kovind at the Rashtrapati Bhavan last year.

THE SCIENCE STUDENT WHO TurnED TO FARMING
Shri Tyagi graduated with a bachelor’s degree in mathematics, physics and chemistry from Delhi University. He wanted to take up a job but his father insisted upon him to take up farming in their village. Shri Tyagi then devoted his life to agriculture. He has often admitted to his sadness over the disinterest among youth towards agriculture. Shri Tyagi has consistently expressed concern that if even a farmer does not want his son to become a farmer, then how will the agriculture sector develop? The example set by Shri Tyagi in practicing organic farming has motivated a large number of farmers to adopt his techniques on their farms.

We have big data in support of crop protection chemicals. With the significant increase in production, the indebtedness of farmers is increasing too. Farmers are spending more and more on crop protection measures, but production has not increased in the same proportion. Production has declined qualitatively, and also quantitatively – in terms of proportionate increase. One thing has happened for sure – the sale of crop safety chemicals has gone up multiple times.

Need for equilibrium
We have to work with equilibrium at both the ecology and economy levels. The economy has to be developed on the basis of ecology. The side effect of chemicals is now becoming a problem. That is why there is a need to move forward responsibly on every aspect of agriculture in a planned manner.

Farmers should develop farming methods by understanding the natural rules control and balance. Organic farming is a worthwhile option. The industry and the government must work together on biological molecular research instead of dependence on chemical molecules.

Crop protection products must be used discriminately, only after identification of the pest. All the work related to crop protection chemicals should be done in collaboration the Farmer Producer Organizations – not through the market.

The purpose of politics is to conserve and promote natural resources. Keeping this in mind, restrictions and control must be placed on the anti-nature elements of economic development. Such crimes must receive harsh punishment.

Life with nature is a necessity for human beings. Walking in opposition to the system of nature in the name of crop protection cannot be labeled as development. Most of the activities done solely with profit mentality are anti-nature. Life safety is more important than crop protection. The control mechanism for all kinds of insects, diseases and weeds is available in nature. We only need to decode and understand it. We welcome the decision of the government to ban harmful pesticides. All stakeholders must together to make India free of the use of poisonous chemicals.
Post-Covid, balanced diet and immunity to diseases shall remain major considerations in our food choices. Plant-based nutrition will drive the future food habits of the middle and upper-class population towards vegetables and pulses.

Vegetables constitute a paltry 9% of the total calorific intake of Indians. Against a WHO recommendation of three servings of 100g vegetables each per day per person, we consume two servings of 80g each. Vegetables can help in our journey to reach nutritional security.

We produce about 200 Mn tons (MT) of vegetables and 100 MT of fruits annually. With population expected to exceed to 150 cr by 2030, we will have to produce 350-400 MT of vegetables. We have to increase acreages and yields.

PRODUCTION
Vegetables are comparatively short duration, low input crops. Multiple crops in a year are profitable, but our yields are low. They are half of China and 25% of USA. There is a definite need to improve yields through better seed and agronomic practices.

Better quality seedlings with higher viability will reduce seed cost and enhance yields. Qualified nursery entrepreneurs must be encouraged on commercial scale in rural areas with mechanized seeding and portable trays.

There is a great need to coordinate the extension activity through village level extension workers from Krishi Vigyan Kendras (KVK) of ICAR to advice on crop specific innovative and sustainable practices. Front line extension staff should use digitized extension material on smart phones and tablets for effective communication.

Localized seed production, especially for OP vegetables must be encouraged through formation of seed production clusters. These should be backed by linkages to markets through government and co-operative channels.

RESEARCH
There is need to step up research investments. We have to dig deeper into genomics and bioinformatics to find genes that can resist biotic and abiotic stresses, nematodes, reduce damage in handling, storage and transport and ensure longer shelf life in retail outlets. Our plant architecture must suit drip irrigation systems better, as in Israel and Spain. ICAR research must be linked to the market through appropriate commercial arrangements such as licensing the new varieties and collection of royalties or other fees.

ABOUT THE AUTHOR
Dr Ram Kaundinya is Director General, Federation of Seed Industry of India (FSII)
A coordinated approach between private and public research programmes will help in focusing on areas of strength and avoid duplication of efforts and expenditure. Policy support to enhance research investments in terms of IP protection and research incentives will help in bringing world class varieties to farmers.

Technology transfer from lab to land needs to be speeded up manifold so that farmers access the latest products. Creation of localized seed banks with geo-tags can enhance the value of seeds grown locally. They can be used as assets for capitalization and attract investment from seed researchers.

We missed the Bt Brinjal bus which picked up Bangladesh on its way. Adequate scientific evidence shows the benefits of Bt in large pesticide consuming crops like Brinjal, Cabbage, Cauliflower and Okra. Bt technology helps in making our vegetables chemical free and in enhancing farmers yields and profits. They benefit both the consumer and farmer. It is still not too late.

**MARKET LINKAGES**

Farmers’ profitability depends on farmgate prices and market linkages. Since vegetables are perishable, producers need a strong linkage to the market and processing industry. Direct purchase of vegetables from farmgate and supplying them to both retail and bulk consumers can be strengthened with infrastructure and technology. Value addition through storage and processing is required on a large scale to absorb surplus production during glut times and to stabilize market prices. A big PPP project at state and district level and with inter-state relationships, modelled on the EU market, might provide a workable solution.

Some young agri-tech entrepreneurs are using app-based aggregation of vegetables from farmers and are connecting them to large retail city markets. Though some digital platforms operate connecting farmers and buyers, the government may have to create a national grid of such applications with ENAM to connect farmers to markets.

Contract farming with farmer groups to produce specific varieties suitable for processing would ensure both demand and supply round the year, viz. canned tomatoes, tomato paste, lycopene production etc. The recent reforms announced by the Finance Minister shall help in this endeavour.

FPOs may be utilized for providing technical advice and inputs, output marketing as well as in downstream processing of fruits and vegetables for value addition. Necessary infrastructure can be developed with PPP at the village level and along the entire value chain utilizing digital technology for linking with the remotest regions.

Policy support is required to increase vegetable cultivation under poly houses/greenhouses, as seen on a commercial scale in Europe and Israel. This will include financial support for seed companies to develop seeds suitable for poly house cultivation. Demand for organic vegetables and fruits is growing and farmers need help to participate in these markets.

We should work with a target of 50-60% of the consumer price going to the farmer. The efficiency of the market linkage system will be determined by this parameter. This can only be achieved by transparency in the supply chain and fair transactions.

**EXPORTS**

India can become a global leader in custom production of vegetable seeds for other countries, for export of vegetables seeds developed in India and for conducting joint product testing programmes in India and outside.

We exported 1.2 MT of vegetables worth Rs. 5400 cr last year. India can play a bigger role. Identified export production zones, approval of specific plant protection chemicals and plant nutrition chemicals that are safe with negligible residue levels, free movement of seeds and planting material across borders and bank funding are important.

For meeting export market requirements, other measures like farmers ensuring traceability of production, an India GAP that will support growers in meeting export market requirements, common facility centre for post-harvest handling and meeting certification requirements of importing country are needed. Logistical support for farm to port movement and appropriate cold storage and transportation are essential.
The Pesticides Formulators Association of India (PFAI), established in 1967, was rechristened as Pesticides Manufacturers & Formulators Association of India (PMFAI) in 1997 – the national association of more than 250 member companies of the pesticide industry. Since its inception, PMFAI has worked consistently for the well-being of pesticide industries and also farmers.

Farmers have for long depended on pesticides/agrochemicals to save crops from various pests such as insects, weeds, and pathogens in order to increase farm yield. Pesticides are inevitable for the sustainability of agriculture. Their judicious prevents crop losses and also keeps our environment safe, clean and habitable.

Vital need of PMFAI
PMFAI functions as a nodal organization between farmers and industries and plays an important role for the accelerated growth of the nation.

One of the important activities undertaken by PMFAI is to conduct training and counselling for farmers regarding judicious and safe use of pesticides. Its major thrust is on identifying pest problems by collecting information from farmers at ground level, and justifying the need for pest control measures. PMFAI and its members help farmers by giving solutions in various ways. Farmers are trained to decide the type of pesticides necessary for their crops, the method of application and the frequency.

It is imperative that data on pest population must be monitored on a regular basis. India is losing one-fifth of its crops to insects, pests, diseases and weeds every year. The value of the crops lost is estimated to be a staggering over Rs. 90,000 crore as per government statistics. Indian pesticide manufacturers are trying to save more crops by providing indigenous products at a very reasonable price so even small farmers can purchase them. This helps farmers to prevent crop losses as well as increase productivity, which in turn will help to feed our growing population. At present, India’s population is around 135 crore. It is expected to reach 150 crore by 2030. PMFAI feels that there is an urgent need to save our total agricultural produce, particularly in this present scenario.

Mr Pradip Dave is the President of Pesticides Manufacturers & Formulators Association of India (PMFAI)
We also ensure that farmers are familiar with the mandatory safety aspects while using or storing pesticides. Proper disposal of empty containers of pesticides after use is very important. During interactions with farmers, we educate them regarding safe disposal of empty containers of pesticides. Farmers are trained on triple rinse of empty container after use to ensure removal of more than 99.99% pesticide residue, how to discard rinse water, how and where to dispose empty containers etc.

Critical role of pesticides

Using pesticides at the right time, at economic threshold level (ETL), and minimizing their usage has a major role in crop protection. The use of pesticides for sustainable crop production was advocated by Nobel Peace Prize winner Dr NE Borlaug. Insecticides are a reliable source to keep pest population below ETL if used cautiously. The judicious usage of pesticides plays a key role in plant protection. Expert advice should be taken prior to deciding on a pesticide option. First, one has to confirm that the pest we want to control is going to cross the ETL, which is the density of pest at which control measures should be applied.

Farmers must quantify the damage caused by a particular pest after determining the ETL and apply pesticide accordingly. We educate farmers about the benefits of right usage of pesticides.

We have constantly opposed import of readymade pesticide formulations without registering its technical grade products i.e, active ingredients. This practice discourages indigenous manufacturers of Technical Grade products and its availability to MSMES, SMES etc. Ultimately farmers are sufferers. Cost of cultivation goes up, making them economically weaker. Formulation import without registering its technical grade is a big problem for Indian generic manufacturers. In this case registration is granted to a single party in India, which leads to monopoly. Importers charge high margins of over 200-400 pc. Adoption of bad policies robs poor farmers. Also, the purity of readymade imported formulations is doubtful, resulting in various environmental issues and loss of crops.

Every year PMFAI organizes International Crop Science Conference and Exhibition (ICSCE) to serve the interests of the industry and farmers. Industry experts, scientists and farmers from all over the world are invited to participate and share their views. ICSCE was started by PMFAI in 1997. It has helped in exponential growth of the Indian pesticide industry. This PMFAI initiative raised Indian export potential from 270 crore in 1997 to 22,000 crore today. ICSCE provides an excellent platform for ground level interaction between farmers and industries/experts through presentations, exhibitions, group discussions and also personal discussions.

PMFAI promotes generic pesticides and their formulations in the country. This helps both farmers and the industry to grow economically, as the Indian pesticide industry can bring down prices of pesticide formulations for the benefit of farmers. PMFAI is an active member of Agrocare, a global association located at Brussels, Belgium, representing the independent post-patent crop protection industry. Agrocare works globally for the promotion of generic pesticides products.

India is the most dynamic and largest generic manufacturer of agrochemicals in the world. It has about 75 technical grade pesticides manufacturers and more than 600 formulators. This enables farmers, mainly poor farmers, to get crop protection products at a very low price.

Protect “Me Too” registration under Section 9(4)

The growth of the Indian pesticide industry is mainly driven by registrations under Section 9(4) “Me Too” registration, which helped the growth of MSMEs
in the agro-chemical sector. Thanks to the great efforts made by PMFAI, today India is ranked fourth in the global agro market on account of 9(4) registrations.

Unfortunately Section 9(4) of the Insecticides Act 1968, i.e. Me Too registration practised in India, which is prevalent all over the world, is being objected and abused by importers, basic manufacturers, MNCs and many large manufacturers in the country. The fact is that these large manufacturers are born with 9(4) registration. They have survived for so many years and now have changed their stance. They have started working against 9(4) registrations on behest of MNCs. The government should be smart enough to protect the same.

The prevalence of spurious and duplicate products is a worldwide phenomenon in almost all sectors like medicine, food items, engineering, textiles and edibles. Pesticides are not an exception. To malign the Indian industry, wrong data has been circulated about the existence of 25% spurious pesticides in the market by some companies to serve their interest and glorify importers of ready-made formulations to abuse local production. We totally disagree with this data. This has given a very wrong message to the government and also to common people, which is deceitful for the industry and the users.

PMFAI is always working against spurious pesticides circulating in the market by some erratic and irresponsible people who have vested interests. We often call meetings or directly contact our members and farmers regarding this issue and resolve it. With all our reliable sources it has been found that there are around 2-6 pc spurious pesticides in the market. Our farmers are intelligent enough to identify and differentiate spurious pesticides from the genuine one and also help the industry and enforcement agencies to nab the culprits. In our view this wrong message has been spread maliciously to benefit some importers and MNCs who want to bring/import their ready-made formulations without registration of technicals, making India a dumping ground in the form of formulation imports of technicals are not registered here.

Motivated campaigns targeting pesticide use
PMFAI is also taking up with the government the issues faced by the farmers and also the industry due to the proposed ban of certain pesticides. The agrochemical industry has made substantial contributions to India’s Green Revolution and our economic growth. Recently, the industry has been targeted by a section of so-called NGOs, environmental enthusiasts and designer media with unscientific and baseless campaigns against the use of pesticides in agriculture. This creates scare and confusion amongst people, and may affect agricultural production in the country. It will also send wrong signals to international markets which can adversely impact Indian agro exports. The government must check this and take wise steps based on scientific findings.

At present, only 25-30% cultivated area is covered by the crop protection umbrella. There is need for increased usage of crop protection products. The domestic market has enormous growth potential because of low pesticide use, which is among the lowest in the world. India’s per hectare consumption of pesticide stands at 0.6kg/ha against the global average consumption of 3kg/ha. Increase in pesticide consumption and bringing hitherto untapped areas of cultivation under its umbrella will help to boost agriculture productivity and feed our increasing population.

India has a very large agrochemical industry. PMFAI is a responsible and pro-India association. Our long relationship with farmer brethren is strong and we understand their capability and strength. The Indian pesticide industry is working in tandem with the honest and laborious farmers. We shall collectively help in achieving the desired goal of our respected Prime Minister making India Aatmnirbhar Bharat. We are optimistic about doubling farmers’ income by 2022.
Reduce your costs and improve future planning using Asteria’s readily customizable drone solutions. With real-time, precise aerial-view data & analysis, you can access the insights, observations and measurements that make farming become exponentially easier. Whether you are a grower, an agronomist, or a crop insurance company, get ready to elevate your agricultural success, flying missions such as:

- Crop Health Monitoring
- Damage Assessment
- Yield Estimation
- Land & Irrigation Planning
- Crop/Tree Counting
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Information and communication technology tools such as artificial intelligence and drones are geared to uplift the agricultural sector. These have the potential to not only help increase farmers’ income but help ignite a rural growth-engine for India’s economic recovery from the current pandemic.

Agriculture remains a cornerstone of the Indian economy. It is imperative for India’s growth that the farmer is positioned at the centre of the Digital India mission’s focus to leverage advanced technology for benefit of the rural population. For this, the government has set up a dedicated Farmers’ Portal with the aim of delivering all types of information services in a cohesive manner.

To enhance farm productivity and reduce input costs and losses, we need much greater adoption of Smart Agriculture techniques suitably adapted for Indian conditions. This term represents the usage of technology interventions for farming and has expanded to include precision irrigation, smart sensors to monitor environmental indicators, aerial crop health assessment and even agronomic innovations.

Since the last few years, several government agencies and companies from within India as well as across the globe have invested efforts to develop technology-driven solutions to support agriculture activities. The Economic Survey of India 2019-20 highlights how Cyber Agro-Physical Systems (CAPS) – a digital agricultural platform – is enabling farming in India to become more viable and self-sustaining. This is done by reducing uncertainty and risk using AI, integrating data from sensors and aerial imagery, and using supercomputing infrastructure.

Leveraging a smart eye-in-the-sky
Artificial intelligence (AI) is being increasingly used for deriving insights from data including geospatial and temporal information about soil health, water-resources, crop yield estimates, seasonal

ABOUT THE AUTHOR
Mr Rajan Luthra Chairs the FICCI Committee on Drones and is Head of Special Projects in the Chairman’s Office at Reliance Industries Ltd with 30 years’ experience in business strategy, technology, innovation, public policy, and risk management.
patterns, local and global demand for pulses, fruits and vegetables. Such algorithms and data sets can help monitor crop health, estimate crop-wise plantation, estimate potential yield from the farm as well as assess wastes and losses.

The increasing coverage of wireless broadband (4G) internet and, in the future, narrow-band IoT (NB-IoT) networks, combined with lower cost of sensors and edge computing devices will render such solutions affordable for even small farms. A potential opportunity for encouraging widespread adoption is to deliver these technologies on a pay-per-use model.

A highly successful outcome over the past few years has been the growing quantum and availability of high-quality data. This combined with aerial imagery and video feed analysis from satellite or unmanned aerial vehicles (UAVs - commonly called drones) adds a new dimension for smart agriculture. Drones with AI can be used in India for a diversity of objectives including better field and soil analysis, enhancing crop growth, control of pests, and identifying dry or over irrigated areas.

According to an FAO report, the use of drones as ‘an eye in the sky’, combined with technology tools to interpret metadata and aerial imagery for actionable information have ushered in a new revolution. Drones with AI are uniquely positioned to perform wide ranging activities in the agricultural sector supplemented by high resolution visual and multi-spectral cameras and AI-based software algorithms. Planning farm activities, spraying agrochemical products, planting seeds, inspecting crops, conducting crop damage assessment and data analytics are just some of the tasks that drones can perform with speed and accuracy.

Within India, more and more policy discourse has begun referring to remotely piloted unmanned system (RPAS) – the legal term for drones – as a key technology component supporting agrarian development. In Volume XI of the report of the Committee on Doubling Farmers’ Income, the role of drones in surveying farm area and warning farmers about possible challenges is mentioned. Similarly, in its report, National Bank for Agriculture and Rural Development (NABARD) observes the need for investments in technologies such as drones which could play a critical role in mitigating risks and crop insurance schemes.

Sensor based Smart Agriculture

In 2016, Government of India conceptualized a research project ‘SENSAGRI’ (Sensor based Smart Agriculture), which envisaged development of an indigenous prototype for monitoring of crop and soil health based on drones.

In India, farmers are at the receiving end of the vagaries of weather either through droughts or flooding during monsoons. To mitigate the ill-effects of weather, the Pradhan Mantri Fasal Bima Yojana (PMFBY) provides for calculating crop losses via drones and settlement of insurance claims.

The exists a clear and current opportunity to make the use of drones in agriculture widely popular and affordable. Government bodies, research institutes such as Indian Council for Agricultural Research (ICAR), and industry will have to work hand in hand to create awareness among farming communities. In addition to organizing pilot demonstrations and deployments, central and state governments must seize the opportunity available during the implementation of Survey of Villages and Mapping with Improvised Technology in Village Areas (SWAMITVA) scheme. This scheme, that will map the abadi area in 660,000 Indian villages over the next four years, shall also help in educating rural youth about the transformational power of drones and AI for agriculture.

A large proportion of the rural hinterland is classified by the Directorate General of Civil Aviation (DGCA) under the green zones made operational in July 2020, whereby approved drone operators can deliver high quality imagery and data analysis as a service, making this viable for even small farmers. It is now feasible for a gram-panchayat to collectively pool in money and purchase a drone that will benefit the entire community.

Large enterprises and startups are beginning to focus on making drones and artificial intelligence solutions more effective in delivering tangible value for smart agriculture. This potent combination can now enable Indian farmers to take their farms’ productivity to global levels, cut down wasteful expenditure, double their own income, and put India’s GDP growth back on its double-digit targets.
India is known for its agrarianism and rightly so – about 61% of the country’s land area is agricultural land, contributes about 14-15% of India’s GDP, and reached an all-time high of nearly 6.1 trillion INR in the fourth quarter of 2019. It is the main source of livelihoods for over 80% of India’s rural population and creates jobs for north of 52% of all labour in the country. Clearly, a majority of Indian population is dependent on agriculture which is beset with its own challenges. Farmers across the country have to deal with issues such as soil erosion, crop failure, scarcity of capital, and even access to resources such as seeds, fertilizers and pesticides at varying levels.

According to a report by NITI Aayog, the average income of farmers in India took 22 years to double, increasing at 3.31% from 1993 to 2015. If India is to grow to become an economic powerhouse, then it is essential to reduce this period drastically to double farmers’ income.

India is also known for its thriving tech industry. It only makes sense to leverage this booming industry to alleviate the challenges in the agriculture sector and boost productivity. With the introduction of agri-tech methodologies, not only will agricultural practices get transformed for the better, but the technology sector would also see an explosion in demand with the growth of the agri-tech marketspace.

**How drones help deliver superior agricultural results**

Drones can aid in improving per-acre-yield and reduce farming expenditures. By mounting powerful payloads, drones can survey very large patches of land quickly and efficiently. This can revolutionize agriculture.

With a drone handy, a single pilot can remotely scan the entire farmland in a few hours. With reduced manpower and time...
demands, the farmer’s job is far more streamlined.

Powerful imaging systems can be mounted on drones, making drone-powered multispectral analysis and precision agriculture an accessible reality. This technology gives information on crop health, harvest readiness, nitrogen levels, growth bottlenecks, crop counts, water content, chlorophyll content, etc. It can enable farmers identify healthy and stressed areas in a farm with precision.

Hence, farmers can utilize their resources such as water, pesticides, and fertilizers more strategically. In a study, researchers optimized the variable rate application with drone-powered precision agriculture techniques which reduced the use of fertilizers by 50 percent while improving overall crop health. Farmers can benefit from cost savings as high as 50 percent and 20-30 percent increase in the yield of farmlands, which can result in increase in their overall income.

Drones can help prevent the spread of weed, pests, and fungal infestations. Often, they are present in small patches. They are difficult to identify without close inspection. The spread can be avoided by an aerial scan.

Drone-based mapping and surveillance operations of agricultural land can unveil opportunities for improvement. Farmers can view their crops and the layout of water and irrigation channels, how these are affected by elevation and slope of land, the condition of soil erosion, where the crops are crowding and where they can start newer plantations, and so on.

Benefits of drone-powered land surveys
Even today, a large number of people in rural India lack formal ownership documents of their assets, primarily land. This leads to property disputes. Since official evidence to substantiate their claims is in short supply, legal proceedings are difficult and lengthy. Farmers are not able to procure financial support from banks or established government services to meet agricultural expenditures. This problem is further compounded by droughts, floods and unseasonal rains. They are unable to claim crop insurance or financial assistance due lack of land ownership documents.

By deploying drones, it is possible to conduct extremely accurate surveys of agricultural lands and create high resolution maps which can help aggrieved parties resolve their land disputes. With legal documents of ownership, farmers can apply for formal financial assistance to support agricultural activities. Accurate land records will allow government authorities to weed out fraudulent claims and increase accountability.

Major challenges
Nearly 90 percent Indian farmers have relatively small landholdings of less than 2 hectares. Drones can be prohibitively expensive for them. Government and private sector organizations can use their reach to build the market, educate farmers on the benefits of drone technology and drive adoption.

We have to ensure that potential is unlocked on the demand-side as well as on the supply-side. Farmer cooperatives or collectives can be established under government or public-private-partnership model to cluster small land holdings and achieve economies of scale. Government can incentivize the use of drones through programs and subsidies and work closely with private organizations and agri-tech firms to ensure last mile delivery of this technology. For example, the partnership between ideaForge and EM3 Agriservices aims to provide state-of-the-art precision agriculture services to farmers on a pay-per-use basis, making it technology and accessible.

Indian agriculture has a lot to gain from drone technology and vice-versa. Once drones are deployed on a large scale in India towards boosting agricultural productivity, sectors such as agriculture, manufacturing and allied services will become the engines of Indian economy that will set our giant nation on the path of Atmanirbhar Bharat.

Future of drone-based precision agriculture
The rise of Artificial Intelligence (AI) is opening up a variety of applications for everyone, including agriculture professionals. Structured and suitably labelled data can make AI models accurate and efficient. An AI model needs to be trained with historical data to build optimized algorithms that can enhance productivity and curb losses.

Finely tuned AI models can analyze raw data to empower agriculture professionals to provide recommendations to improve crop health and maximize farm yield. AI can help formulate strategies that help identify specific crop needs for diverse inputs, how to place irrigation channels more effectively etc. AI-powered drones will soon take precision agriculture to the next level and bring about operational excellence. The time is now to sow the seeds and reap the benefits.
National Agricultural Cooperative Marketing Federation of India (NAFED) has taken over the national-level Federation of Indian FPOs and Aggregators (FIFA) along with its professional team of 106 FPOs base. FIFA, under the aegis of NAFED, shall focus to support Farmer Producer Organizations (FPOs) registered under the Cooperatives Act and Companies Act by linking them to markets for their agriculture produce as well as the supply of agriculture inputs. The Federation promotes and strengthens FPOs by addressing the challenges related to access to investment, technology and quality inputs in order to prepare farmers for new market linkages. In parallel, FIFA also works with its registered members to create business relationships to scale their business and revenues.

Mr Pankaj Kumar Prasad, who is also the Additional MD of NAFED, has been appointed as MD FIFA. Mr Prasad was holding the charge of MD NERAMAC prior to joining NAFED. Mr Unikrishnan Kurup, General Manager NAFED, has been appointed as the Director of FIFA. While taking over the challenging assignment, Mr. Prasad stated, “The prime function of FIFA is to increase farmers’ income through integration of member organizations into the value chain. Mobilisation of farmers into FPOs shall facilitate operation of agriculture at the three stages of pre-production, production, and post-production segments in an efficient manner.”

New Office of FIFA inaugurated
The new office of FIFA at Mathura Road, New Delhi, was inaugurated on August 31, 2020, by MD NAFED Mr Sanjeev Kumar Chadha in the presence of senior officials and the staff of NAFED, members and other dignitaries, following the necessary social distancing and other safeguards in the wake of Covid-19. Mr Chadha, while inaugurating the new office, said,
“FPOs can be the game-changers for India's agriculture sector, empowering farmers and strengthening them economically and socially.”

**NAFED's initiative to empower farmers**

NAFED has been taking various initiatives to support Cooperative Societies (CS), Farmer Producer Organizations (FPOs) and Framer Producer Companies (FPCs) for marketing agricultural produce on the output side as well as for supply of agri inputs like seeds, fertilizers, equipment etc. under various schemes initiated by GOI, state governments and NAFED. The national level cooperative federation has already worked extensively with FPOs like MAHAFPC, KFMS, etc. for business worth Rs 1,000 crore approximately. It has been appointed as the 4th national implementing agency other than SFAC, NABARD, and NCDC for the creation of 10,000 FPOs by the Department of Agriculture, Cooperation & Farmers’ Welfare (DAC&FW).

FIFA shall work with the support of NAFED and is aiming to provide robust market linkages to its members by linking to institutional buyers and large B2B/B2C players. FIFA is also in talks with various nationalized banks and financial institutions like NABARD and NCDC to facilitate in providing credit facilities, value-chain financing, and facilitate for making Detailed Project Reports (DPRs).

FIFA, with the help of NAFED, is in the process of establishing a network of physical and electronic Kisan Mandis popularly called NAFED e-KISAN MANDI (NeKM) outside the APMCs. The NeKM are being established on pan-India level as per The Farmers’ Produce Trade and Commerce (Promotion & Facilitation) Ordinance 2020. The structure of NeKM shall be the hub-and-spokes model. The spokes shall be the mandis at the farm-gate levels (local mandies). Hub shall be the centralized mandi near major cities connecting all spokes.

**Playing vital role in the agri sector**

Hon’ble Prime Minister Shri Narendra Modi had stated in February this year that his government is making consistent efforts to bring agricultural markets closer to farming fields. The PM had launched 10,000 FPOs and had reposed great faith in them for their role in empowering farmers and increasing their income.

FIFA will guide the members in the clusters for efficient use of mandi infrastructure and will provide good-quality agri-inputs by removing the unnecessary intermediaries. With support from NAFED and professional agencies, FIFA will implement focused initiatives to support member FPOs in the vital areas of market linkages, quality agri-inputs, developing business plans, proper access to various government schemes, Regular training of board members, introducing the members to new technologies, etc.

FIFA shall also provide various other benefits to members like opportunity for partnership in procurement for Price Support Scheme (PSS)/ Market Intervention Scheme (MIS). Display of Company Profile (FPOs/FPO Federation) on the Membership Section of FIFA's website, awareness programs/logistic support/warehouse support /storage support including pre-cooling and cold storage facilities under Operations Green, training and capacity building of BoDs of FPOs for post-harvest management, market networking opportunity amongst FPOs/FPO federations, connecting to institutional buyers of agri-produce, agri-input suppliers, warehouses at farm-gate level (micro-warehouses), assistance in creating Detailed Project Reports (DPRs) and business plans etc.
Farmers lose a significant portion of income as their crops and produce are attacked by various insects, diseases and weeds leading to a significant reduction in crop productivity and lower actual yield than the attainable yield of crops. There has been a sustained campaign in the last few years to shun Crop Protection Products (CPP) and instead go back to managing agriculture the way it was done centuries ago. The solution is not in shunning chemical pesticides but in educating farmers about proper use and consistently spending on research to come out with safer and more efficient products.

Yield losses caused by pests, pathogens, and weeds are responsible for 20–40% loss of global agricultural productivity. In India, 20-25% crop losses are reported due to pest attacks every year. As per the Ministry of Agriculture, India is losing agricultural production worth INR 1.48 lakh crores annually due to damage from pests, weeds and plant diseases.

Commenting on the affordability of CPP, Dr Dalwai Committee report, on “Doubling Farmers Income” mentions that cost of pesticides is only 0.4% of total cost incurred by the farmers. The share of pesticides in the cost of cultivation was 3 per cent in cotton, 1.9 per cent in paddy, further lower in wheat (0.7%) and sugarcane (0.3%).

Recently, India fought a battle against desert locusts whose attack had wiped out lush green fields laden with crops like bajra, sorghum; maize, green gram, black gram, castor, wheat, cotton and vegetable crops spread over 50,000 hectares in Rajasthan, Gujarat, Madhya Pradesh, Uttar Pradesh, Punjab and Maharashtra. The use of insecticide Malathion helped very effectively in managing the situation.

Plant protection chemicals are help in preventing rats, mice, flies and other insects from contaminating the food whilst in storage.

**Crop protection is in constant evolution**

Climate change is an important development that has affected global population and agriculture. Pest and disease dynamics have altered considerably. Many minor pests have become major pests and many new pest and diseases have emerged. This has kept the crop protection sector on their toes. Besides the sweeping changes in climate, the continued emphasis on sustainability of agriculture and environmental concerns, the industry will be keen on investing in better delivery techniques and products that leave very little impact on the plant and the soil. Crop protection is in constant evolution.

Farmers at large remain unaware of new CPP or
they lack knowledge regarding a product at hand. This is a precarious situation as the efficacy or the usefulness of the product is closely linked to the knowledge of the user. Lack of education and awareness among farmers is counted as one of the main reasons behind failing efficacies of CPP or their misuse. The main point of contact between the farmers and the manufacturers, the retailers too are not bothered or are unable to provide a proper understanding of the product to the farmers.

Also, very often farmers are not able to communicate their needs effectively. Supply chain inefficiency and inadequate infrastructure are the major causes for post-harvest losses. The lack of knowledge of the farmers that there are products and storage techniques to effectively cut short these losses have added to the agony of the sector.

The development of a new molecule has huge R&D and time costs, followed by final registration process which has an extremely slow pace. Intervention is needed from government and regulatory authorities to streamline the registration process and further registration should be granted by a reasonable timeline of one year.

The recent proposal of Ministry of Agriculture and Farmers Welfare prohibiting the import, manufacture, sale, transport, distribution and use of 27 very widely used and highly effective pesticides is going to affect the farmers’ approach towards the selection of pesticides for insect/disease/weed control and subsequent input cost.

The 27 generic pesticides proposed to be banned account for 40 per cent of the domestic market and 50 per cent of all exports from India. Banning these will shrink India’s export capability. The entire export market of these products worth Rs 12,000 crores will go to China, which is the main competitor of India in the global market and it would be detrimental for the Make in India movement.

In case of crop protection chemicals, following a risk-based (not hazard based) approach will be ideal. Banning any pesticides based on some studies done elsewhere in the world and taking similar action in India without adequate scientific evidence in the Indian context is not the right approach. The local climatic conditions, cropping patterns, dynamics of insects, disease and weed scenario must be taken in to consideration while guiding the choice of pesticides for any country by its government.

Recently, France proposed lifting a ban on neonicotinoids category of systemic insecticides to protect sugar beet crops after strong resistance from sugar beet growers. In addition, France will also offer 5 million euros ($5.9 million) to support research into alternatives to neonicotinoids. Similar proactive approach and action is required from GOI.

The complexity of pests is likely to increase, with more frequent pest outbreaks in future. Climate change is likely to pose a potential threat. There are both strengths and opportunities for further updating the existing approaches of pest management in India. The country needs to adopt a holistic approach towards availability of high yielding seeds, soil test-based fertilizers application, Integrated Pest Management (IPM) and Integrated Crop Management with improved agronomic practices.
The Trust for Advancement in Agricultural Sciences (TAAS), a neutral Think Tank for strengthening agricultural research and innovation for development (ARI4D), in collaboration with the Society of Pesticide Science (SPS) India, the Indian Phytopathological Society (IPS), and the Entomological Society of India (ESI) organized a “Stakeholders Dialogue on Current Challenges and Way Forward for Pesticides Management” through webinar on 24 July, 2020. It was attended by about 80 participants including eminent experts, senior research managers, government officials representing diverse stakeholder groups, viz., central and state governments, scientific societies and institutions, pesticide industry and farmers. The main objectives of the Dialogue were: i) to discuss major constraints and explore solutions for phasing out banning of certain pesticides, ii) to seek views of stakeholders on proposed ‘Pesticides Management Bill 2020’ and suggest possible alternatives for accelerated growth of pesticides in India, and iii) to review and suggest reorientation of pesticides management, present regulatory system, existing policies and enabling environment for faster growth of pesticide industry to promote botanicals and agro-chemical R&D in the country.

Major Issues Discussed
In-depth discussions were held around regulatory mechanisms for pesticides management including time line for processing registration application, re-registration, ‘Me-Too’ registration, excessive jurisprudence, regulatory data protection, pricing, and bulk ban of 27 pesticides including tricyclazole, buprofezin and glyphosate. Discussions were also held on rationality of alternatives, ecotoxicity, reasonable data requirements on bioefficacy and toxicity, and mandatory application of glyphosate by PCO.

The webinar was attended by distinguished stalwarts, policy and decision makers of the Crop Protection sector including Dr RS Paroda, Dr RB Singh, Dr TR Sharma, Dr AK Singh, Dr CD Mayee, Dr Bhag Mal, Dr SN Sushil, Dr SK Malhotra, Sh Rajesh Malik, Sh Ajay Vir Jhakar, Sh Bharat Bhushan Tyagi, Sh Salil Singhal, Sh RG Agrawal, Sh Pradip Dave, Dr Ram Kaundinya….. to name a few.

The Outcome
As a result of intense discussions, several useful recommendations have emerged. A roadmap is in the process of finalization by September 2020.
Transforming Villages. Ensuring Prosperity.

- Climate Action
- Rural Infrastructure
- Watershed Development
- Farmer Collectives
- Women Empowerment
- Tribal Development
- Financial Inclusion

NABARD
Development Bank of the Nation

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Before reaching our tables, the food we eat has to withstand many challenges in the field such as invasive weeds, harmful insects, fungi, diseases and extreme weather conditions. Without crop protection solutions, a lot of the food that farmers grow would be lost to pre-harvest pests. The Food and Agriculture Organization (FAO) estimates that up to 40% of food crops are lost due to plant pests and diseases annually.

**Why Crop Protection**

Such losses not only threaten global food security but also have the potential to limit food access due to unavailability of food, or sharp increases in food prices. But this challenge is also an opportunity to find new ways to help crops better withstand adverse conditions in a farmer’s field. That’s why at Bayer, we are exploring new ideas that can help farmers with tailored solutions to protect their crops.

Bayer offers a broad range of chemical, biological and data-driven solutions to help farmers safely and responsibly protect their crops from pests such as weeds, disease, harmful insects and fungi. Our diverse and growing portfolio provides farmers with the latest technologies and a wide range of choices for their crop protection needs. These include innovations such as pesticides, herbicides, agricultural biologicals such as microbials and digital farming tools. We also work collaboratively with farmers to offer tailored solutions – including agronomic recommendations based on the specific needs of their fields, crops, and soil to defend against pests, help ensure productive harvests and improve soil health, all while protecting our natural resources.
Curbing counterfeit CPC

Crop Protection chemicals (CPC) play an important role in preventing crop losses both before and after harvesting. That’s why the increasing incidence of counterfeit and illegally traded CPC in India is a serious issue.

While legally registered CPC undergo rigorous testing under global and local regulations, illegal products are not tested for efficacy or impact on human health and environment. Counterfeit CPC may contain unknown, toxic impurities. The residues of these untested substances can be carried into harvested food and may compromise human and animal health. It can also pose health threats to farmers and farm workers through exposure during application.

Manufacturing legal CPC involves significant investment and time for securing new registrations. Proliferation of illegal products results in loss of sales, patent and trademark infringement, erosion of data protection and damage to reputation. Illegal products also cause resistance in pests and manufacturers have to come up with newer technologies to replace old chemicals.

Bayer has a zero-tolerance position towards counterfeits and is committed to combating them as effectively as possible. We conduct regular awareness campaigns to educate farmers against the ill-effects of using counterfeit CPC. This is a part of our ongoing Product Stewardship strategy.

Dealers and distributors can play an important role in discouraging the illegal sale and supply of counterfeit Crop Protection chemicals. Additionally, the enforcement department and the government's regulatory mechanism has to be more vigilant in curbing this menace.

Need for sustainable agriculture

The industry and government are supporting the shift to sustainable agriculture by popularizing the use of science-based good agronomic practices (GAP) that are climate-smart and financially viable. Enhanced collaboration will play a critical role to transform Indian agriculture.

Digital tools shall help farmers produce more with less resources (water, land and energy) and make data-driven decisions in real-time. New technologies like drones are revolutionizing farming. Drones can help identify weeds, pests and diseases and localize application of crop protection chemicals. Farmers in China and south-east Asia have started using drones to reduce their risk and improve profitability. Once drones are approved for use in Indian farms, it can provide farmers significant benefits including targeted and timely use of crop protection chemicals to reduce crop risks.

Right policy and market environment

India needs to develop policies for improving farm-to-fork competitiveness of major crops. For example, in horticulture India has significant opportunity to improve productivity and quality for domestic and export markets. Creating end-to-end crop value chains with focused state clusters and strong linkages to FPOs will enable this to succeed.

Innovations in modern crop protection and biotechnology have helped change the face of agriculture, offering farmers the benefit of efficiency, productivity, and sustainability. Innovation lies at the core of transforming food production. That’s why India needs to accelerate introduction of new technologies in crop protection to match pace with other big agricultural nations. This means shortening product registration timelines and fast-tracking critical innovations for timely response to emerging threats like the Fall Army Worm impacting corn cultivation. In case of biotech regulatory reforms, they need to be introduced in conjunction with reforms for crop protection. This requires a holistic regulatory regime starting with breeding, crop protection to biotechnology to mitigate risk and improve yields significantly.

For India to become a globally competitive manufacturing hub for crop protection products, we need enhanced data protection measures to safeguard the investment towards innovation and R&D of new products.

With accelerated use of digital technologies and open knowledge platforms, there’s a great opportunity to scale up our regulatory capacity including strong alliances for knowledge transfer with other leading countries. This again will be a strong foundation to accelerate regulatory reforms on a real time basis.
COVID IMPACT

AGRI INDUSTRY AND THE ROAD AHEAD

Arrivals of the majority of the Rabi crops this year were significantly lower compared to the same period last year. The adjacent table compares the arrivals of key Rabi crops during Mar to June time frame for the current year and previous year. At a time when India harvested a record high Wheat crop this Rabi season, arrivals have shrunk significantly. As per 3rd advance estimates of Govt of India, Indian Wheat crop during Rabi 19-20 is estimated at a record 107.2 million MT as against 103.6 million MT last year. Farmers generally bring the produce to the mandis straight from their fields immediately after harvest, and this activity was disrupted because of lockdowns. Farmers have turned out to be stockists this season, and these stocks with farmers will come out depending on the fund requirement by farmers. Stocks in the hands of processors and traditional stockists are lower this season, and hence volatility in prices can be seen once the demand resumes.

The adjacent table illustrates the acreages of some of the Kharif crops till Aug 14, 2020. Acreages of almost all the Kharif crops are higher this season compared to last year. Agricultural production this season could be far better compared to the previous year. There is no negative impact seen on the agricultural sector in terms of sowing or other filed activities during the current season. The contribution of the agricultural sector in the GDP of the country could be higher this financial year. The sector can cushion the Indian economy from the pandemic shock during this fiscal.

The government has brought in three significant reforms for the

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<th>All India Arrivals (in lakh MT)</th>
<th>All India Kharif Acreages till Aug 14 (in lakh ha)</th>
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<tr>
<td><strong>Commodity</strong></td>
<td><strong>Crop</strong></td>
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<td>Wheat</td>
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<td>Mustard Seed</td>
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<td>Barley</td>
<td>Sugarcane</td>
</tr>
<tr>
<td>Coriander</td>
<td>Cotton</td>
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</table>

Source: www.agmarknet.gov.in
Source: Dept. of Agriculture, Cooperation & Farmers welfare
agriculture sector, which have the power to transform the industry. Amendments to the essential commodities act are one of the landmark reforms in the recent past wherein government has deregulated cereals, pulses, edible oils, oilseeds, potato, and onion from this Act. Stock limits will not be imposed on food processors, value chain participants, and exporters under the new framework.

The Govt has approved the Farming Produce Trade and Commerce (Promotion & Facilitation) Ordinance, 2020, which will ensure barrier-free trade in agriculture produce. The said ordinance will gradually reduce the dependency on the current APMC network for aggregation of commodities. Warehouses will become focal points of the gathering of commodities moving ahead, and the entire procurement and collection will inch more towards the warehouses and other storage structures such as silos. Various market participants have come up with various initiatives to address procurement and aggregation.

SURAKSHIT MANDI
One such prominent initiative is *Surakshit mandi* launched by National Collateral Management Services Limited (NCML). Its major objective is to tackle the aggregation of farm produce without breaking the protocol of social distancing in the global pandemic. It shall also help farmers in selling their crops through its network of warehouses across the country with the help of state of the art e-marketplace. With the use of a digital token-based queue, testing certificate, digital transaction for price discovery between farmer and customers, the digital flow of credit between buyer and lender process comes to life, at the NCML owned warehouses/silos/cold storages, which are nodal point for this whole process.

Govt has also shown interest in promoting e-trade in commodities. Further, the Govt has also announced that a standard mechanism for predictable pricing will be put in place. Under this, the Govt will come up with a legal framework to help farmers to fix their price for the commodity they produce, assures guaranteed return for the crops before sowing, and further proposes to increase the availability of farm technology and selling opportunities.

**THE ROAD AHEAD**
The pandemic has taught new lessons and has thrown a few challenges for the sector. The sector, especially farmers, has provided a much-needed cushion for the economy during these hard times. If not handled properly, this may increase the farm distress. On the one hand, Kharif acreages are higher on a y-o-y basis, and on the other hand, prices are trading way below MSP for most of the crops, and demand prospects for few commodities are bleak at the moment. If farmers fail to get remunerative prices for their produce, the agrarian stress would mount up and may pressurize the economy at a later stage. This may force the Govt to procure higher quantities at MSP during the upcoming arrival season. Either way, it will be a Catch 22 kind of a situation for the Govt. No doubt, India will harvest a good Kharif crop this season. Govt is already sitting on huge grains and Pulses stocks and may find it challenging to procure higher quantities. Rather than procurement, the Govt should focus on exporting the surplus out of the country by giving sops to the trade, similar to that of what is observed in the Sugar sector. This will be beneficial in two ways. One, the cropping patterns will be aligned to market reality, and two the Govt will be freed from surplus inventories.

The Govt's procurement activities are skewed, wherein few crops like Rice and Wheat are procured in large quantities while there are little procurement and price support for other commodities. One probable alternate solution for procurement is Direct Benefit Transfer (DBT), which can be made applicable to a large set of farmers across different states. Market forces will handle the prices part, and farm distress will be under control by DBT. The focus should now shift from cereals to Pulses and Oilseeds, where India is continuously dependent on other countries for its requirements. It's time for a second green revolution in agriculture to make India self-sufficient in Pulses and Oilseeds.

**OPPORTUNITIES**
The objective of NCML’s Surakshit Mandi initiative is to provide aggregation of farm produce without breaking the protocol of social distancing.

**ABOUT THE AUTHOR**
Mr Siraj A Chaudhry, Managing Director and CEO of National Collateral Management Services Limited (NCML) is the country’s largest and integrated post-harvest solution provider offering a bouquet of services along the entire supply chain in the commodity space.

@ChaudhrySiraj
Pesticide sector needs major govt focus

We need structural agricultural reforms in regulatory provision in the crop protection sector. Governments will need to have in place the necessary institutional infrastructure for registering pesticides and enforcing legislation. It will require effective supporting policies and tools to promote sustainable pest and pesticide management.

The Central Insecticide Board (CIB) was constituted as per the provisions of the Insecticides Act, 1968. Even at inception, its objective was vague. The recommendation of this committee was advisory in nature, and hence toothless. It was to be led by a generalist and not a specialist. Imagine a situation where an army of warriors is led by the institution of no experience in how to fight. In the last 40 years, it has further deteriorated and therefore requires complete overhaul. Pest control is an issue of serious concern.

Robust regulatory system vital
The nation needs a robust regulatory system in place for vibrant crop protection. Improved regulations and implementation in relation to collecting and recording data on import, export, manufacture, formulation, quality and quantity of pesticides are essential for Indian agro produce to become...
globally competitive. As of now, we have inconsistent regulatory framework for control of pesticides, overlapping mandates for different agencies with pesticide management responsibilities and conflicting provisions regarding allowed pesticide uses. Joint reviews and inspection of fake and spurious pesticides is the need of the hour. Public confidence in pesticide regulatory processes and decisions needs to improve. In an un-starred question in the Lok Sabha on March 3, 2020, it was mentioned that in the last three years, out of 1,91,365 analyzed spurious samples, merely 2,584 are under prosecution stage. Further, there are over 250,000 registrations corresponding to only 292 registered pesticide molecules, i.e. close to 900 per molecule (process of issuing such registrations continues at an alarming pace). This has made way for non-serious players who have little regard for quality and standards. Getting a manufacturing license from the state-notified authority under the Insecticide Act is not difficult either. By and large, it is given without checking for basic facilities, including quality control.

The result is an unmanageably large number of pesticide manufacturing units – currently over 1,400. Juxtaposed with poor enforcement of IA and Insecticides Rules (1971), this has led to proliferation of spurious and sub-standard products and helps fly-by-night operators. The government must integrate all stakeholders in the value chain who function as the eyes and ears for inspecting the quality of pesticides. The government can enable joint review of pesticides to create a democratic environment for those who are working hard to make available the right quality of pesticides.

The challenges we face

The current Inspector Raj and provision of keeping a tab over mala-fide practices in pesticides inspection still belongs to Stone Age. There is absolute monopoly of a single government lab in New Delhi. How will the farmers far from Delhi access it? Don’t we have resources to multiply it? Can’t we have professionals for inspection in case of any anomaly? In other sectors, there are GLP and NABL accreditations. Why do we have different standards for the farming sector? Why we can’t have multiple labs with the mandate of joint review or joint Inspection of pesticides? Why are private sector labs not permitted to work in this sector, as in developed countries?

These issues remind us of the 70s, where the slogan was more and more government and less governance. The current system is spreading red-tapism. It breeds corruption, helps the anti-poor cartel and is miles from good governance. The current system is not equipped to nab the wrong doers. Surprisingly, it measures the ethical practitioners with the same yardstick!

The severe punishment system and the current Inspector Raj will drag every small matter to the courts. It shall give undue advantage to the anti-poor lobby against whom we have struggled so much.

Farmer awareness

Farmers must be made aware of the types of illegal pesticides. These include:
- counterfeit pesticides packaged and labelled to look like legal products
- counterfeit pesticides with poor or limited labelling and packaging, clearly different from the original
- pesticide products without registration in India

Nearly 700 KVKs and extension systems working in PPP mode are required to consistently spread awareness regarding the risks posed by use of illegal pesticides. PMB 2020 must provide for spreading literacy about buying the right product with bill.

The draconian Act like APMC and the lack of coordination between the Union and state governments in the agriculture sector are huge stumbling blocks. Indian farmers are still not getting the right set of agri-inputs and the right market for their produce. Ease of doing Business in Agriculture is sorely needed.
Covid has taught us that when everything shuts down, farmers and farm labour shall be working in the fields, rotating the wheel of the economy by ensuring food security. For the western world, the mantra was globalization and liberalization. Today, they are building their economy on the Swadeshi principal of self-reliance. Indian Sanatan Arthashastra has adopted indigenous self-reliance for centuries.

Prime Minister Shri Narendra Modi has pledged to make India self-reliant in all fields including agriculture, manufacturing and service. The three recent agri-ordinances shall usher in agrarian reform. The government is preparing to connect the farmers directly with the industries. Recently, PM Modi launched an agricultural fund of Rs 1 lakh crore. One of the objectives is to free small farmers from the clutches of middlemen and commissions agents. We must all work for achieving Aatm Nirbhar India. India is abundant in natural wealth.

• While only 11% of the entire land globally is arable, 56% of our land is arable
• 64 types of soils are available all over the world. India has 46 types of soils
• We are rich in availability of rain, surface and ground water. We are able to use only 10-15% of our abundant rainfall. Of the total land area of 328.7 million hectares, about 30 crore hectares is catchment area. There are about 445 rivers in the country, whose length is about two lakh kilometers
• Due to excessive water exploitation caused by Green Revolution, today about 264 districts in the country are categorized as dark zone, and are facing water crisis. Ground water level is decreasing at the rate of 0.3 meters every year
• There are 15 types of climate zones globally, and 127 agro-climatic zones, all of which are available in all of India.
• In terms of biodiversity, India has 48,000 varieties of trees, 1500 edible plants and 811 species of domestic and wild animals. We have about 375 varieties of fruits, 280 varieties of vegetables,
about 80 types of kandamul, about 60 types of flowers, seeds and nuts
• We have 77 km long coastline and our own economic area of 20 lakh sq km, which offers not only a lot of fishing but also valuable oil, gas and minerals and power generation potential.

Agri reforms in India
There is a need to analyze the reforms in the agriculture sector in the last 70 years, divided into seven time segments
• First Period - From 1947 to 1968, with expansion of sowing area, increase in irrigation resources and land reform laws
• Second period - from 1968 to 1980, in which high yielding dwarf varieties, fertilizers, pesticides and new techniques were used, called the emergence period of Green Revolution
• Third period - from 1981 to 1991, with introduction of MSP, assured government procurement and nationwide system of storage and distribution
• Fourth Period - Liberalization from 1991 to 1998. Period of globalization in which WTO was established. Major changes were introduced by incorporating industrial, service sector, intellectual property rules as well as the world’s agricultural sector into world trade
• Fifth period - from 1999 to 2004, to promote traditional organic farming, construction of rural infrastructure such as development of roads, electricity, education, health care etc. and remove anomalies in the agriculture sector in November 2004. National Farmers Commission was constituted under the chairmanship of Dr S. Swaminathan. The Commission submitted its final report to the Central Government in October 2006
• Sixth period – For fulfilling pledge of Modi government to double production as well as farmers income, many schemes including Soil Health Card, Per Drop More Crop Irrigation, New Crop Insurance Scheme, Value Addition and farmers connected directly to marketing

Low farmer income
Despite systematic agrarian reforms and Green Revolution technology revolutionizing food production, the income of farmers did not increase much. Prosperity that has been achieved in the progress of the country’s economy of the country was not distributed equally among the various sections of the economy and society. The rural community did not get its proper share. Agriculture faces many challenges including falling productivity, inadequate and unbalanced use of nutrients especially nitrogen, low water and nutrient utilization efficiency, erosion of natural resources, lack of water for irrigation etc. Farmers face rising costs of inputs with increasing diseases and pests, and adverse effects of climate change. The Green Revolution ensured India’s food security. But it adversely impacted our self-reliant agricultural system based on the principles of soil, water, biodiversity, human health and nature and coexistence.

Covid impact
Covid has taught us the significance of long-term sustainable use of natural resources such as land, water and biodiversity based on the principle of co-existence with nature. We must resolve to build self-reliant India by building self-sufficient villages. We need to adopt coordinated farming systems based on the principle of co-existence of nature. This saves the farmer from the burden of loans and unnecessary dependence on markets. In this way, farmers shall be able to make their villages self-reliant and live life with self-respect.

India is a country settled in villages. Without making the village completely self-sufficient, Aatm Nirbhar India cannot be imagined. Hence the nation must focus on creating self-sufficient village to self-sufficient India.
For its large population, India needs to not only increase agriculture production but also the overall productivity to ensure food and nutritional security. Increasing productivity of farming has to be through optimum usage of farm productivity enhancing inputs.

Crop protection products (CPP) have been playing a pivotal role in protecting the produce of the farmers across the globe from diseases and pests at various stages of the crop. In a recent study, The Indian Council of Agricultural Research (ICAR) estimated that without the use of CPP, the loss in value terms of India’s agriculture produce due to weeds alone would be to the tune of over US$ 11 billion (INR 80,000 crores). Additionally newer products would be necessary to manage farmers’ changing cropping patterns and pest complex because of climate change effects.

Crops have to compete with 30,000 species of weeds, 3,000 species of worms and 10,000 species of plant-eating insects, the newer and more complex pests like Fall Army Worm (FAW) and locusts combined with climate change. Bugs, molds and rodents threaten post-harvest. CPP are the only solution that can prolong the life of crops and prevent post-harvest losses.

Fair review essential

If India today produces a record 291.95 million tonnes of food grain, it owes much to the introduction of CPP besides quality High Yielding Variety (HYV) seeds. Despite this, CPP come under intense scrutiny, reviews and criticism from NGOs. They have to prove their worth again and again.

Admittedly, better products with the least environmental impact should be available to the farming communities. But one sees lack of enough scientific basis to the reviews and knee jerk reactions by way of bans, both at the Centre and State levels. A case in point is the recent proposal to ban 27 molecules by the Central Government. The industry has been generating scientific data on the efficacy as well as safety aspects of the various molecules and most importantly,
the importance to the farming community in protecting their crops. The scientific community and farmers have been sending their feedback and representations to the government on the adverse consequences if the molecules are banned. Hopefully after due consideration the government will take an informed science based decision.

**Enabling policy needed**

The Pesticide Management Bill 2020 is another opportunity to bring in a predictable progressive science-based legislation in place of the age old Insecticide Act of 1968. There is need for greater thrust on the industry, which has been striving to get the best technologies to our farming community year after year.

The R&D based crop sciences industry has been launching molecules that has over time led to reduced application rates. These were as high as 1,000-3,000 grams of active ingredient per hectare in the case of molecules such as organophosphate and carbamate during the 1960s and 1970s.

By the eighties, with the advent of cartap and synthetic pyrethroids, the dosages had come down to 50-500 grams per hectare. From the nineties to the early 2000s, there was further advancement giving way to triazoles and neonicotinoids, having dosages of 25-200 grams per hectare. Since the mid-2000s, the active ingredient application has fallen to less than 100 grams and in some cases of very low toxicity molecules – such as sulfonylureas and diamides – even as small as 4 grams per hectare. The pursuit towards greener chemistries continues.

That pursuit needs encouragement to make our agriculture both economically viable (through reduction of crop losses) and more sustainable (by reducing environmental load). It calls for creation of a policy environment that incentivizes a steady flow of the latest and safer products. There must be adequate duration of protection of regulatory data for first-time registrants who spend almost INR 2000 crores over a 11 year period from discovery to commercialization. This will enable them to not only recoup some of their investments but also steward the product properly. A period of exclusivity is granted by countries across the world for first time registrants in accordance with the WTO and TRIPS guidelines.

The trust deficit needs to be bridged. Provisions like criminalization of offences in the PMB 2020 do not augur well and vitiate the atmosphere. Some of the regulatory provisions like re-registrations and certain provisions will affect ease of doing business. They will restrict new molecule introductions which are necessary for farmers in an extremely complex environment and pest pressures.

**India lags in CPP usage**

The criticism by NGOs that India uses large amounts of CPP is unfounded. Per hectare consumption of pesticides in India is a mere 0.29 kg/ha compared to other countries like China at 13.06 kg/ha, Japan 11.85 kg/ha and Brazil 4.57 kg/ha.

We also need to examine the number and nature of pesticides used in India. At present 1175 molecules are available globally but about only 270 are registered in India. Only about 75 molecules and their combinations are being used to protect 140 million hectare of diverse Indian agricultural crops.

In contrast, much smaller countries like Vietnam, Pakistan have over 500 registered molecules. USA, EU and Brazil have around 650/750 approved molecules for their farmers. Indian farmers need far greater range of newer molecules to fight the battle against pests, diseases, weeds and other attacks. The limited number of molecules lead to unintended consequences of spurious and fake products in the market, compounding the problem further.

There is a need for a predictable science based policy regime for the proper growth of the crop protection sector. Any hasty decision to ban or a policy environment restricting use and introduction of new molecules will be detrimental to agriculture. Industry and government should work towards ensuring that the farmers are equipped with the best technologies to produce more from less in an environmentally sustainable manner.

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**Dr Ravi spends much of his free time in catching up with and cooking for his family, friends and when he wants to eat good food! Switches between Carnatic and rock music and tries to keep pace with his daughter’s play list also! An avid painter and an amateur clay sculptor of majorly Ganesha idols, he derives happiness in feeding the poor**
Crop Protection Chemicals (CPC) are an extremely important element of the agriculture sector and play a vital role in ensuring the nation’s food security. Challenges in the application of CPC must be addressed by their efficient and judicious use within the confines of required regulatory framework.

In between sowing to harvesting, crop gets attacked by various pests and diseases that infect, consume or damage crops, thereby significantly reducing the quantity and quality of food production. Pesticides, Herbicides, Fungicides, Rodenticides, Molluscidies and Nematicides are CPC that help control insects, diseases, weeds, fungi and other undesirable pests. Crops respond to infections in two ways:

1. Through natural resistance developed by way of natural genetic improvement and nutritional capabilities of the crop. Plants have survived stress over years of harsh climatic and environmental exposure through self-selection of genetic parameters creating natural strains, and continuously developing this capability. This will also depend on health of plant and availability of nutrients.

2. Through use of CPC for pest attack, build bacterial infection that cause damage through diseases like root rot, rust, mild dew etc and or control the growth of weeds that take away the nutrients from the crop.

CPC are like allopathic medicines for human being, dealing with specific problem to provide relief. The relief may be permanent or temporary. Such attack may get repeated and multiple doses of CPC may be required to deal with the problem.

Strengthening the plant immune system
Drawing parallel again with human medical treatment, Ayurved deals with not the symptom but the root cause to make one stronger and deal with the prob-

The VeLPR FOOD standard should guarantee the consumer that farmers have used CPC responsibly, and their residue level in such certified farm produce is at substantially lower level than the normal produce.

Dr Sunil Kulwal is the CEO of Indo Gulf Fertilisers. He is a thinker and a turnaround professional, having wide ranging experience in leadership positions across multiple industries including agri-solutions across different geographies.
lem through stronger immune response. If we apply the same analogy to crops, we can make plants stronger to develop greater resistance to such attacks through immune response system. This is possible through genetically superior seed developed through natural selection or induced hybridization, as well as by providing right quantum of nutrients to the plant to develop stronger inherent capabilities to fight the disease. This is like the well-fed human who has stronger capabilities to resist attack from different viruses versus the human who is nutrient deficit. Like humans, plants need the right fertilizers and nutrients during its entire period of growth to grow strong.

**Customized Fertilizers**

Indo Gulf Fertilisers, through years of research, has developed an improved nutrient and mineral delivery system (customized fertilizer) that is crop and soil specific. Through use of specific customised fertilisers, crops grow stronger with higher inherent capabilities to fight diseases.

Indo Gulf Fertilisers has also developed and launched an organic soil conditioner product *Oorja*. When applied as a basal dose during sowing, it develops strong root zone of the plant, helping it to absorb the required nutrients from the soil more efficiently. These make the plant very strong.

There had been instances when a virus attack was seen in a particular farm field. The quantum of infected plants were much less in the area where Oorja was applied compared to the area where Oorja was not applied. That demonstrated that with the right quantum of nutrients, plants develop inherent capabilities to resist the viral attack in more effective manner. Compared to using CPC to deal with viral attack, it is perhaps beneficial to use products like Oorja to develop stronger resistance to viral attack. This shall also reduce dependence on CPC.

It has been observed that farmers end up using much higher quantum of CPC than required because of the fear of losing the crop. Excessive use of CPC is expensive and also poses harmful to health of the farmer and consumer alike. In many studies, diseases like cancer have been attributed to high level of residual pesticides, etc. in the crops which finally gets consumed by human beings.

To deal with this problem, it is of paramount importance that our current minimum residue level standards should be re-examined. New standards should be set to reduce the risks associated with excessive use of CPC. The government should encourage research to promote use of CPC which are more effective at the farmer level and less lethal to human beings. There is huge requirement to create greater awareness amongst farmers and consumers about the risks of excessive use of CPC.

**Focus on organic farming**

Awareness regarding organic farming has increased following the immense benefits it offers. Farmers get higher realisation of produce and consumers benefit through safer farm produce.

There is now a strong case to go beyond organic food, and develop and introduce a new class of farm produce. This is *VeLPR FOOD*, where Ve stands for Very, L stands for Low, P stands for Pesticide, R stands Residue. The *VeLPR FOOD* standard should guarantee the consumer that farmers have used CPC responsibly, and their residue level in such certified farm produce is at substantially lower level than the normal produce. These new standards will help farmers to realise better price of the produce and will also help the consumer to buy healthier food.

A committee of prominent scientists and industry players must be formed to develop *VeLPR FOOD* standards, make a plan to create their awareness, and ensure implementation with the help of the administrative machinery. This can be the game changer for a healthier and happier India.

Dr Kulwal loves to experiment with gardening and converting agri-produce into delicious dishes. On the social work front, he spearheaded the formation of Khandelwal Professionals Association (KPA) as its Founder President, with an aim to provide financial help to needy Indian students to pursue their postgraduate studies. Since its inception, KPA has provided financial help to over 500 students to pursue postgraduate studies.
Indian agriculture is resilient. During the Covid lockdown period, despite disruptions in supply chain, transport services and reverse migration of farm labour, food items including fresh fruits & vegetables were made available to all sections of the society and there was no shortage. Our food grain production in 2019-20 stood at a record 296 million tonnes, which is 10.5 million tonnes higher than last year. Kharif crop area in the current year is 21% more than the corresponding period last year.

The agriculture industry – be it Seeds, Fertilizers, Crop Protection, Farm Machinery & Equipment, Agriculture Produce Marketing and Processing etc – all have been in forefront since the Green Revolution. All have contributed immensely in making modern agricultural inputs and technologies available at the doorstep of farmers and creating awareness regarding their benefits in increasing the crop yield and quality. The development of agricultural trade channels consisting of distributors, dealers, village retailers etc. also played a significant role in dissemination and adoption of innovative and modern agricultural inputs and technologies at farmers’ fields.

The role of industry in promoting the concept of IPM, safe and judicious use of pesticides, ICM, Grow Safer Foods, safe disposal of pesticide containers and overall agricultural development in India is commendable. But a lot remains to be done with the constantly changing and fluctuating fortunes of Indian agriculture. The government’s agricultural extension departments – Village Level Workers (VLWs), ICAR’s Krishi Vikas Kendras and many other agricultural schemes and missions/projects didn’t measure up to the expected level of impact as desired. In the absence/failure of government-led initiatives, the private sector took a lead role in developing the agricultural ecosystem as it is today. Its efforts are continuing as per the resources and capacity of individual players to take Indian agriculture to the next level.

Our unique challenges
Indian agriculture is characterized by...
small land holdings. Our agriculture is highly diverse, heterogeneous and fragmented, and not uniform across the states and districts. Every 100 kms in any direction, there is change in soil, climate, cropping pattern, languages, food and culture. With approximately 110 million farm families spread across 600,000 villages, reaching out and connecting has understandably remained a challenge. Innovative products aligning with farmers’ needs and committing to improve productivity is not an easy task. Getting farmers to acquire the skills required to adopt these technologies involves a lot of effort & significant investment in manpower. It is beyond the capacity of a single private player in the industry to reach out to every village. It needs location-specific collaborative strategic interventions and approaches by all stakeholders for bridging the gaps between innovative products and technologies, and its utilization by farmers. Innovative products and sustainable technologies will continue to play an important role while the dynamics of the agriculture sector changes and produces new challenges.

We cannot be complacent as the demand for food. More importantly, the concern for safe food is increasing due to population growth and rising per capita income of 350 million strong Indian middle class. With 190 million ha of gross cropped area, availability of all major agro-climatic regions, all types of soils, growing almost all crops of the world throughout the year, India can be a global agricultural powerhouse. But Indian agriculture lacks cost and quality competitiveness. It is not remunerative enough, as 52 % of the total labour force employed in agriculture contributes only 17 % of the GDP.

India ranks eighth in global exports of agricultural produce with only $ 39 billion of annual exports. More and more people are moving out of agriculture. The younger generations are not interested to continue unless new innovative products and technologies are offered to make agriculture more remunerative.

The biggest challenge agriculture faces today is the adverse impact of climate change and weather aberrations (abiotic stresses), deteriorating soil health, environmental sustainability etc. The industry is playing an increasingly important role by focusing on bio-ag inputs/climate resilient innovative products and technologies. This needs investment in R&D and people, knowledge building, infrastructures, robust delivery mechanism. An enabling environment provided by the government and policy makers shall catalyse these efforts.

**Leading from the front**

Over time, services that go beyond merely selling a product but that also provide training to farmers about when and how to use, application rates, time of application as well as supplementary components such as advisory and marketing services, have become an increasingly important and integral part of any product offering. The industry is making farmers understand the benefits of various policies and schemes launched by the government as a part of their differentiated services.

Many players in the industry have their dedicated farmer call centres, farmer service centres and agri-input retail stores to make products available closer to the farm gate. Several new start-ups in agriculture are developing solutions to tackle climate change challenges. For example, Sky Met Weather Services is involved in monitoring and predicting weather and providing agri-risk solutions. Technology is playing an important role in bringing these elements together. With the high penetration of smart phones in villages, the industry leveraging digital technologies to connect with farmers and explaining the merits of innovative products for faster adoption and scale up.

Farmers are prompt to identify what works in their interest. They are ready to pay for performance-based quality products which improve soil health, protect the yield from insects, pests, diseases, weeds (biotic stresses) in a sustainable and cost effective manner and enhance quality yield, ensuring higher returns. The time has come to boost smart agricultural strategies through innovations and strengthen the supporting framework. This shall enable inclusive growth in agriculture and create linkages with all stakeholders – scientific institutions, state agricultural universities, ICAR’s Krishi Vigyan Kendras, Government Extension Departments and Farmer-Producer Organizations for impactful innovations in agriculture. This shall make make India self-reliant and atmanirbhar – a journey which the industry shall lead from the front.
Drone Usage in Agrochemical Spraying

Drone usage in agrochemical spraying has proven to be among the most promising technologies emerging from the fourth Industrial Revolution. Drone usage in agrochemical spraying can have a major impact on Indian farms and needs government support for enabling supportive policy framework.

The main benefits of drones in spraying of agrochemicals are the following:
- Increased efficiency and precision of agrochemical application. This leads to improved pest management and crop productivity, eliminates or reduces wastage of crop protection products (CPP)
- Significant reduction in risk of operator exposure during spray operations
- Field capacity of drone-assisted spraying is over 20 times higher compared to manual spraying
- Lower water consumption
- Development of certified applicators, including community spraying professionals providing application services, thereby creating new skilled employment and entrepreneurship potential in rural India
- Certain special field conditions (such as deserts or hilly terrains) and crop growth stages are more suitable for spraying through drones
- Mitigate emerging trends in labour shortage

Admittedly, there are risks involved in any new technology. For drones, these are flight risks, risks to the operator, bystander, the crop and also the environment. It is important to study how other countries are using pragmatic regulations for mitigating these risks.

Asian Scenario
Drones in agrochemical application have grown in sophistication and scale, boosting ease, confidence and affordability of use. This innovation is being driven largely by Asia. The adoption of drones in farms is the highest in countries such as China, Korea and Japan, as they are confronting growing labour shortage challenges from urbanization and aging populations.

According to a study by Goldman Sachs, the agriculture sector is predicted to be the second-largest user of drones in the world in the next five years, after construction.

As per a study by UNFAO, in China...
alone, the number of agriculture drones is estimated to have doubled between 2016 and 2017, reaching 13,000 aircrafts. 30 million hectares of crop land was sprayed by drones in 2019.

- The economies of scale in usage have meant that the operating costs per hectare in some Asian countries are now equivalent to just Rs 100-150 for field crops (rice, wheat and maize) and Rs. 250-400 in orchards.

Indian Scenario
In recent years, use of drone in agriculture has gained attention. Drones have been used to fight highly mobile invasive pests such as Fall Armyworm (FAW) and desert locusts efficiently and effectively; prevent them from becoming endemic while maintaining high agricultural productivity.

Recently Government of India, as a special case has recommended usage of drones for spraying operations to control the locust as band application to save the crops. Some state governments have issued e-tenders for inclusion of drones in aerial pesticide applications. Ministry of agriculture has come up with broad specification for drones that can fly at night and stay airborne for night duty in locust control, making India the first country to do so. There is opportunity to extend it to other pests and areas of application through robust and pragmatic science-based policy framework. Progress has been made on the subject in setting guidelines for “Krishi drones” as envisioned in the ICAR expert committee appointed by the Ministry of Agriculture.

Drone use Regulations – Global Scenario
- Japan has an extensive 30 years of experience using single rotor remote-controlled helicopters (unmanned drones) for spraying CPP and have well established guidance documents
- Use of drones for spraying CPP is regulated in South Korea and Malaysia. China has established a civil aviation law and standard operating procedures (SOP), tolerating chemical spray applications of conventionally registered products while fine tuning the guidance. In Philippines, Indonesia, Thailand, Taiwan etc. guidance documents are under development.
- Latin American countries are commercially using drones in small scale and also determining suitability for multiple crops.
- In the USA, the EPA (Environmental Protection Agency) allows the use of pesticide application using drone technology when in compliance with federal aviation rules and if manned aerial application is present on the label.
- The European Union, which has traditionally have had conservative views, is now considering the use of drone pesticide application. EU is developing guidance for use of Drones for spraying CPPs for areas inaccessible to vehicles and where manual spraying is difficult e.g. Grapes orchards on sloppy hills. Recently, Switzerland approved use of drones for spraying CPP
- Australia and New Zealand have embraced drone technology and are governing the use of drones in agriculture and management of weeds.

Drone Use Regulations in India

CropLife India – an association of 15 R&D driven member companies in crop protection (jointly represent more than 70% of the market, are responsible for 95% of the molecules introduced in the country; member companies have annual global R & D spend of 6 billion USD) strongly believe that it would be in the interest of farmers and Indian agriculture if drone technology can be deployed on a large scale for agrochemical applications.

This should be supported by a robust and pragmatic science-based policy framework. Japan’s revised guidance document can serve as the most suitable point of reference. The focus should be to minimize potential risks by promoting active learning and rapid adoption of this well-developed technology, extensively tested globally. Ministry of Agriculture & Farmers Welfare, CIB&RC, Ministry of Civil Aviation and Ministry of Home Affairs should collectively facilitate a supportive policy framework for drone usage for higher farm efficiency, productivity and sustainability.
Our regulatory system and policies have paralyzed India’s capacity for innovation. There is also lack of a concerted approach to demonstrate these innovations and lack of encouragement to farmers to adopt them. Such weaknesses are more common for innovations related to natural resource management and those that need capital investment for commercialization.

The Pesticide Management Bill 2020 is far from expectation in the wake of tall promises for doubling of farmer’s income and making India a $5 trillion economy. Through PMB 2020, the government has subverted the constitutional rights of the farmers and disobeyed international treaties. It has compromised to the few pressure groups working against India’s interest. It is enshrined in Article 48 of the Directive Principle of State Policy of our Constitution: “The State shall endeavor to organize agriculture on modern and scientific lines”.

PMB 2020 is going to attack the foundations of crop protection. It will create an agrarian crisis and lead to farm distress.
Each and every clause is full of flaws, being used to further political purposes rather than for nation-building by enabling farmers with right to technology. Its impact on the economy shall be long-lasting and irreversible.

This bill entails economic isolationism. In a liberal economy, we have binding obligation with various international forums. In PMB 2020, there is no provision of data protection even though our country is the signatory to WTO and must provide for data protection.

Public policy formulation in agriculture has gone a metamorphic change due to the rapidly globalizing world. PMB hasn’t learnt from this metamorphosis. Most of the clauses have been drafted without considering the experience of the last 50 years of dealing with the Insecticide Act. A lot of changes are needed to make it suitable in today’s changed environment after Covid. PMB should be reconsidered in light of making India not dependent on China.

In PMB 2020, punishment has been increased disproportionally without differentiating between genuine and fly-by-night operators. Punishment should be given as per the severity of the violation. As per GOI’s policy of ease of doing business, minor offences should be compounded and brought under civil law from criminal law. Criminal Law should be applicable only in cases of major violations – intentional fraud, cheating, etc. This should be the norm for all laws which govern commerce.

There is dire need to slash the red tape, roll back license raj at the grass-roots and simplify regulations to help small businesses thrive. At present, registration and licenses are issued by the Centre and the State by violating the Insecticide Act 1968 and Rules 1971. Government officials must be held accountable for actions with malicious intentions. The process of registration should be transparent and time-bound with a system of accountability; punishments for delays and information leakages.

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Criminal network behind illicit trade of pesticides

The criminal network behind the illicit trade of pesticides benefits from these opportunities at the expense of public safety, farmers’ rights, legitimate business activity and sustainable environmental resources. Trade in counterfeit pesticides undermines legitimate competitive advantage of rights holders, hampers innovation, farmers economy and long-term economic growth. Illicit trade may also ultimately undermine the rule of law and citizens’ trust in government. Indian Institute of Public administration recently observed in a report that 58 percent of agricultural items of use in rural India are fake and no action has been taken against these manipulators. The state suffers economically because the GST for these illegally marketed product is never accounted for. We should make the law transparent. The system of sampling, analysis and quality control should be to support genuine companies and take stringent actions against manipulators.

PMB 2020 needs scientific review

PMB 2020 does not provide for technological training for the use of new pesticides and use of new spray technologies like drones. The world is changing fast after Covid. Precision technology is used globally through satellites. In PMB 2020, there is no provision for adopting these technologies and training farmers, dealers, government officials and extension machinery.

Our future will depend on taking decisions based on science and research, instead of going with the wrong perceptions of some activist group motivated by vested interests. PMB should be reviewed by a scientific committee. A new improved version must be drafted and then sent to Parliament for discussion. PMB does not answer the needs of farmers. We must empower farmers with crop protection solutions, enable them with right to new technology and train them accordingly.

The real solution to farm distress is to free the markets for farm produce and enable Indian farmers with right to technology. Farmers have struggled for a common national market for agriculture. We have argued in favor of commodity derivatives, regulation of moneylenders rather than an outright ban, joint stock companies owned by farmers to handle the supply chain, companies owned by farmers as an alternative to land acquisition by the government, and equal property rights for women in farmland. The neo farmer movement has to reflect the need of these new generation farmers who are fighting regressive and adamant policies.
The development of new crop protection products with adequate bio-efficacy, user safety and minimum environmental contamination is an important task for agrochemical industries. Institute of Pesticide Formulation Technology (IPFT), Gurugram is actively engaged in development of new generation pesticide formulations for the safety of user & environment. The Conventional formulations like Emulsifiable concentrate (EC), Dusts (DP), Wettable powder (WP) provide adequate bio-efficacy but have shortcomings related to the safety of user and environment due presence of organic solvents or dust forming particles. New generation formulations produce desired bio-efficacy at lower doses of pesticides. Thus they minimize environmental contamination and pesticide residue in crop products. IPFT has contributed in the latest technology and developed various types of formulations.

Initial phase of New Generation Formulations development
The journey of developing new formulation for crop protection started with inception of the institute in 1991. In early phases of development, the formulations like Suspension Concentrates (SC), Water Dispersible Granules (WDG), as safer alternative to WP, DP formulations and Concentrated Emulsion (EW) as safer alternative to EC formulation were developed. These organic solvent free formulations have advantages like low particle size, good dispersibility in water, good bio-efficacy at lower doses of pesticides. At that time such newer formulations were not commonly used in India. The technologies of these safer formulations were provided to different Indian industries, which started commercial production and the products reached farmers for application in crop protection.

Advancement in formulation technology
Advancement in technology continued. The institute developed further superior formulations like Microemulsion (ME) and nanoemulsion e.g., Chlorpyriphos ME, Pyrithiobac Na + Quizalofop-P-
Ethyl ME, Permethrin NE which are water-based formulations with very fine droplet sizes usually between the range of 1-500nm. These formulations provide easy dilution in water for spray applications and give good bio-efficacy at lower doses.

Controlled release formulations like Capsule Suspension (CS) containing active ingredient encapsulated inside microcapsules of size upto 10 microns were developed. These formulations provide slow release of active along with prolonged availability of pesticide at target site. The formulations are highly suitable for volatile, highly toxic, skin irritant pesticides in order to reduce contamination of surroundings and further, they extend activity at the target site. The controlled release formulation reduce leaching thus minimize ground water contamination.

Combination formulations like Deltamethrin+ PBO Tablet, Lambda cyhalothrin + Thiometaxam Suspo-emulsion, Multifunctional botanical based formulations with insecticidal, nematicidal and fungicidal activity, controlled release floating tablets suitable for aquatic weed control, Acetamiprid & Enmaemectin Baezoate WG have been developed to provide broad spectrum efficacy at minimized spray application for effective and economic crop protection.

Further advanced formulations ZW (combination of Lambda cyhalothrin CS & Chlorpriphos EW), ZC (Combination of Lambda cyhalothrin CS & Diflubenuron SC) were developed. These water-based formulations contain two different active ingredients. One active ingredient is encapsulated within microcapsules, and the other active ingredient is in the free emulsion/suspension form. After application, the encapsulated pesticide releases slowly from the microcapsules and provides prolonged bio-efficacy. The other pesticide is available as free droplets/particles provide knock-down effect on target pests. This technology provides application of two pesticides in a single spray. It facilitates control of a wider range of pests with minimum doses.

Various types of other formulations like Gel baits, nano encapsulated gel, bio-botanical formulations, slow-release bio-degradable granules for soil application, seed treatment formulation have been developed for management of various agricultural pests. Neem and bio-botanical based formulations have also been developed control of vector born diseases and household insects.

Analytical and bio-efficacy studies
In addition to formulation development, the institute assists pesticide industries by providing analytical services (NABL accredited lab), Bio-efficacy, phyto-toxicity and residue data generation for registration of new formulations, providing training on formulations, quality control and application technology aspects. IPFT is continuously making efforts to provide effective and economic pest management in the country.
our agrarian economy is experiencing remarkable changes due to the technological revolution, digital revolution, rising urbanization, unparalleled growth in middle income groups, fast changing consumption habits and preferences – and above all, due to climate change and environmental degradation. These changes offer unique challenges and opportunities to transform agriculture to be more productive, economically remunerative, socially equitable and inclusive, and environmentally sustainable.

The agrochemical industry is heavily impacted by counterfeiting. The global market share of illegal agrochemical products has risen the last few years. There is ever-increasing pressure for improved transparency and traceability of agro products across the entire supply chain. To establish and maintain a consistent, safe, and unambiguous food supply, the design and implementation of complete traceability in foods and agricultural inputs is essential. In the agrochemical industry, there is an increased need for sharing data across supply chain actors in a machine-readable format in order to get the greatest benefit from supply chain traceability.

Agricultural yields strongly depend on crop protection measures. The main purpose of pesticides is to increase food security, with a secondary goal being increased standard of living. With the changing climate, not only crop yields but also pesticide use shall be affected. In terms of climate change, temperature increase and changes in precipitation patterns are the main pest and pathogen infection determinants. Increased pesticide use is expected in form of higher amounts, doses, frequencies, and also different varieties of products applied. Climate change will reduce environmental concentrations of pesticides due to a combination of increased volatilization and accelerated degradation. These are strongly affected by high moisture content, elevated temperatures and direct exposure to sunlight. Pesticide dissipation seems to be benefitted by higher amounts of precipitation. To overcome this, pesticide use might be changed. An adapted pesticide use will finally impact consumer exposure at the end of the food chain.

For many consumers around the world, where their food comes from and how it is made are important measurements of safety and quality. The demand for transparency is further propelled by concerns over foodborne health threats, the growing global trade of counterfeit and illegal pesticides, and the globalization of the food system.

**Agrochemical traceability**

Good traceability enables producers, distributors and consumers to track the movement of goods. These processes are complex and span across borders. Most companies still rely on paper-based tracking systems which are time-consuming, manual and inefficient.
As per an Accenture report on supply chain traceability in agro-chemicals, “In order to get success in the digital economy, stakeholders are realizing that they must manage the integration of business, technology, people and processes, not only within the enterprise, but also across the value chain. There is increasingly need to relook and to adopt supply chain management systems that enable inter-enterprise cooperation and collaboration with their suppliers, customers and business partners”.

Antiquated and fragmented systems can result in safety issues and inconsistent data, as well as an increase in counterfeited goods – a significant problem for the agrochemical industry.

**Roadmap to global harmonization**

To create and maintain complete traceability, the entire supply chain needs to understand the concepts and implications of a good system. This includes farmers, post-harvest processors, marketers, research practitioners and policy makers.

Fortunately, strong partnerships, advances in sensor technology and better traceability standards have created the momentum toward a more functional system for the agrochemical industry.

Traceability innovation means to have the tools at our disposal for a fully harmonized, end-to-end supply chain solution that can track a formulated product from conceptualization to the field. Achieving this solution on a global scale is vital for trading partners to effectively meet their company’s needs and exceed customer expectations.

**Track and Trace Technology**

This can help stakeholders with the following operations:

- Demand forecasting
- Anti-counterfeiting measures
- Sustainable purchasing
- Inventory management
- Recall management
- Consumer engagement tools
- Loyalty programs
- Real-time supply chain visibility
- Decision-making tools with data analysis

**Traceability will help answer the following questions:**

- How can one assure customers that my product is safe?
- How can one prove that my ingredients are sustainably sourced?
- How can our customers be sure that my product is not counterfeit?

**Benefits**

As a result of experimenting with traceability solutions, many industries, organizations and companies are discovering the collaborative potential for enhancing the workflows in their supply chains. Increased transparency of products, transactional efficiency, reduced costs and fewer staff redundancies are some of the benefits that could be unlocked through full traceability of the supply chain. The supply chain traceability can establish the network needed to reliably register, verify and track goods transferred between distant parties. It can help reduce operational inefficiencies and fraud by enabling greater transparency and accountability for the information shared between parties.

Traceability systems tend to be motivated by economic incentives, not government traceability regulation. These systems improve supply-side management and shall increase safety and quality control to market foods with credibility attributes. The benefits associated with these objectives include lower-cost distribution systems, reduced recall expenses, and expanded sales of high-value products. The benefits of traceability translate into larger net revenues for all stakeholders. These benefits are driving the widespread development of traceability systems across food supply chain.

Traceability alone cannot accomplish these benefits. Simply knowing where a product is in the supply chain does not improve supply management unless the traceability system is paired with a real-time delivery system or some other inventory-control system. Tracking food by lot in the production process does not improve safety unless the tracking system is linked to an effective safety control system. Firms use traceability systems together with a host of other management, marketing, and safety/quality control tools. The dynamic interplay of the costs and benefits of these tools has spurred different rates of investment in traceability across sectors – and continues to do so.
**VITAL ROLE OF ANIMAL HUSBANDRY, DAIRYING AND FISHERIES**

On August 18, Cadila Pharmaceuticals, IRM Group and The Agriculture Today Group organized a virtual Expert-Talk on Animal Health, Poultry and Livestock. A galaxy of experts from these sectors spoke at the conference. They spoke of the challenges in these sectors, the government initiatives to enable growth and the opportunities for growth.

**Shri Atul Chaturvedi, Secretary, Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, GOI**

Animal husbandry, dairying and fisheries can play a vital role in enabling Atmanirbhar Agriculture, by transforming farmers into entrepreneurs and providing investment opportunities. The government's aim is to market demand in the dairy sector to 290 million tonnes, from 158 million tonnes presently, over the next five years. The share of the organised sector in milk processing is targeted to be raised to 50 per cent from present 30-35 per cent. Some of the vital initiatives of the government in this sector include improving cattle breeds through artificial insemination, IVF and surrogacy; and aiming to unleash rural entrepreneurs by growing better feed and fodder for animals.

Fisheries is a sunrise sector. It is marked by high growth rate, vast and diverse resources, low investment with high returns, low gestation period, strong technical backup, huge consumer base and export opportunities.

In September 2019, our Honourable Prime Minister launched the national animal disease control programme from Mathura. This programme has two major aspects: (i) vaccinating 537 million animals of five species for disease like Foot and Mouth Disease (FMD) twice a year; and (ii) tagging each and every animal with a unique ID number.

The government is giving one billion doses of vaccine in a year for Foot and Mouth Disease (FMD). This is the biggest campaign ever in any nation to ensure that cattle are disease-free. The government has also undertaken animal tagging of five species through Pashu Aadhar. About 57 crore animals will have unique IDs over the next 1.5 years on digital platforms for mapping their parentage, breed and productivity.

All the information regarding the animal such as the name of the species, its productivity, lineage, health condition, symptoms in case of diseases shall be recorded. This can be a game changer in terms of traceability of the animal and animal products like meat, milk or other dairy products.

**Shri Tarun Shridhar, former Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, GOI**

A major learning of Covid has been that human health and animal health are interdependent and bound to the health of the ecosystems in which they exist. This concept is not new. The World Organization of Animal Health, commonly known as OIE (an abbreviation of its French title), had summarised this years ago as the One Health concept.

As human populations expand, it results in greater contact with domestic and wild animals, providing more opportunities for diseases to pass from one to the other. Climate change, deforestation and intensive farming further disrupt environment characteristics, while increased trade and travel result in closer and more frequent interaction, thus increasing the possibility of transmission of diseases. This builds a strong case for strengthening veterinary institutions and services. It calls not only for close collaboration at local, regional and global levels among veterinary, health and environmental governance, but also for greater investment in animal health infrastructure.

The size of India’s human and animal populations is almost the same, but India has only 65,000 veterinary institutions to tend the health needs of 125.5 crore animals. This includes 28,000 mobile dispensaries and first aid centres with bare minimum facilities. There could not be a stronger case for reinventing the entire animal husbandry sector to be able to reach every livestock farmer, not only for disease treatment but for prevention and surveillance to minimise the threat to human health. Early detection at animal source can prevent disease transmission to humans and introduction of pathogens into the food chain. So a robust animal health system is the first and a crucial step in human health.
Livestock and poultry sector play an important role in socio-economic development of rural India. Livestock provide livelihood to 2/3rd of rural community, as 20.5 million people depend on livestock for their livelihood. Livestock sector substantially contribute to India’s GDP 6.11% in country’s GDP and 25.6 % in agriculture GDP. The total output worth is higher than the value of food grains. India’s livestock sector is one the largest in world ($35.78 million); 56.7% of world’s buffalo, 12.5% of cattle, 20.4% small animals, 1.5% of pigs and 3.1% poultry. Hence India has huge potential to enhance productivity.

Livestock is undergoing steady transformation and has become technology driven sector. In spite of Covid, growth in livestock sector has remained unaffected. Improving productivity of non-descript and low producing animals particularly indigenous cattle, availability of affordable quality of feed and fodder, traditional feeding practices, poor animal health care with poor veterinary infrastructure, acute shortage of skilled manpower, low milk price with increased feed cost, insufficient processing and chilling facilities in rural areas and high cost of transport are some of the challenges being faced by this sector. Animal Health Market is also witnessing strong growth with paradigm shift in business approach – evolved therapeutic to preventive to productivity enhancement.

**Dr. Anup Kalra, Director Corporate Affairs, Ayurved**

Animal Health and Nutrition management is the key to reproduction and production. Availability of quality feed and fodder is important for improving breeding efficiency of livestock. Immunity of the animals/poultry has to be optimum to prevent diseases and success of vaccination. Herbs which are validated scientifically and proven clinically (Herbology) have played significant role in improving immunity and health. This can add value to the success of the government’s initiative of FMD vaccination to all the animals, a step towards preventing losses and improving farm profits.

The quality of chicken and its processing will be important to provide value for the farmers and customers, alike. The grading of eggs is equally important for making the right quality available to consumers. This shall improve farm profits. The science of herbalism needs to be promoted amongst farmers to improve animal health and production. Etho-veterinary should be practiced basis the principles of science using modern tools. A special drive towards extension education will be key. The government can partner the projects with the corporate sector.

**Prof. K.M.L Pathak, Former DDG (AS), ICAR and Vice chancellor, DUVASU, Mathura**

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**Prof. P. K. Shukla, Former Joint Commissioner (Poultry), GOI; Registrar, Dean Post Graduate Studies, Professor And Head (Poultry Science) Veterinary University, DUVASU, Mathura**

The new normal initiated by the Covid pandemic will present different new challenges and opportunities in the poultry sector. It is a wake-up call for India to be Atma Nirbhar in all areas including poultry. Global Poultry Meat Production is around 107 MMT. Trade/Exports are around 11 MMT, viz. around 10% of total production. India ranks 5th in chicken meat production, but has only 3.3% share of the production. Exports are negligible at only about 5.5 thousand tones. Global Egg production is around 1387 billion eggs / 74 MMT; Trade around 10% i.e. 7 MMT. India stands at 3rd position in egg production, but has about 6.3% share in the global production. Exports are very negligible with about less than a billion eggs. Major items exported from India are table eggs, egg powder, hatching eggs, SPF eggs, live birds, and poultry meat. The current export value of Poultry Products is to the tune of around Rs. 552 crore in 2017-18. However, India is way behind in exports at 32nd place as per APEDA data from 2013 to 2015. India’s share in World trade is around 0.23 percent.

Poultry sector contributes nearly 0.5 % to the national GDP and 10 % to total livestock GDP. But unfortunately, this promising sector is also facing lots of challenges since 2011 and the major constraints being faced by Poultry sector are feed cost, genetic improvement, bio-security measures, avian influenza and Anti Microbial Residue (AMR).

**Dr (Capt) Tanweer Alam, Director-Marketing, Kemin Industries South Asia Pvt. Ltd.**

Healthy food is the base of the health of country citizens. During Covid, the purchase and consumption pattern of food has largely got disrupted, due to various reasons. Broadly speaking, we Indians are starch eaters. We eat more carb than protein. Not surprisingly, 70-80% Indians are protein deficient. Almost 38% children are stunted. Much needs to be done for increasing the per capita protein consumption in India.

This protein can come from plant and animal source of food. If we take all the produce of wheat, rice and pulses, we get approx. 15 Million MT of protein. The livestock sector contributes almost equal volume of protein ie around 15 MMT per annum. How can we make the availability of protein to each Indian and also influence the eating habit of people from merely starch based food to a decent proportion of protein-based food, is the challenge before us.
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