₹80/-

AUGUST 2022

AGRICULTURE TODAY

The National Agriculture Magazine

VOLUME XXV | ISSUE 8

www.agriculturetoday.in

Policy Landscape For

CROP CARE

SIRAM CHANDRAMOHAN
Managing Director

Best Solutions for Farm Productivity

"Our responsibility is to see Smile on Every Farmers Face"

Sahasra Manufactures & Markets

- Residue Free Organic Certified Plant Nutrients
- Microbial Pesticides & Fungicides
- Organic Manure & Bio-Fertilisers
- Micronutrients & Water-Soluble Fertilizers
- Animal & Poultry Nutraceuticals

Sahasra is having

- DSIR Recognized Sophisticated R&D Center
- Certified Organic Products as per NOP & NPOP Standards
- Collaboration with various National & International Universities
- Patented Technologies

Sahasra Crop Science Pvt. Ltd.

AN ISO 90001 : 2015 & 14001 : 2015 Certified Company

Hyderabad, Telangana- 500 070. | www.sahasracropscience.com

Publisher & Printer – Dr. MJ Khan on behalf of M/s Concept Agrotech Consultants Limited, Published from 306 Rohit house Tolstoy Road New Delhi-110001 and printed by Everest Press E-49/8, Okhla Industrial Area-II New Delhi-110020
Phone No. 011-23731129 Fax No.011- 23731130
E-mail: editor@agriculturetoday.in
info@agriculturetoday.in

www.agriculturetoday.in
Page in the magazine: 68

CROP CARE – For Food Safety

Promoting the judicious use of pesticides and integrating cultural, agronomical, mechanical and biological methods to manage pests, rather than trying to control them – these are some pre-requisites for quality food production. The government has been promoting this, and the efforts need to be strengthened with active support of the crop protection industry.

Large scale awareness campaigns with demonstrations for practical exposure to farmers on various methods of identifying and managing pests are required. The industry can pitch in and boost the awareness campaigns with use of CSR funds. Localized pest surveillance and early warning systems should be set up across the country to alert farmers so that remedial measures are initiated on time.

Input retailers are more easily accessible and are regarded as more reliable information sources than the extension system. The government can maximise their contribution by arranging for their training in affiliation with state institutions and the industry. In this way, dealers can provide appropriate and judicious information to farmers. The states can make funding provisions towards this initiative.

As we are aware, there is dearth of qualified functionaries like regulatory toxicologists, chemical specialists, radiologists and experts to improve the pace of quality enforcement and control. The government needs to address this gap by having specialised courses in select universities and institutions along with setting up systematic training facilities for the regulatory regime.

Quality enforcement of agrochemical products is a major issue facing the industry for long. It is observed that in many states, there is nexus among sampling inspectors, laboratories and spurious companies. There is need to make the functioning of the system more effective, transparent and accountable, wherein quality manufacturers are encouraged and fly-by-night players are punished as per law.

This can be done by introducing the system of joint testing of the third sample with the disputing party and by making laboratories accountable, if difference of results is found repeatedly. The Centre has around 150 notified inspectors. If these inspectors are equipped with the right training, they can draw the samples of spurious pesticides and bio products laced with chemical pesticides. The monitoring and punitive regime under the relevant Act and regulations also needs to be effectively implemented to act as a deterrent against illegal and unregulated operations.

We feel pleased in sharing recommendations from some of the stalwarts of the sector.

Happy Reading

Mamta

CONTENT

VOLUME XXV | ISSUE 8 | AUGUST 2022

WILLOWOOD®
Harvesting Dreams

Committed to Innovate

>20 States

>9,500 Channel Partners

>1,00,000 Retailers

>50,00,000 Farmers

29 Granted Patents

>40 Patents in Pipeline

Upcoming State of the art technical manufacturing plant

Status of "Two Star Export House" accorded by Govt. of India

India ▪ HongKong ▪ China ▪ USA ▪ Africa ▪ Brazil ▪ Middle East

- Willowood Group, a global crop protection company with business footprints in >50 countries.
- Being a research driven entity, we are committed to innovate.
- 29 Granted Patents with >40 Patents in pipeline is a testament to our endeavours in R&D.
- Upcoming state of the art facility for manufacturing of novel technical grade active ingredients.

DR. M.J. KHAN

CROP PROTECTED IS CROP PRODUCED

A large proportion of what we produce is lost to the elements of pests and diseases. As much as 40 per cent of the world's agricultural crops are lost to pests each year. Notwithstanding the effect these have on the financial prospects of the farmers, their implications on biodiversity are huge. Invasive pests and diseases have in the recent past wreaked havoc in Indian fields.

Pest and disease dynamics are constantly changing, and it becomes incumbent upon the industry to cater to the differing demands. The sector therefore is on the cusp of constantly changing technologies to suit the varied demands. R&D becomes a priority, but the high cost of R&D deters many manufacturers from investing in new solutions.

Farmers at large remain unaware of the new products or they lack the 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 the crop protection product or their misuse. The threat of spurious products is real and their use by the gullible farmers has questioned many times the efficacy of plant protection products.

Crop protection chemicals are still the most extensively adopted management measure once the pest problem is reported. The new molecules that are being developed negates may of the purported ill effects of the conventional molecules. It is indeed a ray of hope. Greener and safer chemicals can play a significant role in crop protection.

Plant disease forecasting is an underexploited area in India. Pest and diseases are dependent on weather variables to a great extent and many models have been developed to predict the onset of diseases and pests. However, those models are seldom used in conventional agriculture. But in years to come, model based predictions would find favour in agriculture. Biopesticides and biocontrol agents present another dimension of crop protection. This assumes significance considering the resolve of many states in India to go completely organic. Nanotechnology is a fascinating and rapidly advancing science and has the potential to revolutionize many disciplines of science, technology, medicine and agriculture.

The threats of the future are immense and unknown. The crop protection industry must be dynamic enough to combat these threats in the most effective and productive way. The key to India's food security lies with crop protection.

KUWAIT ORDERS COW DUNG FROM INDIA FOR HIGHER YIELD OF DATE PALM

RAJNI SHALEEN CHOPRA

The purpose of education is to open up our mind to the amazing possibilities of life. The purpose of education is also to evaluate traditional knowledge systems critically and retain all that serves humankind best. Sadly, India's indigenous systems of knowledge were systematically destroyed by the British. Across the globe, colonizers demolished the local knowledge systems and shamed the indigenous population for following ancient systems of thought.

All systems of thought need review from time to time to examine what suits current needs and what does not. The British squeezed the space for Indian systems of thought and shamed us for everything that we were. The Gora Sahib won. Science came to be defined the way the Gora Sahib dictated. We, the natives, started believing that whatever the Gora Sahib said was the final word on all that is right.

One of the harshest consequences of colonization was that India was left reeling under endemic poverty. Green Revolution saved us from disaster. But over decades, indiscriminate use of chemical fertilizers became the norm among farmers. More and more agricultural scientists are now saying that there is urgent need to mix bio-fertilizers with chemical fertilizers to save the soil and the environment.

In the last decade or so, there is higher awareness of the astonishing benefits of cow dung application to fields. A recent video that was widely shared in agricultural circles was that India is going to export 192 metric tonnes of cow dung to Kuwait. Agricultural scientists of Kuwait have found cow dung to be highly beneficial in date palm cultivation.

Scientists in Kuwait used cow dung in date palm cultivation and found that this increased the yield. This is the largest order for cow dung ever received by India. The news video said that enthused by this development, the government is working on a strategy to promote the export of cow dung.

It is the cow dung of the Indian breeds that has been found suitable for agricultural purposes. The cow dung is being exported from gau shalas in Uttar Pradesh and Rajasthan. Fortunately, this healthy stream of revenue shall ensure good management of the cows at the gau shalas.

AGROCHEMICALS INDUSTRY

STRENGTHS AND CHALLENGES

The agrochemical sector has played a vital role in increasing agricultural productivity and production. Let's take a look at the challenges the agrochemical industry faces and how they can be overcome for a brighter future.

Heavy dependence on Monsoon: The agricultural sector's heavy dependence on monsoon rains brings a lot of unpredictability to the sector. Every year, as farmers pin their hopes on meteorological predictions, so does the agrochemical industry. Normal monsoons imply a healthy season and a healthy demand.

Lack of Awareness: Despite agrochemicals being used in India for many years now, we are yet to achieve 50 per cent penetration. It is imperative to educate farmers about the importance of using agrochemicals and using them judiciously.

Greater emphasis on the need for Local R&D: India's agrochemical industry has thrived on making generic agrochemicals rather than investing in R&D to produce new molecules that can be patented. Time is ripe for the Indian industry to take a new plunge and graduate to the next level.

Dealing with Misinformation: Even as the unit per hectare use of agrochemicals remains much less in India as compared to the developed countries, there is an increasing misinformation campaign against agrochemicals. The truth is, we need the use of agrochemicals to increase our yields and to be able to continue to feed out population.

Plant location and transportation: This is a micro-level concern which needs to be taken care of when companies are expanding their reach throughout the country. Location of the manufacturing plant is very important to save on the transportation cost from the plants to the depots and clearing and forwarding agents (C&Fs). If the plants are not strategically located, then supplying the products to designated places gets delayed. By way of having plants at strategic locations, not only the supply hiccups can be avoided but also the transportation costs related to raw materials can be brought down relatively.

On The Bright Side

Increase in irrigated area: Thanks to the government's continued efforts to make water available for irrigation, each year around 0.5m hectares of irrigated land are added. This is likely to continue as the government pursues an integrated policy for water management and efficient use of water resources through 'more crop per drop' policies. Such policies will lead to an increase in cropping intensity and hence in gross cropped area,

fun FACT

Mr Sarkar is a gifted painter. The accompanying image is a photograph of a painting made by him.

which will enhance production and raise farmers' income. As a result, agrochemical consumption is likely to increase.

Changing food and consumption trends: The changing consumption trends and demand for a wide variety of fruits and vegetables will encourage farmers to adopt more advanced cultivation practices to command a premium for such produce. This segment is expected to lead to an increase in agrochemical consumption of about 2% to 3%.

Increasing preference for organic foods and shift from toxic chemicals: Concerns about the ill-effects of pesticides are causing a shift toward organic food. This has triggered the usage of biological. It is impractical to fully replace chemical pesticides, but technological development is expected to be able to meet future challenges. Biological pesticides will be the largest growth segment within agrochemicals, with growth of about 15% to 20% per year.

Global warming and climate change: The use of pesticides to prevent crop infestation is likely to intensify. The consumption of pesticides, especially insecticides, is likely to rise.

Pesticide resistance and the emergence of new pest segments: New invasive pests, such as fall army worms, locust attacks, etc., often require the application of new pesticides to control them. This will lead to a shift toward high-value chemicals and more intensive agriculture. These developments justify an increase of about 15% in the agrochemical market.

New technologies and services: There has been a lot of focus on integrated pest management, using methods other than agrochemicals such as AI-based applications, drone applications, etc. Various research-based biological companies are working on innovative technologies in plant growth and protection segment. Algaenergy is working towards a paradigm shift in the entire approach towards the agriculture sector. Algaenergy is a Bio-Tech company founded in 2007 with nearly 5 decades of intensive research and studies on microalgae. The knowledge and expertise gained by some of the best scientific minds with the aid of cutting edge technologies at world class institutions have made Algaenergy a global pioneer in the field.

Advancement in science led technology, enhanced role of private sector in both pre and post harvest phases, liberalized output market, active land lease market, and emphasis on efficiency will equip agriculture to address new challenges. A well co-ordinated action and strategy between the Centre and the states is needed to ensure that agriculture marches to next stage of development along with other sectors, and agriculture is not left behind as it happened in the 1991 reforms agenda.

Major issues directly related to the agrochemicals industry need to be addressed, especially in the areas of simplifying registration, improving production and encouraging exports. Improvement in indirect areas such as farming extension services, technology and mechanisation in agriculture, and agricultural marketing ecosystem will lead to the rapid growth of farmer income and agricultural output, both of which will indirectly complement the growth of the agrochemicals industry. There is need to promote Biologicals and the companies like Alga energy which are pioneers in this segment. GOI should ensure ease of registration process of these kind of genuine biological products. With the required prioritisation, policy and investment support, we can pave the way towards developing a flourishing agrochemicals and biological industry in India.

About the **AUTHOR**

Mr Debabrata Sarkar is Vice President Asia Pacific, AlgaEnergy. He has successfully worked in leadership positions in Monsanto, Chemtura, Syngenta and a US-based biological company

NOBOL

Nationwide One Branch One Loan Special campaign for banks on Agri Infra Fund for a Noble Cause

Agriculture Infrastructure Fund (AIF) under the Ministry of Agriculture & Farmers' Welfare has launched a one month-long NOBOL special campaign for banks from 15th July to 14th August 2022. While launching this special Campaign, Mr Samuel Praveen Kumar, Joint Secretary, MoA&FW informed that all Bank Branches are being encouraged to actively participate in this special campaign by sanctioning at least one Loan per branch during the campaign period since this is meant for a noble cause of Nation Building.

The scheme aims to provide finance of Rs 1 lakh crore for creation of farm-gate infrastructure and affordable credit for viable post harvest management infrastructure and community farming assets through incentives and financial support

He further informed that through workshops /seminars with Banks' Head Offices, Regional Offices and Branches and directly with the customers, awareness on the objectives and benefits under the AIF scheme is being created. Mr Samuel Praveen Kumar expressed hope that the target amount for sanction of 4000 crores would be achieved during the campaign period.

This scheme, launched by the

Hon'ble Prime Minister on 9th of August 2020, is with an objective to provide finance of 1 lakh crore for creation of farm-gate infrastructure and affordable credit for viable Post Harvest Management infrastructure and community farming assets through incentives and financial support. This scheme encourages organic inputs and Bio stimulant production Units and also smart and precision agriculture projects, Farm/Harvest Automation, Purchase of drones, sensors on field, Blockchain and AI in agriculture, Remote sensing and Internet of Things (IOT) etc. Under post-harvest management, it encourages construction of Warehouses, Cold chains, Silos, packaging units, assaying units, Sorting & Grading units, Primary processing centres, Ripening Chambers and Supply chain services including e-marketing platforms etc.

Beneficiaries

Beneficiaries of the AIF Scheme include Farmers, Entrepreneurs, Primary Agricultural Cooperative Societies, Farmers Producer Organizations, Start-ups, APMCs etc. Lending Institutions include

all Banks in Public and Private Sector and Cooperative sector, Small Finance Banks and NBFCs.

Three per cent Interest subvention and credit guarantee coverage is available for eligible borrowers from this financing facility under Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) scheme for loans up to Rs 2 crore. This subvention will be available for a maximum period of 7 years. In case of loans beyond Rs 2 crore, interest subvention will be limited up to RS 2 crore. Interest rate for the loan should not exceed the cap fixed at 9 per cent. The fee for credit guarantee coverage is being reimbursed by the Government.

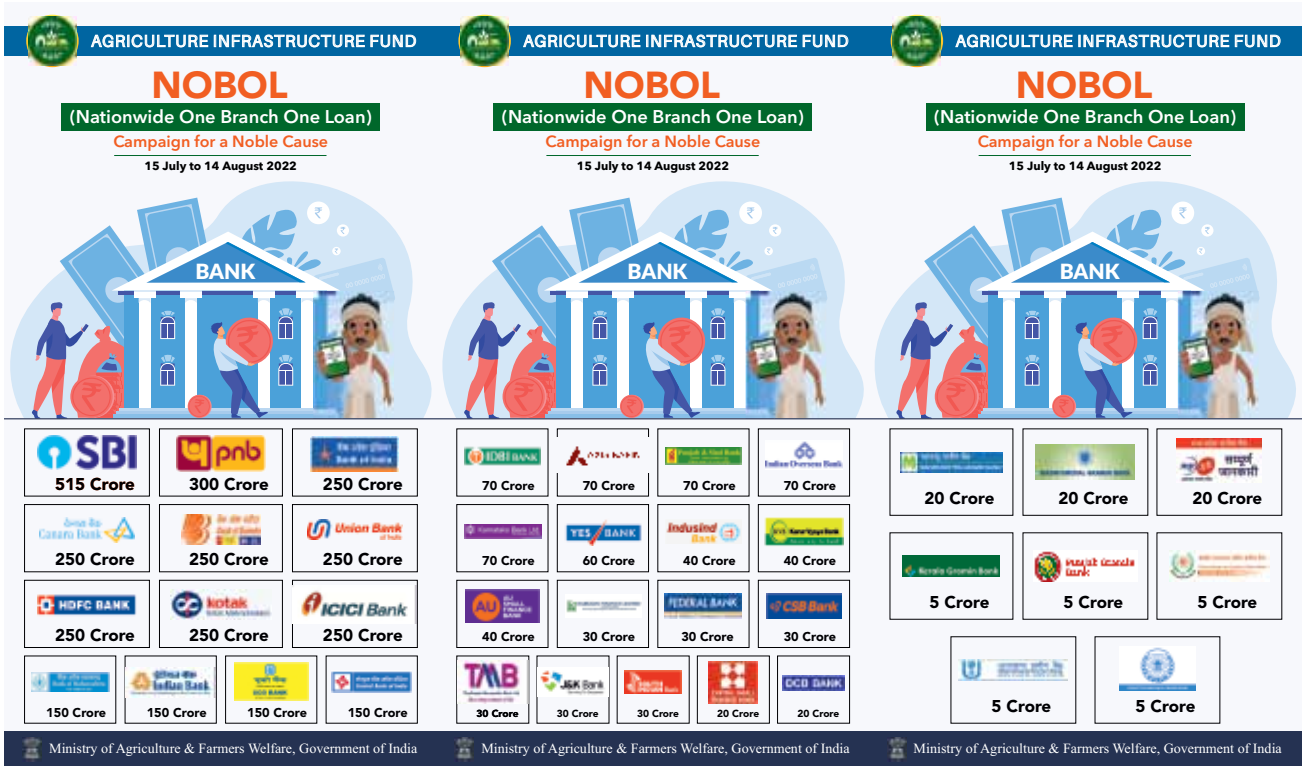
Benefits of AIF can be converged with the benefits available under other schemes of Central or State government.

State Conclaves

In order to popularise the AIF Scheme and mobilise new projects, state conclaves are being organised in coordination with state governments, Banks and other stakeholders. Such conclaves were conducted recently in Kerala, Telangana and Punjab and plans are afoot to cover other states also in near future.

As of now 24000 applications received on the AIF portal. Out of this, 13400 projects worth Rs.16,000 crores were sanctioned by various lending institutions.

The whole flow of process from application to sanction to transfer of benefits is being done online in the integrated Portal of the Scheme, www.agriinfra.dac.gov.in.



कृषि एवं किसान
कल्याण मंत्रालय
MINISTRY OF
AGRICULTURE AND
FARMERS WELFARE

सत्यमेव जयते

Azadi Ka
Amrit Mahotsav

Bridging the Agri infra gap

IMPACT OFFICER JOB DESCRIPTION

About MoneyBoxx:

MoneyBoxx Finance Limited is a BSE-listed which is engaged in providing small-ticket business loans to micro-enterprises. With 36 branches in Tier-3 and below towns spread across five states (Rajasthan, Madhya Pradesh, Haryana, Punjab, and Uttar Pradesh), it caters to credit needs of micro entrepreneurs in important and essential segments (livestock, kirana, retail traders, micro-manufacturers) by extending business loans ranging from INR 70,000 to 7,00,000 with tenure ranging from 24-60 months.

Role Background:

As majority of our customer is a farmer engaged in dairy business, your role is to take care of the issues faced by our customers/borrowers.

Responsibilities and duties: -

- To understand our customers and issues faced by them by visiting them on regular intervals (110-120 customers visits every month)
- Educate customers on the importance of vaccinations, cattle health, breeding through AI, increasing milk productivity through better feedstock and providing awareness & enrolment in various government schemes such as livestock Insurance, AI, and other aspects of preventive care
- Organising camps at local village level for creating above mentioned awareness
- Lead and drive the various impact initiatives of the company to help our dairy customers (who are also small farmers) increase their income such as free plantation of fruit bearing trees dung and various other impact initiatives
- Provide loan leads if any, found during customer visits and assist credit team to assess the quality of animal
- Visit to Veterinary district hospital to understand current govt. schemes running in the state

Skills and Qualifications:

- Expert knowledge of Animal husbandry
- Strong documentation and communication skills
- Inclination towards serving farmers

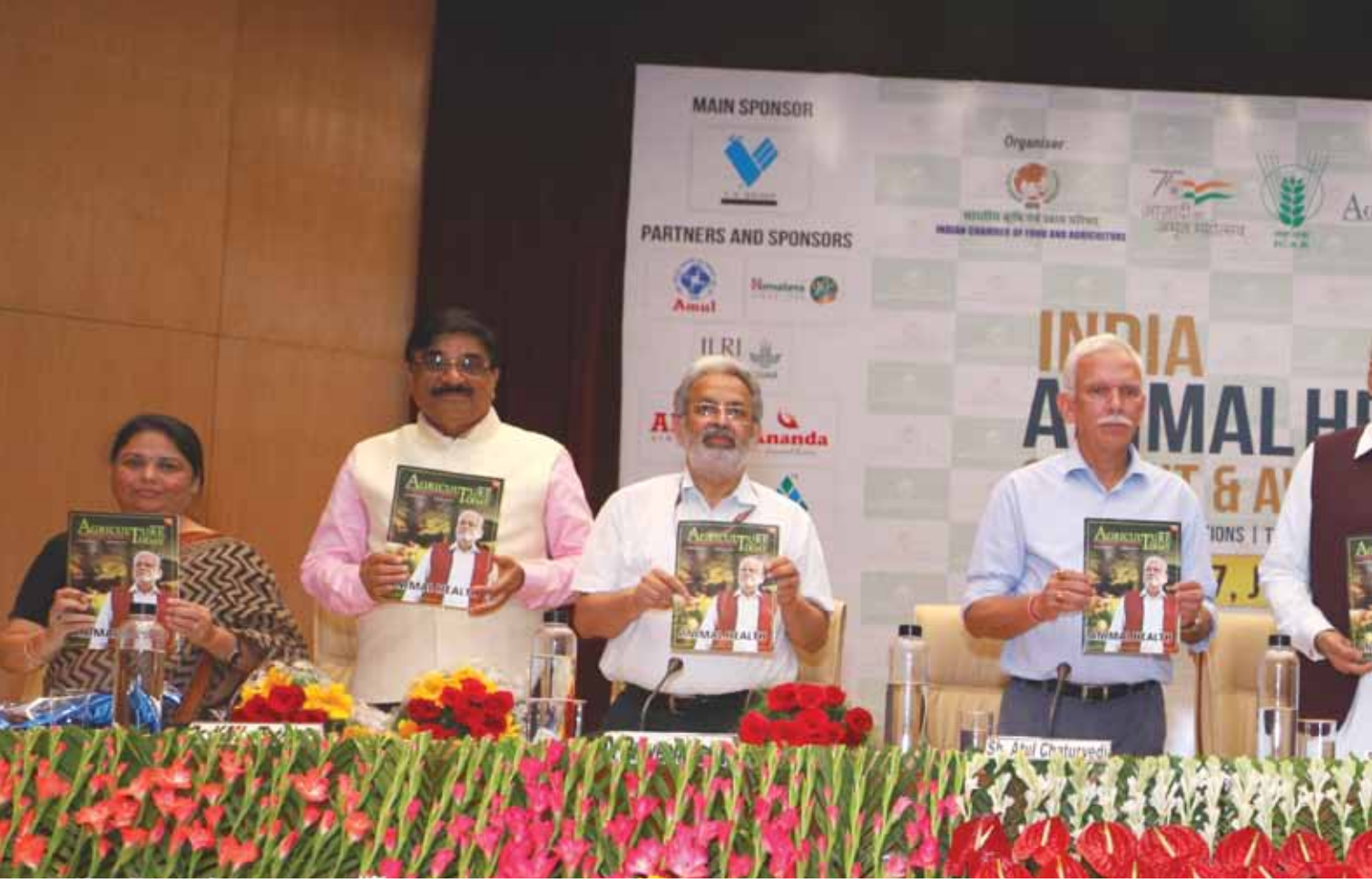
Education and Experience:

- Undergraduate degree/Completion of Doctor of Veterinary Medicine (DVM)
- Practical experience in Animal husbandry

There is a well-defined career path for candidates & we see impact officers as important part of our services

---

Mr Deepanshu Gupta : deepanshugupta@moneyboxxfinance.com



NEED TO STRENGTHEN COOPERATIVE MOVEMENT IN LIVESTOCK SECTOR: SHRI PARSHOTTAM RUPALA

The First India Animal Health Summit 2022

Organized By Indian Chamber Of Food And Agriculture (ICFA) And Agriculture Today Group (ATG), July 6-7, New Delhi

Shri Parshottam Rupala, Honorable Minister of Fisheries, Animal Husbandry and Dairying

- Veterinary doctors should be on par with the human doctors
- Indigenous cows have become central to our food security and to save soils
- Non bovine milk has such as camel milk, donkey milk and goat milk have high nutritional value and production should be promoted
- A large number of animals are with nomads who do not have a fixed address. The department should take measures to address the health and nutrition of the animals reared by them. Masures should be taken to ensure that policy incentives reach them
- Efforts should be taken to popularise ayurvedic medicines and treatment in the animal health segment
- Cooperatives should enter the animal health sector, in addition to private and government institutions

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

- One health is not about zoonotic diseases but also about animal diseases
- FMD free zones can be created and exports from such zones will become easier
- Quality veterinary services at the farmer's doorstep
- What we need is respect for veterinary doctors. Need to upgrade the status and level of veterinary doctors
- Good infrastructure at veterinary hospitals for basic needs
- Using social capitals for R&D extension activities

Shri Tarun Shridhar, former Secretary, Department of Animal Husbandry & Dairying, Ministry of Fisheries Animal Husbandry & Dairy, GOI

- We have to work on productivity and quality of milk
- All stakeholders will gain from value addition of milk
- Reliable data is very important. Digitalization of data is significant.

Shri Praveen Malik, Secretary, Animal Husbandry, GOI

- Segregation of poultry industry from animal husbandry is a biggest problem
- Industry and academia should come forward with their suggestions and recommendations so that policy level interventions can address their concerns
- Feedbacks on policies and schemes from the stakeholders holds immense value

Gujarat Governor Acharya Devvrat honours Shri Tarun Shridhar with the Policy Leadership Award

A REFORMIST AND INSTITUTION BUILDER PAR EXCELLENCE

A visionary leader, agricultural scientist, architect of modern ICAR, policy advisor, educator, and excellent networker are some of the many epithets that truly describe Dr RS Paroda. A true son of India and an excellent human being to the core, he has made extra-ordinary contributions to strengthen and modernise the National Agricultural Research System (NARS), recognised today globally for its outstanding performance for rapid growth of Indian agriculture. His contributions in the field of genetic resource management at the national, regional and global level are so well recognised that fondly he is called 'Gene Guru'.

Early Years

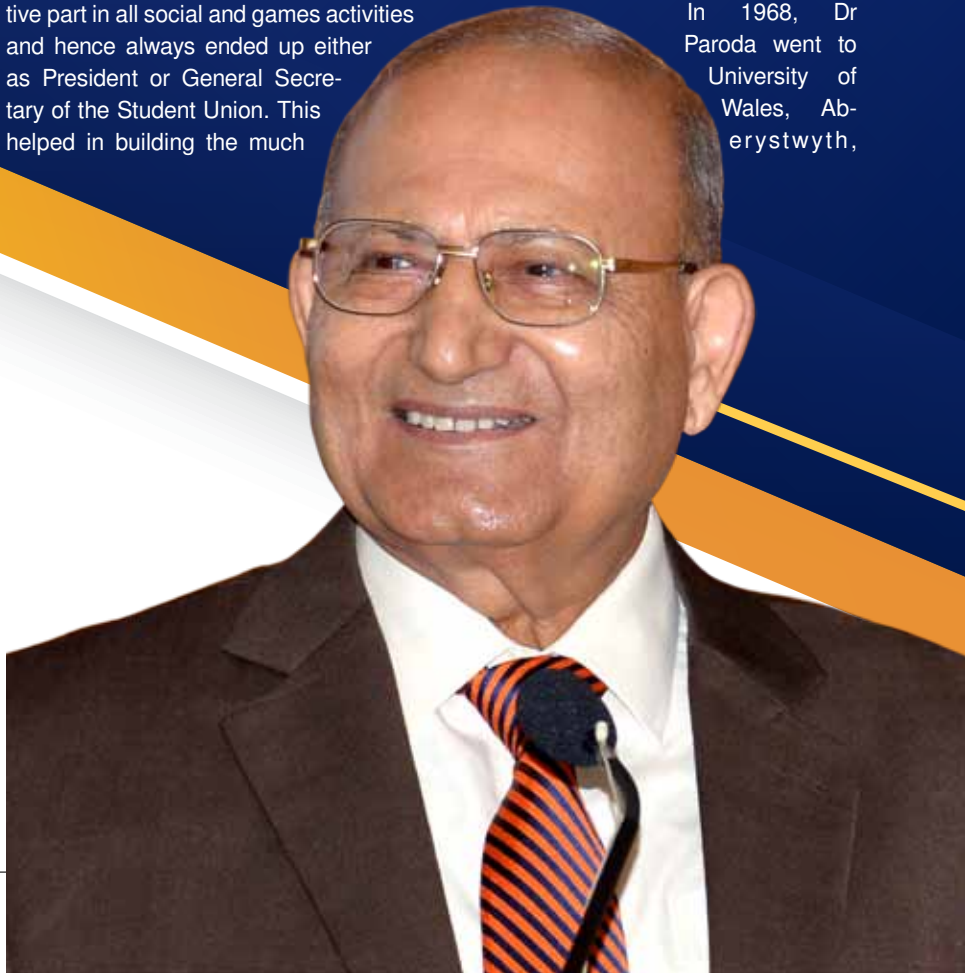
Dr Paroda was born on August 28, 1942 at Ajmer, Rajasthan, to late Shri Ram Karan Singh and late Smt Indira Devi, and was the eldest of five siblings. Rajendra Singh Paroda obtained his early school education in village Saradhna and then in Government High School, Ajmer. Belonging to an agricultural family, and being only son, Rajendra Singh's thoughts and interest steered him towards agriculture. Having graduated from Dayanand College, Ajmer, in agriculture, he moved to Udaipur to pursue post graduation from Rajasthan College of Agriculture in Plant Breeding and Genetics.

"My college life was most rewarding. Despite being good at studies, I took active part in all social and games activities and hence always ended up either as President or General Secretary of the Student Union. This helped in building the much needed confidence to perform better and excel," he says.

His academic merits secured him his doctoral degree from the prestigious Indian Agricultural Research Institute (IARI), New Delhi. Dr Paroda worked under the able guidance of late Dr AB Joshi on genetic architecture of wheat. He was also fortunate to have received patronage of Dr MS Swaminathan.

Reminisces Dr MS Swaminathan, "I had the privilege of knowing Raj Paroda from his student days at IARI. Even at that time, it was clear that Raj was a scholar of unusual ability, creativity and great promise. His Ph.D. thesis in the broad area of plant breeding and genetics was one of the best submitted to IARI P G School."

In 1968, Dr Paroda went to University of Wales, Aberystwyth,



Dr RS Paroda, Founder Chairman,TAAS and Former Secretary, DARE & DG, ICAR

UK, on a Commonwealth Post-doctoral Fellowship. One day, while working in the glass house, a gardener commented, "Raj, if persons of your calibre will move out of India, how will your country make progress in agriculture?" This made Dr Paroda pledge to himself that he would return home despite tempting job offers abroad.

Stellar Career

Dr Paroda started his service career as Forage Breeder at Haryana Agricultural University, Hisar, now named after Chaudhary Charan Singh. Dr Paroda worked at Hisar as Professor and Head, Department of Plant Breeding and later as Additional Director of Research. Then he joined ICAR first as Director, National Bureau of Plant Genetic Resources (NBPGR), New Delhi, and then Deputy Director General (Crop Science).

Dr Paroda later spearheaded the NARs in the country as Director General, ICAR and Secretary, Department of Agricultural Research and Education (DARE) for seven years (1994-2001). During his leadership of ICAR, more than 30 new institutions, beside four Bureaux on Genetic Resources of Animals, Fish, Microorganisms and Insects were created.

For the modernisation of the entire research system, including state agricultural universities, he conceived and negotiated the prestigious National Agriculture Technology Project (NATP) from World Bank for US S 240 million in 1998. This helped in reorienting agricultural research, education and extension system to meet new challenges.

Dr Paroda is well known for initiating and strengthening many visionary programs. He has the unique distinction of being the main architect of one of the world's largest and most modern National Gene Bank, second in the world today, in terms of germplasm, which houses invaluable germplasm of different crop plants numbering more than 420,000 accessions. The most impressive state-of-the-art National Agricultural Science Centre (NASC) Complex, located at Pusa Campus, was also built due to his vision, initiative and dedication.

He has made significant research contributions in the field of plant breeding and genetic resource management. He was also able to get gene banks established in all eight countries in Central Asia and Caucuses (CAC) during 2001-2007. International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad and an Agriculture Research Institute of Kazakhstan have named their Gene Bank after Dr Paroda in recognition of his notable contributions.

Dr Paroda has been conferred Fellowship of several National Science Academies like, Indian National Science Academy (INSA), National Academy of Agricultural Sciences (NAAS), National Academy of Sciences, India (NASI) and

tête-à-tête with Anjana

Recognitions

- PADMA BHUSHAN in 1998
- Rafi Ahmed Kidwai Memorial Prize (1982-83)
- ICAR Team Research Award (1983-84)
- FICCI Award (1988)
- Om Prakash Bhasin Award (1992)
- Asia-Pacific Seed Association Special Award (1995)
- CGIAR Award for Outstanding Partnership (2000)
- Life Time Award by Association of Agricultural Scientists in America (2001)
  Dr Harbhajan Singh Memorial Award (2001)
- Dr BP Pal Memorial Award (2003)
- Borlaug Award (2006)
- ISCA Gold Medal for Excellence in Science (2006)
- Gold Medals from Ministry of Agriculture of Armenia (2006) and Vietnam (2012), Life Time Achievement Award of 'Agriculture Today' (2008)
- Dr A.B. Joshi Memorial Award (2012)
- Prof. Kanniyan Memorial Award (2012)
- Krishi Shiromani Samman by Mahindra and Mahindra Ltd. (2013)
- US Awasthi-IFFCO Award (2017)
- MS Swaminathan Award (2020)

Young and dashing with dream in his eyes

was elected as General President of the prestigious Indian Science Congress Association in 2000-2001.

Among international recognitions, he was elected as Fellow of Agricultural Academies of Russia, Georgia, Armenia, Tajikistan and the Third World Academy of Sciences (TWAS). He had also been the President of more than a dozen Agricultural Scientific Societies in India. Both American Society of Agronomy and the Crop Science Society of America had conferred their prestigious 'Honorary Membership' on Dr Paroda in 2001. Honorary D.Sc. presented to him by 19 academic institutions, including Ohio State University, Columbus describes volumes about his outstanding achievements.

A Global Leader

An internationally acknowledged agricultural scientist, Dr Paroda has donned several important positions abroad. He had served as founder President of Global Forum on Agricultural Research (GFAR), FAO, Rome from 1988-2001. He also served for more than two decades as Executive Secretary of Asia-Pacific Association of Agricultural Research Institutions (APAARI), FAO, Bangkok - a vibrat regional forum, fostered by him from the beginning to strengthen regional agricultural research collaboration among NARS of more than 20 countries.

"My motto in life has been to serve the society with a human face and create required infrastructure for colleagues to perform to their best ability."

He was the only Indian to have served as the Chairman as well as Vice-Chairman of ICRISAT Governing Board. He was the member of Board of Trustees of IRRI, member of WMO High Level Task Force on Climate Services, member of Advisory Council of Australian Center for International Agricultural Research (ACIAR), member of Finance Committee of CGIAR, member of the Governing Board of the Commonwealth Agriculture Bureau International (CABI) and the member of Strategic Impact, Monitoring and Evaluation Committee (SIMEC), an Apex body of CGIAR System Council.

Till recently, Dr Paroda worked for an overall benefit of farmers as Chairman, Farmers Commission of Haryana,

Happy Birthday Sir!

On his 80th birthday, we at **Agriculture Today** wish him the very best and thank him profusely for his enormous contributions to Indian and global agriculture.

Happy Birthday Sir! Keep going great!

Chairman of Working Group on Agriculture and Member of Rajasthan Planning Board. He ensured drafting and release of State Agriculture Policies both for Haryana and Rajasthan.

Efficient Organiser

Dr Paroda's foresight in bringing together diverse range of leaders, thinkers and scientists to promote dialogue and strengthen partnership amongst stakeholders in agricultural research is phenomenal. He has organized in the capacity of either Chairman of Organizing Committee or Organizing Secretary of a number of national, regional and international symposia, conferences and seminars, to promote the cause of agricultural science.

Dr Paroda successfully organized the 2nd International Crop Science Congress in New Delhi in November, 1996. He presided the 88th Session of the Indian Science Congress (2001) as its President, wherein the then Hon'ble Prime Minister, Shri Atal Bihari Vajpayee, released a Vision Statement on Food, Nutrition and Environmental Security.

This resulted in the establishment of Trust for Advancement of Agricultural Science (TAAS), of which Dr Paroda is the Founder Chairman for last more than two decades. He has been championing the cause of women in agriculture, as evident from the First Global Conference on Women in Agriculture (GCWA), organized by him in 2012 in New Delhi. GCWA was graced by then Hon'ble President of India Mrs Pratibha Patil.

In November 2016, Dr Paroda had organised very successfully the '1st International Agrobiodiversity Congress' (IAC 2016) in New Delhi, which was inaugurated by PM Shri Narendra Modi.

"My message to the youth is to embrace agriculture as their profession to serve the society and also empower farmers for better livelihood"

The 'Delhi Declaration on Agrobiodiversity Management', an outcome of IAC 2016, is being used for defining a roadmap for future management of agrobiodiversity globally. At global level, under his chairmanship of the Program Organizing Committee, the two Global Conferences on Agricultural Research for Development (GCARD) were held in Montpellier, France in 2010 and at Punta del Este in Uruguay in 2012 leading to the endorsement of popular 'GCARD Road Map'.

Never allowing setbacks to interfere, Dr Raj Paroda has endlessly and fearlessly cruised ahead fulfilling his objectives with a singular focus on development of agriculture. Indian agriculture is fortunate to have a visionary in him to lead the sector. He headed a committee constituted by the Principal Scientific Advisor, GoI and submitted its report in 2018 on 'Secure and Sustainable Agriculture', suggesting several policy reforms in agriculture sector for both faster growth and the welfare of Indian farmers.

AG-CHEM INDUSTRY

THE FUTURE LANDSCAPE

It is gratifying to note that GOI has included Agrochemicals Industry in the current list of 12 *Champion Industries* in view of substantial manufacturing for domestic and export markets. Some areas need urgent attention for further growth.

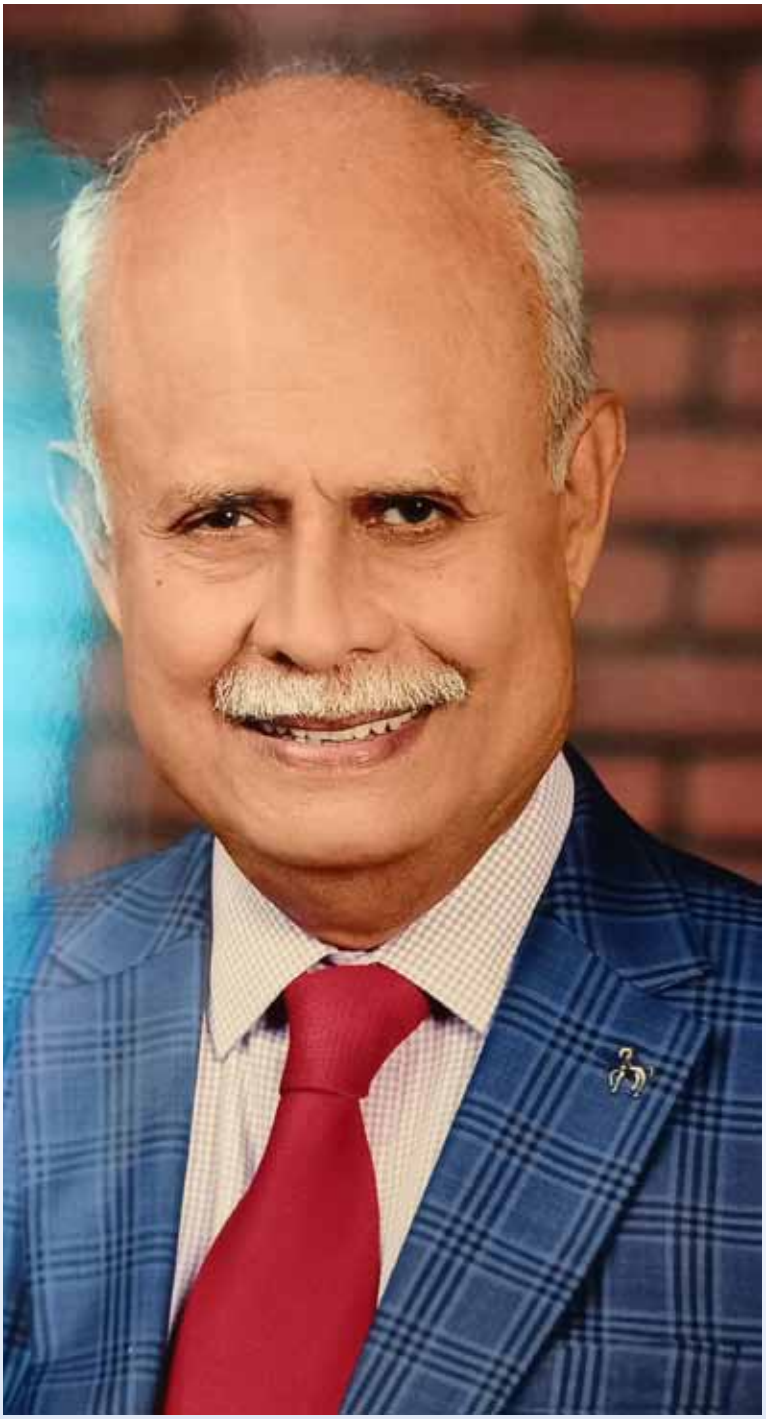
Being Independent Of China

The *Make in India* program should be forcefully implemented for many important agrochem intermediates, thus becoming China independent. There should be significant efforts seen in making this happen. A well-planned focused strategy will have to be evolved between the private sector and GOI. Success should be seen in the next two to three years.

It is pertinent to note that we can export locally made agro chemical intermediates, replacing the dependence of some countries on China. The agro chemical industry should get a big boost by getting a level playing field devoid of cumbersome rules and regulations, as most of them seem unjustifiable. Preachings should be practised so that goals are scored instead of making weak attempts!

Rural Indebtedness

Historically, Indian farmers are at the mercy of money lenders. In spite of several GOI initiatives, the role played by money lenders has not diminished. Here again, we need some revolutionary thoughts on how to minimise rural indebtedness, which will release the farmer from the clutches of



About the **AUTHOR**

Dr KK Unni is a well-known leader of the agro-chemical industry, having put in over 50 years of work in reputed companies. Dr Unni was the Chairman of the Agrochem Industry Association for several years, and is now Chairman Emeritus of CropLife India

money lenders. Practical innovative programmes should be organised as pilot projects so that farmers in the entire village/taluka are debt free, like many debt free companies today. Let there be lot of discussion on the subject and the roadmap drawn in a practical implementable style.

Agrochemical Industry's Expanded Role

Marketing efforts via field extension should be more intensified by deploying people qualified in agricultural science. This vast number of field promotors (earlier called Field Assistants) should get background knowledge of agriculture/ crops – not merely act as salesmen.

At the territory managers' level, only Agri graduated should be recruited. They should have basic knowledge of all Agri inputs such as fertilizers, seed, farm machinery and irrigation systems. This group of field staff should take the role of an Agronomist for the farmer. The industry should make this farmer-friendly change happen soon.

It is well known that when a major pest is effectively controlled a minor pest assumes the role of a major. When caterpillars are controlled, sucking pests take over. Major cotton bollworms were controlled but a minor one like the Pink Bollworms took their place! Take the recent case of Fall Army Worm in creating havoc on maize. It is to the credit of the industry that effective molecules/ practices have been discovered. But this phenomenon of changing pest complex will continue. New problems will need new solutions. Agrochem Industry will definitely take this task.

The New Normal

Digitalisation in Agriculture is taking place at a faster pace. Farmer Connect with companies is now fast and effective. New technologies such as Precision Farming, AI, Digital Mapping etc are indeed gaining ground.

Drones have come to stay. GOI has assigned top priority to drone application of agrochemicals, mapping pest infestations nutrient deficiencies etc. The industry can invest in buying drones and renting it out with suitable approved formulations for aerial spraying. Start Up companies in drone manufacture/ lease will get full GOI support. Driverless tractors controlled by farmers from home will be a reality shortly. All these innovations can increase agrochemical usage and result in treated area increase.

Organic farming is an excellent concept, provided it is integrated scientifically into modern agronomic practices. India should not take chances with unproven technology on a wide scale, though it sounds okay in theory

In India, state government extension workers are in big numbers. Aligning with them, the industry can spread scientific knowledge at a fast pace by complimenting and supplementing each other's activities. The industry should liaise a lot more with agriculture universities and research stations to understand research innovations and help in transferring this knowledge from lab to land.

I foresee a three-way combination: Company Field Staff/Government Extension Workers and Agri University

Skits writing. One example: I wrote and acted in Unni the Murderer and got prosecuted in Leela in the presence of 175 industry people under IPC (Indian Pesicides Code) for killing insect, pests and fungi and got the rope treatment award by the Jury. Got acquitted by Timbactoo Fistricy Court for my plea that I increased food crops and cotton production by killing AK 47 type pesticides with weapons. Thus gave Roti and Kapada to Indians. Highly applauded skit. Plus many more....

personnel – all working in a collaborative manner throughout India. This dream hopefully could come true one day.

The industry is aware of declining soil Health. They must increase the efforts for soil testing, nutrient deficiency rectifications, increase organic matter content of soil by incorporating in their general recommendation to farmers bio fertilisers as well as bio stimulants and biocides. Many companies are doing this but there is an urgent need to accelerate these activities. For these initiatives, it is possible for agchem companies to use part of their CSR funds on a priority basis.

IPR and Data protection: The country should accept much needed IPR and Data Protection especially when there are hardly any research programs running in India to find new pesticide molecules. A lot of new pesticides which are safer and more efficacious are available even to neighbouring countries where data protection and IPR are granted. This issue should be seriously looked into and the barrier should be removed for increased inflow of safer and efficacious products in India.

Regulatory issues: All AgChems come under the Insecticide Act or the PMB which is likely to replace it. Rules should be more congenial for the industry to function and not get bogged down by the need to knock at the door of regulators/controllers for permissions/clearances.

As an example, AgChem companies in some cases have by-products which are mainly non pollutant and sometimes pollutant. There are in-house mechanisms to treat these by-products complimented by Waste Management Boards at district levels.

The government's role should be advisory and supportive rather than wielding a lathi all the time. Ease of doing business must be ensured for genuine manufacturers.

Unless serious calamities take place, the government's role should be advisory and supportive rather than wielding a lathi all the time. Ease of doing business must be ensured for genuine manufacturers. They should not face road blocks, as often seen today. Favourable climate should prevail for agchem companies to feel certain comfort levels in manufacturing activities. Only then, more entrepreneurs will come forward to invest.

On the mandatory product registrations time bound tightly controlled method of registration should be in place and digitally controlled. For each activity, time should be fixed for completion. An annual audit should be installed to check on the efficacy of the process implementation. The industry is in need of speedy registrations. It will be of immense help to this Champion Industry.

In the field, Agriculture Inspectors should play the role of advisory rather than adversary. Action should be initiated only if grave mistakes/non compli-

ances are detected. This Licence Raj should be replaced by and an industry/ market friendly mechanism.

Safe and Judicious use of Pesticides: Companies and Industry Associations are regularly propagating these concepts effectively. While protective clothing's have been provided, actual usage of such inputs is very negligible. There is a big emphasis on IPM and ICM concepts, need based sprayings in a correct manner, understanding economic threshold levels of pests etc. There must be a way to break the resistance of majority of farmers to adopt these recommendations. This can be done with the joint focussed efforts of Company/ Govt Extension Worker and Agri Research Scientists.

Dealers' technical knowledge: Pesticide dealer is the vital link between the company and the farmer. Normal tendency is to push products where their margin is high! Dealers also offer credit to farmers and charge high interests. Their role should be redefined and enhanced with suitable training programs. They should be educated on not only to make profits for themselves but also help to increase farmers' profitability by giving them the right products and help them connect with the company field staff. While dealers training programs are being conducted, a lot of efforts and resources should be pumped in this area to give scientific knowledge and sell the right products to solve a particular problem.

Organic Farming: Organic farming is an excellent concept, provided it is integrated scientifically into modern agronomic practices. India has a huge population. Food and nutrition security is of paramount importance. In the last few years, organic farming based on Shri Palekar model has gained ground, with GOI's full support. The Agri scientific community has unanimously and vehemently opposed the nation-wide acceptance of Palekar based Organic farming. India should not take chances with unproven technology on a wide scale, though it sounds okay in theory.

The example of Sri Lanka is before us. However, integrating biologicals, bio fertilizers, micronutrients etc could be considered.

Move towards scientific farming: Indian agriculture has tradition-bound practices. With a lot of knowledge coming from agriculture universities, traditional agriculture should give way to scientific farming. The younger generation is now manning the fields. They are looking for scientific farming techniques.

Several high-tech areas in farming such a Precision Agriculture, Drones, Tractor Sprayings, Nano Fertilizers, Improved Irrigation Systems etc. will get popular. Adoption of such new technologies by the farmers will lead to higher profitability and reduce in the long term his indebtedness. I foresee faster adoption of these techniques ushering in a Technological Revolution in Indian agriculture.

It is also pertinent to note that horticulture production has taken overtaken agriculture production. Horticulture crops have a bigger export potential. Importing countries will favour Indian produce where scientific farming methods are adopted. For instance, good agricultural practices (GAP) adoption.

Favourable climate should prevail for agchem companies to feel a certain comfort level in manufacturing activities. Only then, more entrepreneurs will come forward to invest

MAJOR ROLE OF AGROCHEMICALS

ENSURING FARMERS' PROSPERITY

Agrochemicals play a paramount role in enabling farmers to uphold livelihood security and food security, and increasing crop productivity. Unfortunately, there are various myths regarding uses of pesticides in agriculture. Some people with vested interests spread rumours and panic regarding the use of crop protection chemicals.

Under the able stewardship of Prime Minister Shri Narendra Modi and Agriculture Minister Shri Narendra Tomar, GOI has introduced several reforms like Pradhan Mantri Krishi Sichai Yojana, Deen Dayal Upadhyay Gram Jyoti Yojana, More Crop per Drop, Pradhan Mantri Krishi Samman Yojana and others that directly benefit our farmers. Reforms like drone technology introduced by GOI shall further boost the development of agriculture.

India is the second largest producer of food in the World accounting 7.39 % of total global agricultural output, with one of the lowest use of pesticides and chemical fertilizers. India is unique in growing 544 crops, in variable agro-climatic zones. India shares 11.2% of total arable land of world, accounting for 156.42 million hectare.

India's food grain production in 2020-2021 has touched an all-time high of 303 million tons against 275 million tons in 2016-2017, which is 2% higher than the previous year 2019-2020. Agriculture exports have grown by 19.92% in 2020-2021 worth 50.21 billion USD. Horticulture production has also reached an all-time high production of 334 million tons during 2020-2021. Our export of fruits is worth Rs. 4,971.22 Crores (674.53 million USD) and vegetables, worth Rs. 4,969.73 Crores (667.61 million USD) during this period.

About the AUTHOR

Mr RG Agarwal is Chairman, Dhanuka Group

Challenge of Pests And Diseases

One of the major challenges that India faces includes pests and diseases that cause significant crop losses due to sub- optimal usage of pesticides, lack of quality pesticides or dearth of variety of new generation pesticides. Such factors compromise our food and nutritional security. Annual production losses dues to pests and deceases in India has been estimated at Rs 90,000 crore in 2002 (37th Standing Committee under Ministry of C&PC). FAO (2019) estimates reported 20 to 40% crops losses globally due to pests and diseases.

Productivity in most of our crops lags behind the world average except in case of sugarcane. Our average paddy production is 2 tons per hectare against world average of 3 tons per hectare.

In spite of 30% more arable land and rainfall, our agricultural GDP is one-third compared to that of China. India hardly uses 292 pesticides against more than 900 by China, Our use of crop protection chemicals of 340 g per hectare compared to 13 kg per hectare in China while fertilizers usage in India is 161.5 kg. per hectare compared to 346 kg per hectare in China. With judicious use of agro-chemicals in optimum dosages and adequate use of fertilizers, the observed gap in GDP of India (460 bn USD) with that of China (1.04 Trillion USD) can be plugged.

Crop Protection Challenges

Various crop protection challenges outlined below must be resolved to realize the full potential of agriculture in national GDP:

1) Out of total 1175 pesticides registered worldwide only 294 molecules are registered in India. Development/ introduction of New molecules should be encouraged, which need enabling appropriate policies of Government.
2) Lack of quality agri-inputs is a cause of concern. Quality wise agri-inputs should be promoted by all the stakeholders.
3) GST on agrochemicals should adequately to be reduced from 18% to 5%. This will benefit the poor and marginal farmers and reduce their cost of cultivation.
4) Strict compliance of Insecticides Act 1968 and Rule 1971 as well as various decisions by CIB&RC ,Ministry of Agriculture in their various meetings may be commissioned to check the Unregulated players in the market.
5) New technology implementation in agriculture should be promoted in fast-track mode.
6) Action against trading , manufacturing as well as monitoring by various government agencies of spurious pesticides, should be dealt with heavy hands.

Use of new technologies, chemical fertilizers and use of quality pesticides to optimum levels can result in increasing our agriculture GDP beyond 1 trillion USD, at China's rate of growth

As per the website of CIB&RC, DPPQS, Faridabad, 6,831 companies were issued registration certificate (1st May, 2022). However, in 2018 during the 8th Interface Meeting held under the Chairmanship of the then Additional Secretary, DAC&FW issued a list of only 314 companies who had submitted their data in response to the public notice

to the registrants to provide details of registrations hold by them data on manufacture, export & import sales, and purchase for last 3 years. Registration Committee also stated that the failure to provide the requisite data Registration Certificate's (RCs) to the defaulters may not be issued to them. In spite of this, fresh RCs are being issued to such companies. In 2020, Shri Tomar stated in the Parliament that 2,403 companies were issued manufacturing license.

The Karnataka government drew 250 samples of Pseudo Bio stimulants and on analysis they were found containing cocktails of various pesticides, may be smuggled in an illegal manner. They were not even registered in India.

As per GOI Gazette Notification Number-SO166 (E) dated January 2022, 2010, so far RCs and manufacturing license of only two companies have been cancelled. No action has been taken by CIB&RC even for the violation of Insecticide Act, 1968 & 1971 after 2010.

There is confusion about the number of companies working in the pesticide industry sector that hold genuine license or are operating without any license. The matter is a serious concern and needs fair investigation by GOI. Fake samples should be strictly investigated as per the provisions of the Insecticide Act, 1968 and Rule 1971, and the guilty must be punished stringently.

Agriculture is a science-based subject. Science-led decisions are the way forward. Nobody should be allowed to play with science

Similar samples were tested by Dr CD Mayee, then Agriculture Commissioner who found that a group of samples of bio-pesticides were found laced with insecticides. Various raids were conducted by authorities near Delhi and other states, where a large number of duplicate pesticides were intercepted but no action has been taken by competent authorities. Even the media did not highlight such sensible matters, while other type of news is commonly broadcasted.

Major Concerns

A critical area of concern is the constraint regarding unavailability of genuine price to farmers for their produce in the market. GOI must take urgent steps for better remuneration, livelihood and income of farmers. GOI proactively introduced drone technology. The technology needs engagement of pilots and appropriate new formulations for deriving full advantage.

Water scarcity is the foremost constraint globally. Jal Hai To Kal Hai. There is need to develop reservoirs for rainwater harvesting. Rainwater harvesting is a suitable technology for saving water for use in agriculture during drought and scarcity. Our Hon'ble Prime Minister has emphasized much in this area initiating several projects on water conservation.

Dhanuka initiated this in 2015 by forming the artificial reservoirs for rainwater harvesting. Dhanuka initiated a mission giving a slogan Khet ka paani Khet Main aur Gaon Ka Paani Gaon Main. Dhanuka has made many dams and ponds in Alwar district of Rajasthan towards fulfilling this lofty mission.

Non-availability of genuine agri-inputs to the farmers' is a big concern. Quality agri-inputs play a big role in agriculture production and sustainable income. The schemes launched by GOI provide benefits to the big farmers, and often the marginal farmers are deprived. GOI must reduce GST on agro chemical from 18% to 5%, since it is an essential component of crop production system.

If above constraints are removed, the country can achieve the vision of our Hon'ble Prime Minister to generate 5$ trillion economy by 2025, wherein 1$ trillion can be contributed by agriculture sector.

Some Suggestions To Resolve Challenges

We can deal with these challenges in the following manner.

1) Until and unless quality agri-inputs are provided to manage crop losses, crop production and doubling farmer's income will be a real challenge.
2) Yield gap in major crops can be reduced by using new innovative technologies.
3) Import duty should be reduced up to 5% on new technology formulations imported from countries like Japan, USA and Europe should be based on science. It should be approved on priority.

4) Implementation of science-led decisions in interpretation of the causes of crop losses, ban imposed on agro-chemicals and other regulation imposed from time to time.
5) Country should fast-track registration of pesticides/green chemistry and their import by multinational companies for making crop protection more effective and vibrant.
6) Regulatory reforms in agri-input industry are needed to achieve 20% contribution (1 Trillion USD) from agriculture sector so that our Prime Minister's vision of 5 trillion USD economy of our country can be achieved by 2025. This is more pertinent especially when the government has started enabling policies and created environment for ease of doing business.
7) There is need for reforms in CIB&RC to hasten the process of registration for new innovative molecules.
8) GOI should provide Production Linked Incentive (PLI) to facilitate and strengthen the pesticides industry to develop India as an international manufacturing hub as per government decision, declaring it as a champion sector.
9) GOI should support private sector for dissemination of new innovative technologies through extension as well as AI technologies in PPP model.

Unfortunately, there are various myths regarding uses of pesticides in agriculture. Some people with vested interests spread rumours and panic regarding the use of crop protection chemicals

Agriculture is a science-based subject. Science-led decisions are the way forward. Nobody should be allowed to play with science. The scientific community should come forward and contribute their knowledge and innovation to make speedy progress in agriculture development.

For better efficiency, our CIL/RPTL/SPTL laboratories should be NABL accredited. We must leverage the resources of NABL and GLP accredited private labs to bring in greater reliability, accuracy and transparency in analysis. It is enigmatic that while the agro chemicals exported from India have never failed abroad, the same often fail when tested in our labs. Sustainable growth in agriculture needs the support of science-led decisions and adoption of new technologies. As per today's perspective, there has been a significant change in the field of agriculture globally, both in terms of technology advancement and development.

If farmers benefit, entire industries of agro-chemicals will move ahead. This will ensure food and nutritional security and concomitantly result in enhancement of GDP from agriculture sector. Many progressive policies are awaiting implementation by the various government departments.

India lives in its villages. Without farmers' prosperity, we cannot think of revolution in agriculture. It is embarrassing to address Indian farmers as 'Poor Farmers'. How long will Indian farmers have to tolerate the abuse of being called poor farmers? Such a taboo pertaining to the status of farmers needs to be removed through further provision of new generation technology to make their income sustainable and doubling farmers' income.

The use of optimum levels of genuine and new generation agro-chemicals, based on scientific recommendation is essential. These will serve as insurance for farmers' income. Scientific knowledge about new generation technologies often do not percolate to farmer's fields. Hence they are not able to benefit accordingly. Farmers often remark that some of the advanced technologies reach them at the behest of private industries. It is often impossible for the government to approach every farmer door-to-door. GOI must encourage the private sector to leverage potential resources and promote assistance by sharing responsibilities.

REFORMS NEEDED IN AGROCHEMICAL POLICIES

Agro Chem To The Fore

GOI has identified the agrochemical industry as one of the 12 champion industries where India can play a significant role in the global supply chain, recognizing its potential. India's agrochemical industry is expected to grow 8-10 percent by 2025. India is the fourth-largest producer of agrochemicals, with domestic consumption of around Rs 32,000 crore in FY2021 and exports of around Rs 40,000 crore.

It is essential that we should evolve a strategy for the management of agrochemicals to promote their judicious and sustainable use. Some key policies that can be a game changer need to be tackled urgently to make the agrochemical industry more vibrant.

Ease of Doing Business: Essentially this relates more to the manufacturing sector. The recent global geopolitical developments, movement of supply chain

About the **AUTHOR**

Mr Nand Kishore Aggarwal is Chairman, Crystal Crop Protection. He is Chairman of the Agri-Business Committee in PHDCCI. He has been the President of ACFI, Director of CCFI, President of HPMA and active member of CAPMA

due to China's environmental restrictions on various chemicals companies, *Make in India*, *AatmNirbhar Bharat* reforms, highly experienced entrepreneurs, cost competitiveness of Indian companies, lower cost of operations, availability of skilled manpower (scientist, chemical engineers, etc.) along with young labour force, competitive corporate tax regime, etc. are all contributing to making India a preferred contract manufacturing destination or sourcing hub.

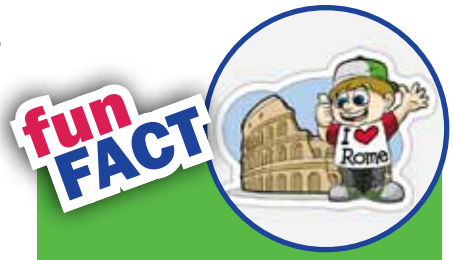
The focus of all global economies including India is on introducing sustainable green chemistries with cost-effective solutions. From 2017 to 2022, patents of 26 pesticides are expected to expire. Additionally, 22 pesticide active ingredients between 2021 and 2030 are expected to get out of their IPR period in the next 10 years. This ensures an enormous potential and opportunity for the Indian manufacturers.

Full exploitation of these favouring trends and manufacturing capability can be only made if *Ease of Doing Business* is addressed. Many bottlenecks plague the manufacturer with respect to licenses and approvals at state level. A further dismantling of the License/ Inspector Raj is desirable.

Production Linked Incentive (PLI) Scheme should be extended to agrochemicals. The government should approve the PMB bill 2020 with the modifications sought by the industry to ensure greater transparency in the regulation of the Indian pesticide industry.

Focus on Exports: India is the 13th largest exporter of pesticides globally: India can become an alternative source other than China for the supply of agrochemicals globally. GOI must reduce the delays in environmental clearance and other regulatory approvals to further propel agrochemical sector exports. India should offer incentives like China to encourage exports and ensure our global presence.

Regulatory hurdles: Time-consuming data generation and tedious registration procedures increase the cost of registration of new products and delay the introduction of new products. It takes 4-6 years to register a product. This discourages research-based companies from introducing new products. Hence reforms are badly needed. We have the lowest number of registered products when compared to many other countries, viz about 300.



Mr Aggarwal likes to travel. He is fond of historical places and hill stations

The process of registration by CIB&RC needs to be streamlined such that period for getting a new registration is minimized while meeting safety-related requirements. The data guidelines must be clearly defined by CIB to avoid interpretation challenges, which lead to confusion and add to complexities for agrochemical companies. Fast-track approvals and clearances should be provided to introduce new green chemistry products.

Reforms leading to outsourcing the data scrutiny with reputed government research institutes, especially in toxicology, encourage the "crop grouping concept" to enlarge label extensions, granting post facto approvals of all endorsements as there are mostly legal or administrative in nature, faster MRL setting process. India should also implement OECD principles in letter and spirit.

Peer review on toxicological data should be adopted by India similar to the pattern adopted by other OECD member countries, limited period data protection or data compensation mechanism be extended for new molecules introduced for the first time to overcome costs and handle product stewardship costs. These measures to a great extent will drive new innovations to be made available to the farmer community.

R&D focus: Indian companies spend roughly between 1% and 2% of their revenue in R&D compared with the global MNCs which invest about 8%–10% of their revenue. A conducive environment to encourage R&D activities can be ensured by adopting Good Laboratory Practice (GLP). New innovations or developments should be recognized, and companies should be incentivized for them. Patent applications should be processed on priority and granted.

Counterfeit Products: The new Pesticide Management Bill (PMB) 2020 should ensure stringent severe punishment to counterfeit sellers. This menace leads to loss of revenue for farmers, the government and the companies, apart from harassment for genuine companies by authorities.

It is noteworthy that the government is adopting standardized labels/ leaflets along with a QR code for traceability. This will help in curbing the sale of spurious products to the farmers. Companies should also invest in technology to help end-users distinguish and validate the authenticity of the original products.

GOI has initiated various projects under the Digital Agriculture mission for the period 2021 to 2025 based on new technologies like AI, blockchain, remote sensing and GIS, the use of drones and robots, etc. These are transforming Indian agriculture. The future is bright for the Indian agrochemical industry as a facilitator of Indian agriculture and the economy. The agrochemical industry needs robust policies that are friendly, transparent, and implementable.

New innovations or developments should be recognized, and companies should be incentivized for them. Patent applications should be processed on priority and granted

Transforming The Agrochemical Industry

MAKING OF A GLOBAL LEADER

India loses more than two lakh crores of agricultural output to pests and diseases (approximately 20% of total production). This is where agrochemicals can play a key role in protecting farmers' crops. India is the fourth-largest producer of agrochemicals in the world, even though the domestic usage of agrochemicals (at <0.5 kg/ha) is amongst the lowest in the world.

There is significant room for agrochemicals to be one of the pivotal export industries taking advantage of global supply chain shifts in the post COVID world. Agrochemicals has already been classified by the government as one of the 12 champion industries to focus on. , and the agrochemicals market is expected to reach a value of around $7.4 billion by 2026 .

In order meet both domestic and export requirements, the industry needs to overcome specific challenges. These include low farmer awareness and consequently low usage, poor understanding of technology and scientific techniques, low level of innovation in the domestic market, lack of domestic key agrochemical raw materials and intermediates, as well as a rigorous and complex regulatory framework. Dependence on imports for the key starting materials and intermediates compromises competitiveness of Indian agrochemicals industry in global markets.

Let's look at some of the initiatives that can accelerate the growth of the agrochemicals industry and consequently create a positive impact on the overall agriculture ecosystem.

Encourage innovation and development of agrochemical products within the country: To do so, the industry should remain open and welcoming to all technologies that can enhance crop productivity and climate resilience – re-

About the AUTHOR

Mr Ravi Annavarapu is the President of FMC India. He is a team builder and leader with global experience leading large multicultural teams across Americas, Europe and APAC regions

gardless of whether the technologies are indigenously developed or imported. Incentivizing innovators via specific policy interventions will deeply root the industry, simultaneously making available the latest technologies to Indian farmers.

Regulatory support to ensure timely, expeditious introduction of new technology: Having an enabling, non-discriminatory, transparent and consistent regulatory environment that delivers time-bound approvals to innovations is a must to move ahead. There is urgent need to shorten registration timelines of agrochemicals today so that farmers have the benefit of choice of many new products. Similarly, it is imperative for GOI and other regulatory bodies to provide adequate and broad protection to these technologies against me-too registration seekers as well as counterfeiters, to ensure that their IPRs, especially patent rights, are not violated. This will result in creating a higher level of confidence amongst technology innovators to bring these new technologies and investments into the country.

Deeper focus be provided to spreading awareness and imparting knowledge to the farmer community on safe and judicious use of agrochemicals. A national consensus on recognizing the contribution of agrochemicals in improving the lots of farmers will help align national extension and policy framework towards better farming.

Promote Integrated Pest Management

In order to enhance the sustainability profile of crop protection, it is important to promote integrated pest management, where biologicals can play a major role. The agricultural biologicals market is estimated at $12.9 billion in 2022. It is expected to reach $24.6 billion by 2027, growing at a CAGR of 13.7% .

India should have a policy that welcomes the import of latest biological innovations so that Indian farmers use the cutting-edge biological solutions available globally. The existing regulatory system needs to be unambiguous and should facilitate introduction of these technologies faster. Access to these technologies will also enhance the competitiveness of the export-oriented farmers who cater to the natural and organic produce market.

Promoting AgTech

To improve the input use efficiency and to safeguard users & the environment, GOI has done a commendable job by approving and facilitating use of drones in agriculture. This will improve effectiveness of agrochemicals and generate employment in rural India. More such progressive policy interventions promoting AgTech is required so that even a smallholder farmer with a fragmented landholding is able to access mechanization and other cutting edge technologies.

Promote India As A Global Base For Manufacturing

To grow and position India as an important part of the global agrochemicals supply chain, it is imperative to accelerate the formulation as well as implementation of policies and schemes that incentivize promoting India as a base for manufacturing for global markets. For instance, the Production-Linked Incentive (PLI) scheme under the aegis of "Make in India" for agrochemicals needs to move forward.

At present, around 60-80% of the raw materials and agrochemical intermediates are imported. There is need to have future-ready strategy to reduce dependence on countries such as China, a key producer. GOI should try to facilitate or fund availability of Key Starting Materials (KSMs) and agrochemical intermediates to increase Indian competitiveness in the global supply chains.

Center and State governments should be in accord in terms of banning of any product or any attempt to do so. Bans must be based on hard provable scientific facts independently evaluated and based on global standards. Similarly, a coherent and collaborative action against counterfeiters or IPR infringers is required to build farmer trust in agrochemicals.

It is clear that the performance of the Indian agricultural sector is directly linked to the growth and performance of the domestic agrochemicals industry. Hence the latest emerging technologies and high-quality products must be accessible to the Indian farmer. Establishing a well-oiled, transparent, futuristic, technology-oriented regulatory framework structure can act as the key enabler in transforming the agrochemical industry.

GOI must align the objectives of the various stakeholders – the private players, academic and research institutes, public sector enterprises, and the entire farming community – with the larger objectives of promoting the use of technology in enhancing food production and strengthening the country's position in the global market. Some of these interventions will allow India to become the agricultural powerhouse that it deserves to be!

Ag-Chem Sector

Potential And Possibilities

Ensuring food security is the joint responsibility of the government and all the stakeholders in the private sector, including the ag-chem industries. Indian agrochemical manufacturing sector with strong basic manufacturing set up and process knowledge supplies quality pesticides to the world market. If GOI extends policy and procedural support, the industry can grow to reach to the market size of Rs 75,000 crore within a short span with major increase in exports. The following are some of the bottlenecks that we face.

* Unfavourable registration policy allowing imports of readymade pesticide formulations to the country without registering technical grade pesticides in the country

The regulatory authorities allow imports of finished pesticides formulations to the country without registering the technical grade active ingredients used in the said formulations in India.

The policy discourages registration of technical grade pesticides in the country and encourages import of ready to use formulations. This is contrary to GOI policy of “Make in India” and “Atma Nirbhar Bharat”.

The government should ensure that technical grade pesticides are registered in the country prior to granting registrations for formulations, as is prevailing in major agricultural nations in the world. The policy allowing registrations for imports of readymade pesticides formulations without registering technical grade pesticides in India encourage monopolies. This is contrary to the policy mandated by FAO/WHO and followed globally including major agricultural nations like USA, Europe, Brazil, China, Australia, Argentina etc. These countries follow the policy of compulsory registration of Technical Grade products prior to granting registrations for formulations (imports or indigenous manufacturing).

Also allowing imports of these pesticides formulations (finished products) at a customs duty of 10% against custom duty of 7.5% on raw-material and intermediates (manufacturing use products) does not leave much scope for agrochemical manufacturing sector.

*Increasing imports and dependency on imports for technical grade pesticides harm the progress of Indian agrochemical industry

Every year increasing imports of technical grade pesticides to the country from countries like China and other countries is becoming a threat to the growth of Indian agrochemical industry. To become

About the **AUTHOR**

Mr Bhavesh Shah is the Managing Director of GSP Crop Science Private Limited

self-sufficient (Atma Nirbhar) in Agrochemical sector, GOI should consider financial and procedural support for creating technologies and infrastructure to manufacture active ingredients in the agrochemical sector on the lines of the pharma sector.

Increasing imports from cheaper sources like China is another threat to the industry. There are many importers who are misusing the registrations to do trading in technical grade pesticides in the country. They even make arrangements with overseas companies for exclusive distribution rights for technical grade pesticides in India. This had resulted in a surge in imports of technical grade pesticides, discouraging domestic manufacturing.

A major problem is that in spite of India having granted many registrations for indigenous productions and having larger production capacities for many technical grade products, the same are imported to the country from cheaper destinations for minor price gains. This defeats the interests of indigenous manufacturers. Imports of technical grade pesticides, if at all required, need to be made strictly on actual user basis and not for trading to ensure success of Make in India.

Registrations granted under TI (Technical Import) v/s. TIM (Technical Indigenous Manufacturing) category is another area hurting the indigenous manufacturing sector. In spite of having enough indigenous capacities, high imports are taking place from cheaper sources like China for minor price gains. Action must be taken to stop this by appropriate steps and also by increasing import duties.

* Anomalies in existing customs tariffs on imports of finished pesticide formulations versus raw material and intermediates does not encourage local manufacturing

The existing customs duty structures in the country require rectification to marginalize imports and encourage indigenous manufacturing of agrochemicals.

Imports of technical grade pesticides, if at all required, need to be made strictly on actual user basis and not for trading, to ensure success of *Make in India*

Cooking and playing with my dog are my favorite de-stressing activities

The difference of 2.5% custom duty between raw materials/intermediate and import of technical grade material/finished product does not leave any scope to attract investments and encourage manufacturing in India. GOI must increase the import duty of the finished product and on imports of technical grade products to encourage local production of technical grade pesticides.

Unfair demand for data protection / data exclusivity in agrochemicals sector beyond patent protection period of 20 years

GOI should not consider regulatory data protection for agrochemicals in India. If demand for data protection is considered, large number of off patent molecules will enter the country with additional protection beyond patent period. Patent period of 20 years ensures sufficiently to recover their investment and fair profit during the period of patent. Similar scenario prevails in pharma and other sectors. The same logic can apply to the agrochemical sector. There is no need to have different set of rules for agrochemicals sector. Unlike consumer products, agrochemical products need to be economically priced. For the agrochemical sector, the consumers are farmers. The majority of our farmers have small land holding of 1-5 acres and cannot afford high prices. Introduction of newer and safer molecules is a plus point for Indian agriculture. Delay in entry of generic pesticide products will badly affect the country and will not be a pro-farmer policy.

Strict law enforcement to prevent production, distribution and sales of spurious agrochemical, botanicals, biological and bio-stimulants

The Centre and state governments must be more vigilant and enforce the laws to prevent production, distributions and sale of spurious, non registered agrochemicals, botanicals, biologicals and bio-stimulants which poses major threat to the crops, lead to losses for farmers, impact the yield and leave residues in the food chain.

Policy Landscape For FLOURISHING Agrochemicals Industry

India's agrochemical industry has grown leaps and bounds in the past few decades, reshaping India's agricultural landscape and assisting farmers in producing safe food, improving food security, and maximizing crop yields. The food we plant for sustenance is severely harmed by fungi and insects, from fruit flies to fruit rot diseases. As a result, very little is left that is safe for human consumption.

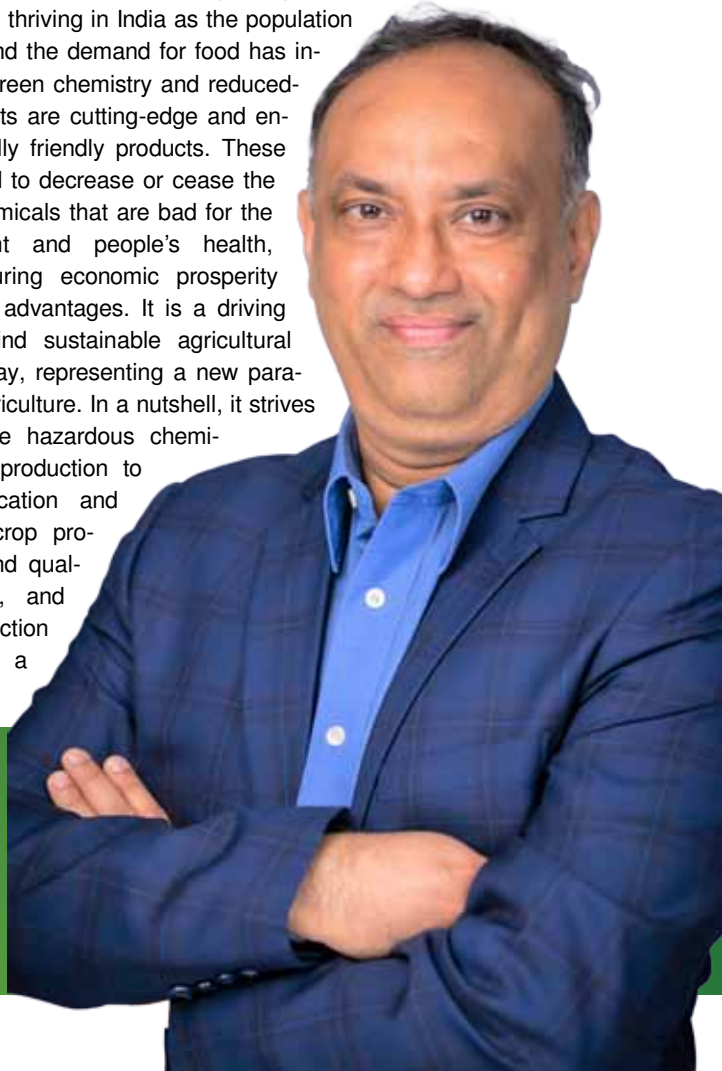
According to a survey commissioned by CropLife Asia, it's clear that the challenges farmers face are growing. The looming threat of climate shocks, water scarcity, soil degradation and salination pose a formidable threat to food security for all of us. Pest assaults are increasing because of the erratic monsoon and the rising temperatures brought on by climate change. Lack of knowledge about modern farming and prudent use of agrochemicals causes significant losses for farmers. This is troubling.

Despite all these negative impacts, using agrochemicals in enhancing productivity can have a range of positive outcomes. Farmers can boost crop productivity and output by using crop protection measures in the food production process. If current pesticide usage were to cease, agricultural production would reduce, as weeds, pests, and illnesses affect up to 40% of future crop production globally. It also aids in lowering consumer food prices, which is a substantial benefit.

Judicious use of chemicals for crop protection that reduces and, in some cases, completely eradicates insect damage allows consumers to purchase high-quality products that are free of insects while posing little risk to human life.

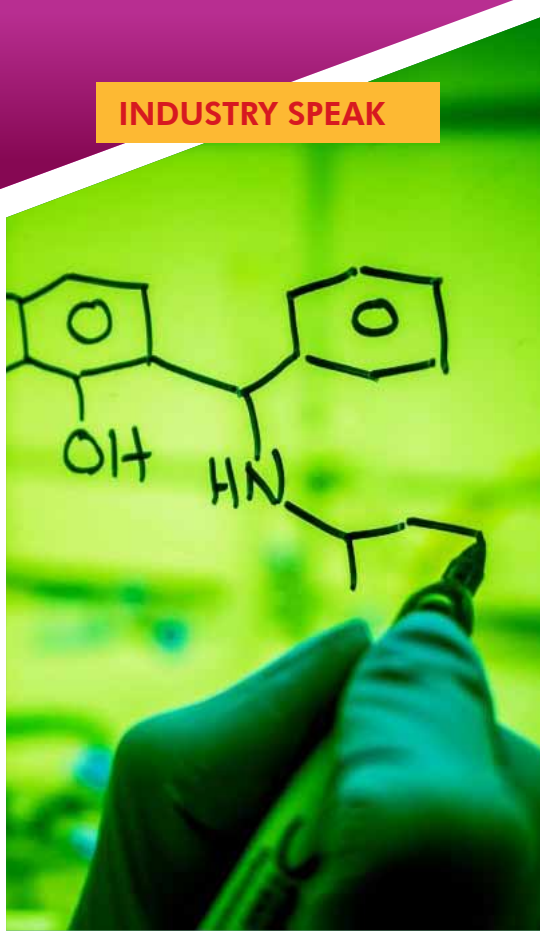
Green Chemistry Vital For Sustainable Future

The Indian agrichemical industry has been experiencing a gradual shift towards green practices. It has been thriving in India as the population expands and the demand for food has increased. Green chemistry and reduced-risk products are cutting-edge and environmentally friendly products. These are created to decrease or cease the use of chemicals that are bad for the environment and people's health, while ensuring economic prosperity and social advantages. It is a driving factor behind sustainable agricultural growth today, representing a new paradigm in agriculture. In a nutshell, it strives to eliminate hazardous chemicals from production to field application and improves crop productivity and quality, usage, and waste reduction through a



About the **AUTHOR**

Mr Shoumo Mitra is APAC Regional Marketing Director, Corteva Agriscience



moral recycling process in line with the safe disposal guidelines (SDGs). Companies have started implementing zero discharge solutions which have produced considerable benefits.

Considering the impact of pests on crop productivity, it has become highly crucial to employ crop protection chemicals that can enhance the productivity of the crops and have a reduced impact on the environment. The reduced-risk products are easily degradable in the soil and have low persistence in the environment. While the agrochemical industry and the government work to make agriculture more sustainable, it's significant that farmers also accept and use the technology, goods, and practices.

Role of Biologicals

Biologicals are based on naturally occurring chemicals and living organisms. These products tend to be low in toxicity and generally do not have any adverse effect on the environment. Some benefits of the biologicals are improved crop quality and yields, help in pest and disease management. Biologicals minimize the environmental effect of agricultural production, increase plant resilience, optimize crop output, and promote food security. Around the world, these products are used on a wide range of crops, including row and field crops, fruits, vegetables, and tree nuts. Their use can strengthen plants, enhance their growth and output while making them more resilient to stresses like excessive heat or cold and water deprivation. They help to keep the environment and people's health safe. Farmers today need to find more environmentally friendly ways to cultivate their crops to meet consumer demands for the food we eat.

We need a stable and predictable policy environment that incentivizes investments in sustainable technologies. This will require changes to the registration and licensing processes for new age molecules and data protection

Policy Support Required

The government has acknowledged the potential of agrochemicals and recognized it as one of the premier economic pillars of the economy. The crop protection industry in India is currently making use of its R&D facilities to create innovative products that are safer, more efficient, and in line with global standards. India is en route to becoming the centre of agrochemical manufacturing in the world thanks to its infrastructure and regulatory framework, which foster an environment favorable to the promotion of the category.

To achieve this, we need a policy environment that incentivizes investments in sustainable technologies in India. This would also require changes to the registration and licensing processes for new age molecules, data protection, and, above all, a stable and predictable policy environment so that it continues to be a responsible and reliable supplier. The farmer is at the center of an equilateral triangle; industry & public institutions, policy environment, and regulatory regime make up the three sides of the triangle. Moreover, clever chemistry with favorable environmental impact and minimal toxicological profile can help get more pesticides to stay on target, drastically reducing pollution.

I am an avid golfer so I like to hit the greens if I get a chance. If I have only an hour then I like to go for a swim or a walk around a reservoir where I live

RECYCLE, REUSE

Benefits of Legalizing recycling of properly rinsed and inspected empty pesticide containers – a robust roadmap towards sustainable management

Single-use plastic ban in India has kicked in from July 1, 2022. It is time to review the policy for empty pesticide containers in India.

Primary pesticide packaging is essential to ensure safe handling, storage and application of agrochemicals throughout the value chain and beyond. Post consumption of the pesticide these packs become waste (Empty Pesticide Container or EPC). Because of current pattern of use and management of pesticides, the volume of EPCs generated is increasing.

As pesticide containers are mostly produced from plastics, they contribute to the increasing mountain of plastic waste in India often dumped recklessly into the environment, burned, or buried near farms. These discarded EPCs bear the risk of soil and ground water pollution owing to contamination with residuals of the pesticide. Consequently, they can be hazardous for the community and the environment. The problem is further aggravated in view of their potential for misuse in illegal counterfeited products.

The International Code of Conduct of the distribution and use of agrochemicals (WHO/ FAO 2008) provides general guidelines on the management options for empty pesticide containers to minimize potential health and environmental impacts associated with their disposal.

Triple-Rinsing of EPCs

The FAO recommends triple-rinsing of EPCs as one effective practice for farmers to remove pesticide residuals from the containers. Cleaned pesticide containers are classified in many countries as "non-hazardous" waste. The European Waste Catalogue suggests that where the hazardous component in the waste is less than 0.1 percent, the waste is no longer perceived as 'relevant' and the packaging is classified as "non-hazardous".

In Australia, triple rinsed containers are allowed to be recycled and classified as non-hazardous while containers that are not cleaned and properly rinsed are classified as hazardous waste.

The effectiveness of triple rinsing has been further demonstrated through a recent study undertaken by the All India Network Project on Pesticide Residues (AINPPR) of Indian Council of Agriculture Research, GOI. The interim results indicate that irrespective of container type, formulation type, pack size, toxicity, etc., the pesticide residues tend to decline by more than 99%. It is reasonable to expect that the remaining active ingredient content in waste composition after rinsing will serve as the basis to address classification criteria (toxicity) and the defined thresholds/cut-offs defined in the Waste Framework

Directives.

This study is a balanced body of contemporary certainty, supplemented by research and analysis to enable GOI to decide on a reclassification of decontaminated primary pesticide packaging in India and establish triple rinsing as a sustainable method for management of empty pesticide containers.

Strict Compliance With Reasonable Safety Measures

In this context, the framework for Extended Producers Responsibility under the Plastic Waste Management Rules 2016 of the Union Ministry of Environment, Forest and Climate Change (MoEF&CC) gains predominance. The regulations demand from all producers, importers and brand owners of pesticide products without exemption the installation and/or financial contribution to a waste collection system. However, strict compliance with reasonable safety measures to minimize any potential risk for exposure during collection, storage, transport, and recovery of used and possibly contaminated EPCs requires a thorough planning of the reverse logistic process including recycling/ disposal steps which is complex and time consuming.

Collection and recovery programs for empty pesticide containers especially of small containers cannot be initiated before destination value chain of the collected material is established and the recycling application developed and approved by relevant authorities.

Virtual International Symposium on EPC Management

CropLife India organized a *Virtual International Symposium on Empty Pesticide Containers (EPC) Management in India - Roadmap for Sustainable Management of Empty Pesticide Containers* on May 25. It was attended by delegates from across the world including Asia, Europe and Africa.

Establishment of collection and disposal of EPCs/Container Management is a stepwise approach which requires strong support of the government and coordination amongst multiple stakeholders. There is an imminent role of every stakeholder in the value chain – government, manufacturers, channel partners, farmers, Producer Responsibility Organizations, recyclers and end-users. CropLife International has successfully initiated and established independent Container Management Systems organizations and activities in 63 countries, which has removed over a million tonnes of agriculture waste plastic from the environment between 2005-2020.

Seven-Step Roadmap For Sustainable Management Of EPCs

In February 2021, CIB&RC issued a public notice inviting comments from all stakeholders for classification of empty pesticide containers and disposal thereof. In response to the public notice, CropLife India had submitted a detailed seven-step roadmap for sustainable management of EPCs through shared responsibilities of all stakeholders. Further The 429th meeting of the Registration Committee held in June 2021 decided to formulate a working group/ task force comprising experts from DPPQ&S/CIB&RC, CPCB, State Governments, M/o EF&CC, ICAR and Pesticide industry associations stakeholders to work upon deciding the responsibility for collection and disposal of the empty container & suggest about linking/creation etc. of necessary infrastructures setup.

CIB&RC's cognizance, and consideration to develop a framework for safe disposal of EPCs is therefore welcomed and perceived as a promising first step in the right direction to add India to this success story.

CropLife India hopes that the Ministry of Agriculture & Farmers Welfare (MoA&FW), Ministry of Environment, Forest & Climate Change (MOEF&CC), Central/ State Pollution Control Boards, Central Insecticide Board & Registration Committee (CIB&RC) and Industry can jointly facilitate a supportive mechanism to promote an effective empty pesticide container management system in India. CropLife India is highly motivated to support the process, as industry's stewardship commitment.

AGROCHEMICALS INDUSTRY

INITIATIVES THAT SHALL BOOST GROWTH

Agrochemical industry has played a major role in the growth of Indian agriculture. Some of the major policy initiatives that have been taken by GOI for the agrochemical sector are enumerated below.

• **Make in India & Atma Nirbhar Initiatives:** GOI has identified the agrochemical sector as one of focused sectors and is working aggressively for its promotion and growth. Under *Make in India* and *Atma Nirbhar* initiatives, our government is determined to make India as hub for manufacture of agrochemicals in the world. This includes not just end use products but technical grade products, which go into making the formulations. Central and state governments have also created special chemical zones for the manufacture of various chemicals in different states, which will facilitate faster clearances of the projects and also ensure that all the statutory and regulatory mechanisms and infrastructure are in place for the various manufacturing facilities located in those zones.

• **New Generation Products:** GOI is determined to promote new generation crop protection products, which will effectively control the target pests at various low doses. This will not only help in dealing with the problems associated with development of resistance in pests but also with the problems associated with residues found in food commodities.

• **Stringent Regulatory Mechanisms:** Considering that crop protection products are to be used judiciously so as to ensure their efficacy and safety, it is important that they are properly evaluated for their efficacy and safety for granting registration for them. The regulatory authorities are making our regulatory system stringent so as to upgrade them to global levels, which will bring efficacious and safe products in the country after proper risk assessment only. The authorities are working in the direction of accepting regulatory data, which are generated only at GLP certified contract research organizations. This will facilitate that the data are of the highest quality and also that they give unbiased assessment of the product for which they are generated.

• **Registration of Consortium of Biopesticides:** Guidelines for registration of consortium of bio-pesticides have been recently approved by the authorities. This

Focus on R&D and Innovation

Prime Minister Shri Narendra Modi has been very vocal on promotion of R&D and innovation in Indian industry. This has rubbed off on the agrochemical industry. Various companies have started investing heavily on R&D and innovation and creating state of the art R&D centres. These are working on development of new chemistries, green chemistry, manufacturing processes, new formulations etc. All these activities will help in offering novel and innovative crop protection solutions to our farming community

will facilitate that the availability of wide spectrum bio-pesticides, which will control wide variety of pests. Further, Department of Biotechnology has also issued guidelines for import of mother culture of new strains of bio-pesticides to develop technologies for their manufacture, formulation development, registration and use in the country.

• **Registration of Biostimulants:** Different types of biostimulants, which play an important role in promoting plant health and enhancing soil health are already available in the country. These products were not covered under any regulation due to which there was no control on their quality, efficacy and risk assessment. These products have been brought under Fertiliser Control Order, under which aseparate category for their registration have been created. These registrations shall be approved by Central Biostimulant Committee. This mechanism will ensure that manufacture, sale and use of these products are properly regulated, controlled and evaluated by the manufacturers as well as the different government agencies so that only genuine products are available for the farmers.

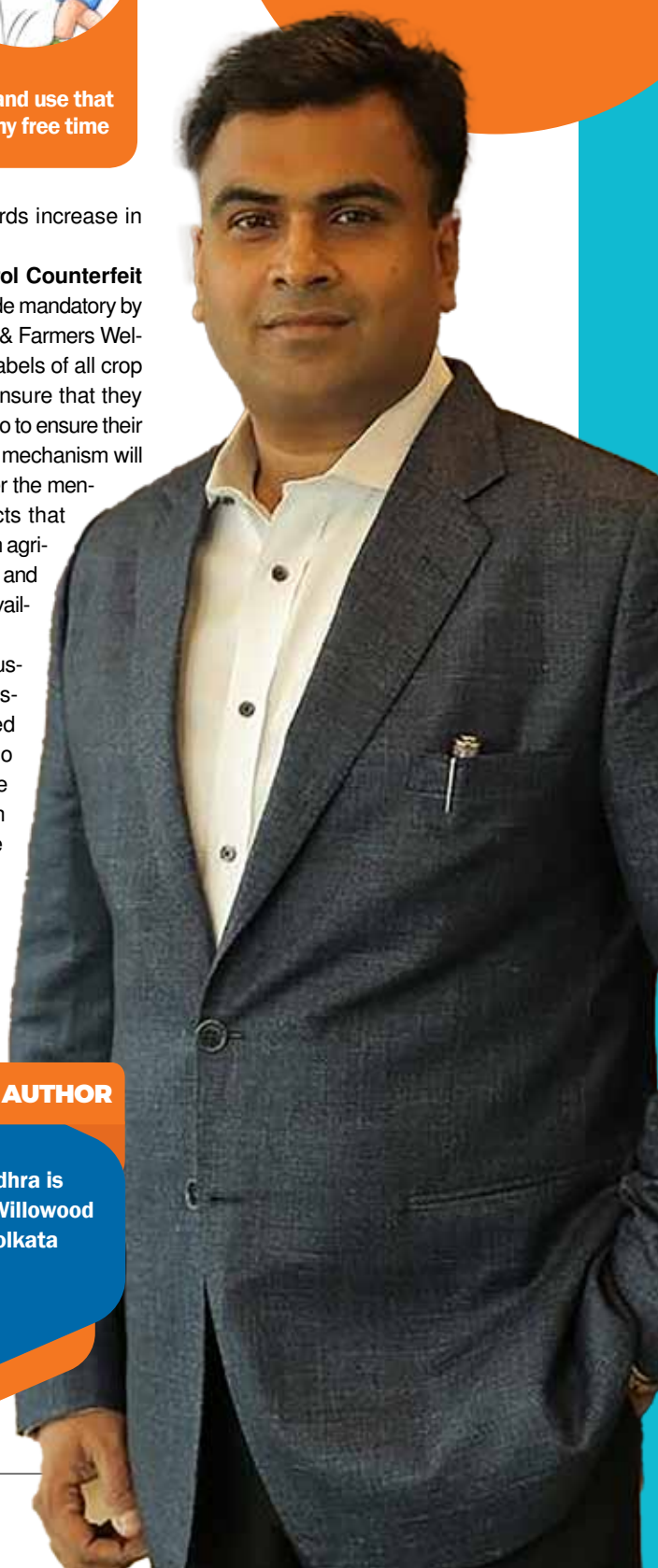
• **Application of Crop Protection Chemicals by Drones:** With the focus of government on precision and safe application of crop protection chemicals, guidelines for regulatory approvals and standard operating procedures for application of crop protection chemicals by drones have been framed by Ministries of Agriculture & Farmers Welfare and Civil Aviation. Department of Agriculture & Farmers Welfare, Government of India have already given interim approval for two years for application of registered insecticides, fungicides and PGRs of formulations for application by drones' subject to generation of requisite regulatory data by industry for approval by regulatory authority for regular usage. The guidelines of Ministry of Civil Aviation will facilitate availability of licensed drones and pilots and also promotion of start-up companies for their manufacture within country.

• **Export Promotion:** GOI is taking various measures to promote export of crop protection chemicals from India to different countries in the world, which help the industry to earn foreign currency for the country and also contribute towards increase in overall exports of India.

• **Measures to Control Counterfeit Products:** It has been made mandatory by Department of Agriculture & Farmers Welfare to print QR code on labels of all crop protection chemicals to ensure that they are not counterfeits and also to ensure their track and traceability. This mechanism will help the industry to counter the menace of counterfeit products that have a deleterious effect on agriculture as well as on animal and human health, which is prevailing in our country.

The agrochemical industry of India is highly optimistic that the aforementioned policy landscapes shall go in a big way to promote the growth of the industry in times to come to enable it to positively contribute towards the growth of Indian agriculture as well as economy of our country.

I enjoy playing tennis and use that as a stress buster in my free time



About the **AUTHOR**

Mr Parikshit Mundhra is Managing Director, Willowood Chemicals Ltd, Kolkata

Agro-Chemical Usage

Balanced Use Vital For Growth

The agrochemicals industry plays a significant role in improving agriculture yields by preventing losses incurred due to pests and diseases. Judicious use of crop protection chemicals supports sustainable farm management and delivers socioeconomic benefits to meet the challenges of feeding India's increasing population and bringing foreign currencies to the Indian exchequer through the export of quality agricultural products across the globe. However, stuck in subsistence farming, most of the marginalized farmers manage to grow just enough to feed their families.

Regulatory frameworks must help get technology in the hands of farmers faster

Balanced and judicious use of agrochemicals is a need of an hour in the ever-changing insect pest dynamics driven by climate change as agricultural inputs like seeds, fertilizers, and agrochemicals play major roles in improving agricultural output.

Innovative chemistry coupled with precision application technologies, including drone-based spraying, would

About the **AUTHOR**

Dr Rajvir S Rathi is Director – Public Affairs, Science and Sustainability, Bayer Crop Science South Asia

prove to be a boon for farmers in tackling endemic and invasive pests and increasing their income as better yield would translate into growth of farm income.

The agrochemical sector is regulated under the Insecticide Act 1968 and Rules 1971, which has provided a framework to produce, import, export and use of agrochemicals in India for the last 50 years. The existing laws have evolved to meet the changing dynamics in Research & Development, technology platforms, novel products, and formulations, including green chemistry, bio-pesticides, and bio-stimulants.

However, the development in the technology front and precision use technologies demand the enactment of new laws on agrochemicals that would create an enabling legislative framework for registration of newer molecules, a combination of chemicals and biological, including sprayable pheromones and a facilitative environment for the agrochemical sector.

Fast-Tracking Regulatory Framework Needed

Given that the Pesticide Management Bill, 2020 is pending in Parliament, the government should critically review the legislature with respect to critical issues like excessive jurisprudence, data protection, compensation, sampling and NABL (National Accreditation Board for Testing and Calibration Laboratories) accreditation of laboratories.

Even though the Indian agrochemicals industry is the fourth largest in the world and has the potential to become a global agrochemical production hub, the country has been able to register only 294 molecules even after over 50 years of regulation of agrochemicals. At present, there are total 1,175 registered molecules in the world, and China and USA are leading with each of them having 950 registered molecules, while Pakistan and Vietnam each have 450 registered molecules of agrochemicals.

Fast-tracking regulatory framework which has a direct bearing on the availability of highly efficacious agrochemicals to control insect pests in India can help to further augment the growth of the sector. This can have a direct impact on reducing production losses and yield gap in comparison to the world.

The concerned government agencies should focus on the creation of an enabling, time-bound, and facilitative environment for seamless registration of agrochemicals. The government should work on enacting a revised and streamlined Pesticide Management Bill to replace age-old obsolete insecticide acts and rules.

Future To Be Built On The Bedrock Of Innovation And Technology

India is the world's second-largest manufacturer and exporter of agrochemicals. The agrochemical sector in India has an annual turnover of Rs 50,000 crore with a potential to achieve Rs 100,000 crore by 2030, and hence, a major contributor to agriculture GDP.

The time is apt to work in the direction of expanding the basket of molecules by registering new chemistry to tackle some of the devastating pests such as fall armyworm, pink bollworm, locusts, sucking pests, etc. Promotion of using cutting-edge precision application technologies such as drone-based customized spraying of pesticides, etc would help in realizing the goal of India becoming a world leader in food production.

To enhance the prosperity of farmers by increasing yields and protecting the environment, crop sequences and cultivation methods need to be adapted to local conditions. The diligent use of crop protection chemicals not only serves to protect plants, but wisely-used herbicides, insecticides, and fungicides also protect farmers against crop failure and their potentially severe economic implications.

The concerned government agencies should focus on the creation of an enabling, time-bound and facilitative environment for seamless registration of agrochemicals

Can Lead To Significant Hike In Productivity

Foreign investments in the agrochemicals sector would result in an improved ecosystem for agrochemical production and increased availability of better molecules for Indian farmers.

Being a committed and responsible entity to support smallholder farmers to progress from subsistence farming to commercial farming, Bayer Crop Science Limited is working in tandem with government initiatives to enable farmers with small farm holdings to enhance their crop yields as well as farm incomes by mitigating their yield losses due to different crop diseases. Bayer Crop Sciences aspires to be a responsible partner of the Country's farmers to contribute to the sustainable development of agriculture by ensuring healthy crops, reliable harvests, and stable returns.

The significance of agrochemicals should be viewed in the context of enhancing agricultural output as their judicious use can improve productivity by about 20–30 percent.

Importantly, the usage of agrochemicals in the Indian agriculture sector is among the lowest in the world as only 0.6 kg of pesticides are used per hectare in the country in compared to the global average of 2.3 kg/ hectare. The countries like China and the USA have higher usage of agrochemicals per ha in compared to India.

However, the industry is currently facing major challenges in terms of low usage, low awareness, non-scientific usage, low levels of technology interventions, etc. Promoting balanced and judicious usage of agrochemicals will ultimately enable the agriculture sector to drive India's growth story in making the country an Aatm Nirbhar (self-reliant).

Agro-Chem Manufacturing Hub

ENABLING POLICY LANDSCAPE NEEDED

The crop science industry has made tremendous contribution in not only enhancing the productivity but also the profitability of farmers around the world. I am convinced that agrochemical Industry in India has a flourishing future provided an enabling policy landscape is created for this sector.

Challenges Facing Global Agriculture

Crop protection products protect crops from diseases, insects and weeds. The widespread use of newer and more effective products since the middle of the twentieth century has increased food security as well as improved food safety standards and also the standard of living of farmers around the world. Crop protection products are one of the most well regulated category of chemicals which are absolutely essential for raising yields and keeping pace with rising demand for food, feed and fibre without encroaching on the environment.

Building a robust Crop Protection Industry in India

According to estimates the agrochemical industry in India comprising of domestic and international players has grown to around INR 212 Billion and is expected to reach a level of INR 320 Billion by 2027. The multinational companies have been operating in India for many decades and collaborating with many Indian partners in bringing quality and effective technologies for the millions of farmers across the length and breadth of India. The R&D based crop sciences industry with spend of close to 10-12percent of its turnover in research has been launching molecules that has over time led to reduced application rates. This pursuit needs encouragement to make our agriculture both economically viable and more sustainable. It calls for creation of a policy environment that incentivizes a steady flow of the latest and safer products.

I would like to bring out another

About the **AUTHOR**

Dr KC Ravi is Chief Sustainability Officer, Syngenta India Pvt. Limited. Views expressed are personal

important aspect. There is this unfounded perception that India already uses large amounts of crop protection products. But in reality, the picture is quite different. According to available data, 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.

What is more revealing is the number and nature of pesticides being used in India. At present 1175 molecules are available globally but only about 292 are registered in India. A further breakdown reveals that out of these only around 75 molecules and their combinations are being actively used to protect the vast 140 million hectares 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. It is therefore absolutely necessary that Indian farmers need far greater range of newer and safer molecules to fight the battle against pests, diseases, weeds and other attacks , without causing any unacceptable risk to environment.

We therefore don't need a crystal ball to see what is required for the crop protection industry to achieve its' true potential. There is a need to create a policy, regulatory and infrastructure environment that encourages greater value addition in the country and encourages manufacturing.

Key Areas

I would like to outline the keys areas for a policy landscape. This needs attention for making the crop chemicals sector achieve greater heights.

* There is need for a predictable science based policy and regulatory regime for building a robust manufacturing base in the country. The Registration Timelines is a case in point. Internationally it takes less than half the time to register products as compared to India. There is an imminent need to bring it in line with international norms without of course compromising on the safety and efficacy aspects.

All avenues to enable penetration of new and scale neutral technologies like drones and digital applications should be explored and encouraged for making farming sustainable

* Mechanism to accord priority for molecules to be introduced first time in the country through a separate cell. All registration categories under section 9(3) for molecules to be introduced first time in the country should be given priority. New molecule introduction needs to be encouraged and facilitated.

* Imminent need to adopt Global Best Practices without compromising on the safety and efficacy aspects. The Minor change legislation has been in the making for many years now and need to be implemented. At present any minor changes to the recipe is like a new registration and leads to enormous delays. Internationally minor changes are allowed without the need for elaborate data requirements all over again. The Ministry of Agriculture has constituted a committee to look into this issue in 2014. India should also allow minor changes based on existing scientifically validated data bridging criteria without the need of reinventing the wheel by generating once again large amount of data.

* There is also an urgent need to upgrade the Labs in the country. India should implement Organization for Economic Co-operation and Development (OECD) requirements in letter and spirit and encourage data generation under Good Laboratory Practice (GLP). Peer review on toxicological data should be adopted by India similar to the pattern adopted by OECD member countries.

Any hasty decision to ban or a policy environment restricting use and introduction of new molecules will be like throwing the baby along with the bathwater. Industry and Government should work towards ensuring that the farmers are equipped with more and more number of different mode of action chemistries to combat the onslaught of tough and exotic pests. This would ensure introduction of best technologies to produce more from less in an environmentally sustainable manner.

fun FACT

New found passion for all things natural – naturopathy, yoga, meditation and pranayama. Sketching whenever in the mood! Learning the vedic way of life. Also an avid writer and sculptor of Ganeshas

Any decision to ban or restrict should go through a rigorous scientific assessment.

Pesticide Management Bill

Pesticide Management Bill is a great opportunity to bring in a predictable progressive science based legislation in place of the age old Insecticide Act of 1968. Provisions like criminalization of offences in the PMB does not augur well to encourage the industry. The offenders should no doubt be dealt with, but the genuine players should not suffer. Similarly, some of the regulatory provisions like re-registrations will affect ease of doing business. And more importantly will restrict new molecule introductions so necessary for the farmers in an extremely complex environment and pest pressures.

The long standing debate on the need to have adequate duration of regulatory data protection for the first time registrants needs to be taken to its logical conclusion. A certain period of Data Protection will enable the first time registrants to not only recoup some of their investments, but also more importantly steward the product properly in the market. A period of exclusivity is granted by countries across the world for first time registrants in accordance with the WTO and TRIPS guidelines. In fact this would ensure "Innovation Protection" and would encourage more discoveries in India leading to creating a robust manufacturing base. Data protection in some form needs to be there for giving a filip to Indian manufacturing.

The government has rightly identified AI as the future of agriculture. This will help growers in making the right decision with respect to spraying technologies, product usage and help in identifying deficiencies and interventions for soil etc. All avenues to enable penetration of new and scale neutral technologies like drones and digital applications should be explored and encouraged for making farming sustainable. The landmark move to scale up use of drones in agriculture spearheaded by the vison of our Prime Minister would pave the way for immense possibilities and usher Indian agriculture into a new era of technology-led growth and innovative pursuits by farmers. The industry is fully geared to educate the farmers/ drone service providers to strictly follow all the conditions and precautions as prescribed by Directorate General of Civil Aviation (DGCA).

It is important to build world class manufacturing and logistics infrastructure. We need to create state of the art industrial parks facilitated by easy environment clearances, centralized pollution treatment plants, power, water and other infrastructure. It would be equally important to build good roads and ports facilities that would also help reduce time and cost besides boosting competitiveness as well as export.

There is need for private sector and government to work towards bringing in newer and safer technologies through public private partnerships. The government is talking of agrochemicals as a champion sector and a blueprint has to be designed for making the sector more robust. Both domestic and multinational companies have helped the sector grow tremendously in India. The strengths of both can be harnessed to take Indian agriculture and the Indian farmer to greater heights.

The government and the private sector have deliberated on a robust road map and identified the areas. What is now required is a systematic plan to implement.

MARGO®

The Ecofriendly Agri Company

PJ Margo P Ltd
A 50:50 Joint Venture with Certis Biologicals

Margo Biocontrols P Ltd
A 100% Subsidy of PJ Margo P Ltd

MARGO® - We are Pioneers in the Extraction of Azadirachtin Technical from Neem Seeds, and the Largest Exporter of Neem Oil from India. We are leaders in Manufacture of Humic Based Bio-stimulants - manufactured from Renewable Bio Resources

AZADIRACHTIN
From Neem Seed Kernels

We Produce Azadirachtin Technical Powder from Neem Seeds. Azadirachtin Technical Powder and Azadirachtin based Neem EC in 5.00%; 3.00% 2.00%, 1.00%. 0.30% 0.15% and Neem Oil Based B'o-Fungicide. We are also the Largest Exporter of Neem Oil from India

BIO-STIMULANTS
Humic Based Liquids and Granules

- Manages Biotic and Abiotic Stresses
- Works for all Field and Plantation Crops
- Low Dosage and Fast acting
- Improves Soil health
- Helps to clean the Drip irrigation lines
- Safe to handle - Non Toxic
- Acts like a Tonic for all Plants
- Works for all Plants, Vegetable/Fruits
- Can be used in combination with other Chemicals
- Improves Water holding capacity of Soil
- Suitable for Hydrophonic pants
- Eight Variants

ADJUVANTS
Liquids

- Super Spreader
- Wetting Agent

BIOPESTICIDES
Wettable Powders

- Trichoderma Viride WP - 1 x 10^8 CFU /g
- Trichoderma Harzianum WP - 2 x 10^6 CFU /g
- Pseudomonas fluorescens WP - 2 x 10^8 CFU /g
- Verticillium chlamydosporium WP - 2 x 10^6 CFU/g

BIO-FERTILIZERS
Liquids and Granules

- Vesicular Arbuscular (Endo) Mycorrhiza - Granules
- Phosphate Solubilizing Bacteria (PSB) - Liquid
- Nitrogen Fixing Bacteria - Rhizobium - Liquid
- Bio - NPK - Rhizobium Based - Liquid
- Potash mobilizing Bacteria (KMB) - Liquid
- Nitrogen Fixing Bacteria - Azotobacter - Liquid
- Bio - NPK - Azotobacter Based - Liquid

Corporate Office: 344/8, 4th Main, Sadashiv Nagar, Bangalore 560080, India. Ph: +91 80 4006 1999
Visit us at: www.pjmargo.com and write to Mr. Sharad Singhania - Sr. VP - at sksinghania@pjmargo.com

Agro-Chem Industry

FUTURE BRIGHT

The Indian agrochemical industry is the fourth largest globally. The usage of agrochemicals in the Indian agriculture sector is among the lowest in the world due to major challenges in terms of low usage, inadequate awareness, non-scientific usage, low levels of technology interventions, stringent and complex regulatory framework. Despite these constraints, Indian agrochemical industry has the potential to become a global agrochemical production hub with its highest irrigated area in the world.

Thanks to constant efforts by GOI, irrigated areas are seeing a steady rise with integrated policy for water management and efficient use of water resources. Higher yield will boost farmer confidence, resulting in increased farm input consumption, and increase agrochemical consumption by about 2%.

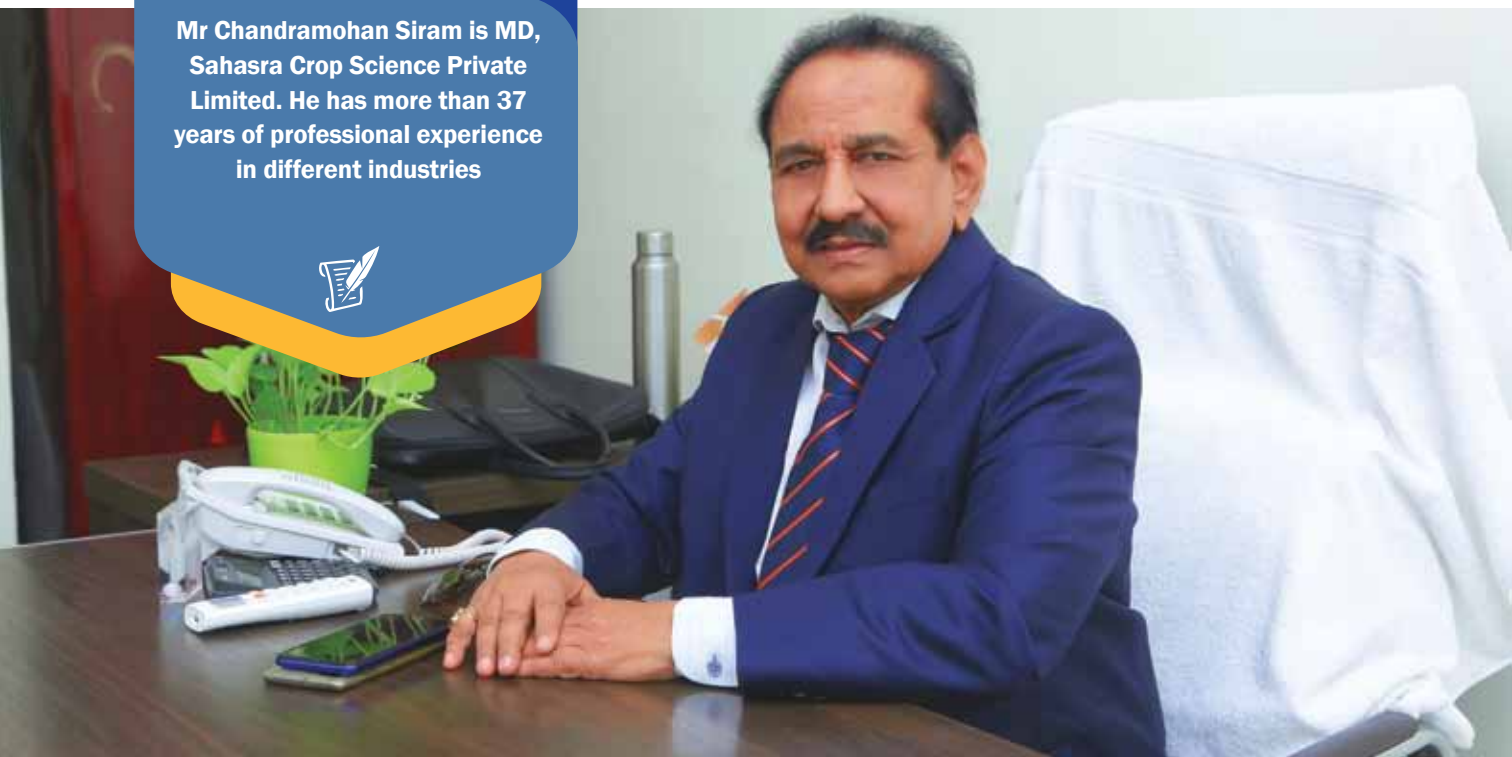
Although farm aggregation is most likely the best option, there is an increasing need for FPOs, cooperatives and corporations to develop new solutions in the future

In several ways, GOI's support for agriculture has been remarkable, both in terms of expenditure and policy. Farmers' incomes have increased. Agricultural infrastructure such as cold storage and warehouses has improved. FPOs have been strengthened through aggregation. Digital infrastructure for agriculture has improved. All these measures should help to fill gaps in the agricultural ecosystem such as addressing information asymmetry, reducing waste and encouraging the construction of cold storage facilities and logistics infrastructure to expand fruit and vegetables cultivation. This will ensure higher incomes for farmers and promote farm mechanization to a reasonable scale. Numerous initiatives by the Centre and state governments such as the extension of MSP for fruits and vegetables will help the process. Such trends are likely to boost agrochemical consumption by 5-10%.

Post COVID, there is increased preference for organic foods and a shift away from toxic chemicals. Concerns about pesticide residues in food are driving a shift towards organic foods. Farmers, like consumers, are concerned about their safety, prompting them to abandon the use of toxic chemicals. This common concern will shape the future of agriculture and farming worldwide.

About the AUTHOR

Mr Chandramohan Siram is MD, Sahasra Crop Science Private Limited. He has more than 37 years of professional experience in different industries



Biological Pesticides Shall Dominate

Biological pesticides will be the dominant agricultural trend in the coming years. It is difficult to fully replace chemical pesticides at the current level of scientific developments in biological pesticides research. But vigorous and incessant technological developments are expected to meet future challenges. Biological pesticides have additional functions besides pest control, such as regulating plant growth, combating stress and so on. Despite being a small segment today, biological pesticides will be the largest growth segment within agrochemicals in the coming years.

With an annual growth rate of 15% to 20%, it will have a 2% to 5% negative impact on traditional pesticides. One of the most important trends in the agrochemical industry is the shift from conventional chemicals to high-value, sustainable, microbial and secondary metabolite chemicals. Pest occurrence is dynamic and more often unpredictable. New invasive pests, such as fall army worms, black thrips and locusts, frequently necessitate the use of novel pesticides to control them. Pesticide resistance can also be seen in many pests after repeated applications of the same chemical. As a result, as the previous chemicals become ineffective over time, more advanced chemicals will be required to combat the same pest. This will result in a shift toward more effective chemicals and more intensive farming.

Mr Siram's hobbies are playing badminton, cricket and computer games. His favourite book is How to Win Friends and Influence People by Dale Carnegie

Integrated Pest Management

A lot of emphasis has been placed on integrated pest management, which employs methods for judicious application of agrochemicals including biological and microbial derived pesticides. There are numerous agri-tech start-ups that promote technologies such as AI-based applications, drone applications and so on.

While genetically modified seeds have previously been accepted for crops such as cotton, consumers and farmers are still hesitant to use them in food crops. Many technologies are being developed, but it will be difficult to predict changes in agrochemical consumption as a result of these technologies. For example, while increased use of drones will reduce agrochemical consumption due to more specific and targeted applications, the overall number of pesticide applications will increase due to the ease with which pesticides can be applied. Farming services will evolve into a new segment as new technologies are deployed. Smaller farm consolidation is required because small farms would otherwise prevent such technologies from being adopted quickly. Although farm aggregation is most likely the best option, there is an increasing need for FPOs, cooperatives and corporations to develop new solutions in the future. With the Government and private sectors working towards intensification of agriculture, the usage of agrochemicals is expected to increase, especially in areas where the penetration of agrochemicals is less.

Post pandemic, there is a global financial down trend, which has been exacerbated by the Russia-Ukraine conflict. No country is immune to these developments. Several countries are experiencing food shortages as a result of socio-geo-political and climate change concerns. Because of GOI's foreign policy, the entire world now sees India as a beacon of hope. In the prevailing scenario, these issues shall be addressed by GOI, allowing the industry to double its exports, for which our industry has enormous potential.

We are convinced that policy interventions aimed at improving R&D, capacity building, regulations, compliance issues, and the promotion of agrochemical manufacturing and export can have a significant impact on this sector. This will assist India in achieving a robust position in the global agrochemical landscape.

Organic

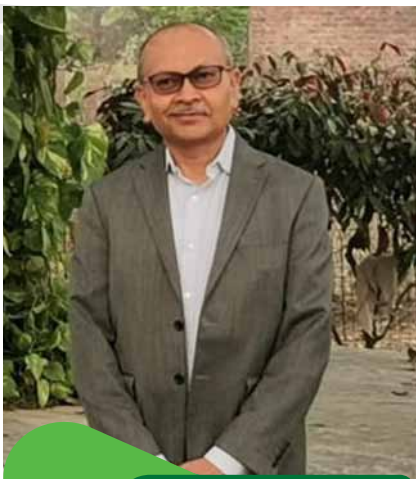
The Future of Farming

'The ultimate goal of farming is not the growing of crops, but the cultivation and perfection of human beings.' —Masanobu Fukuoka.

India is an agriculturally driven nation where around 80% of the rural population depends on it for livelihood. Since ancient times, the country has developed manifolds in the field of agriculture and today the sector is immensely growing with the help of new-age technologies.

With evolving technologies and developed agricultural practices, consumers today have become more aware of what fruits, vegetables, and grains are reaching their plates. They are interested in knowing how and where it was grown? Is it healthy to consume the product? How organically the crops or fruits are grown?

Therefore it is crucial to understand what better farming methods are, and how we can transition from conventional to organic farming.



About the **AUTHOR**

Mr Subrata Dutta is Group MD, Organic India

Difference between Conventional and Organic Farming

Conventional farming largely involves the use of pesticides and other chemicals to get the best possible quality of crops. This method is not one of the healthiest options, as it impacts the overall quality of the crops.

Organic Farming is a much better option. This involves sustainable ways to grow the crops

Steps Involved

The transition from conventional to organic farming is a journey where a farmer has to make numerous changes while understating each and every aspect of modern farming. Many times the transitioning farmers get confused about how to replace the synthetic raw materials with more organic options.

Here are a few things that the transitioning farmers can keep in mind while adopting organic farming.

Understanding basics of organic agriculture practices

First and foremost it is vital to gain sufficient knowledge about organic farming. The transitioning farmers should be familiar with organic production systems and sustainable farming. They should be ready to understand the steps involved in going organic and replacing synthetic materials with organic substitutes. Going organic involves a holistic approach where farmers need to focus on organic remedies available to them for certain problems that they may face during the transition. Prevention is the key to organic production.

Identifying resources to help in transition

Once you are thorough with the basics, identifying resources for organic farming becomes crucial. Connect with the farmers who are already practicing organic farming to gain knowledge about technical aspects. Practical experience from a mentor will be important in identifying the challenges and building new resources. They can also help you source the right materials for production which otherwise might get difficult due to lack of experience. The organic producers should also connect with agrologists, veterinarians, and other agricultural and financial consultants, in order to learn ways to improve their current farming practices.

There are varied reading materials available on websites of organisations--Agriculture Centre of Canada (OACC), the Atlantic Canadian Organic Regional Network (ACORN), the Canadian Organic Growers (COG), the Certified Organic Associations of British Columbia (COABC) that deal with organic or ecological practices. Transitioning farmers can join these organisations to build a strong network with practitioners in the field.

Set realistic goals during transition

Going organic can be a little long and a tedious process therefore it is important to plan your transition carefully with realistic goals. Develop a plan that you are comfortable following and identify steps that you would like to follow during the period of transition. Setting realistic timeframes in line with climate conditions is equally important. From the business point of view make sure to set a multiple-year budget and an effective marketing strategy that would help you harness the benefits of your efforts. Additionally, identify the reliable market that you like to be part of during the production of the organic products.

Deep understanding of soils is vital

Soil is at the core of organic farming. Therefore it is important to understand the varieties of soil and which is best suitable for the farming. Soils used in organic farming have different characteristics and there are several limitations to soils found on the farm. The suitability of the soil may vary from farm to farm. Factors such as good drainage in fields, high level of fertility, and adequate pH with very little pest pressure often qualify for organic farming.

The entrants to organic farming can also do a soil survey to analyse its quality early in the transition. Recycling is an important part of going organic and farmers must be able to recycle the nutrients of the soil through proper nutrient management.

Identify crops as per surrounding condition

Every crop has its season and before growing any crop it is important to consider factors such as soil suitability, demand for the product, marketing challenges, and the amount of capital required among others. Unlike conventional farming, organic farming involves large amounts of capital therefore it is always wise to choose the right crop as per the demand, easy availability of raw materials to grow the crops with more profitability and less workload.

Plan crop rotations beneficial in longer run

Once you have identified the crops, plan their rotations carefully. Ensure to select the most suitable cover crops such as winter cover crops, catch crops, smother crops, etc. Crop rotations are amongst the most important management tools in organic farming. They play a vital role in interrupting pest life cycles, provide and recycle fertility, and improve the overall quality and structure of the soil.

Pest challenges, methods of control

Having deep knowledge about the common pests of the crops is equally important. Pests have life cycles and there need to be adequate measures to control pest pressure. Crop rotation, catch crops, biopesticides, and sanitation are some of the ways that the entrants can follow to control pest pressure.

Agriculture Nanotechnology

PROMISING NEW TECH

Nano science coupled with nano technology is one of the most important emerging tools which can complement modern agriculture by providing sufficient amounts of agro-chemicals and new delivery mechanism to improve crop productivity. Nano materials control the uptake and release of essential nutrients. This science promises to accelerate the development of biomass to fuel production technologies. Potential benefits of nano technology for agriculture need to be balanced for substratum, water and environment.

Agriculture nanotechnology is the most promising new technology in the 21st century to conquer the challenges allied with conventional farming such as imbalanced ecosystem and low productivity

Nano particles ranging from 1 - 100 nm have unique physical and chemical properties, i.e. high surface areas, high reactivity, to enable pore size, and particle morphology. Therefore they have novel applications in diverse fields of science.

There is growing pressure on agricultural resources throughout the world due to pressure from human population. The green revolution introduced in 1970 solved the problem of hunger, by and large in many developing countries. Since then the global human population has doubled and stagnation in agricultural productivity has been

About the **AUTHOR**

Prof (Dr) Ajit Varma is currently Group Dy. Vice Chancellor, a Distinguished Scientist & Professor of Eminence, Amity Institute of Microbial Technology (Amity University Uttar Pradesh) & Vice Chairman, Amity Science, Technology & Innovation Foundation, Amity Campus, Noida. He has received more than 100 awards from several notable scientific bodies such as Commonwealth Fellowship (Australia), National Research Council (Canada), Alexander von-Humboldt Foundation (Germany), National Science Foundation (USA), Swiss Federal Research Fellowship (Switzerland), BP Koirala award (Nepal), DFG-INSA Fellowship (Indo-Germany), FAMI Award 2011 (India) and many more.

Ms Manpreet Kaur Attri and Ms Rashmi Dash, Amity Institute of Microbial Technology, Amity University, Noida

Ms Shubhangi Mahajan, Thorsten Schaeffer, Institute of Geoscience, Jena, Germany

Ms Manika Khanuja, Centre for Nanoscience and Nano Technology, Jamia Milia Islamia, New Delhi

Ms Pratima Solanki, Special Centre for Nanoscience, JNU, New Delhi

Nano technology has tremendous potential to enhance agriculture, horticulture, viticulture and allied fields. It can complement modern agriculture by providing sufficient amounts of agro-chemicals and new delivery mechanisms to improve crop productivity

experienced in many food crops.

This has necessitated the need for innovative technologies for crop improvement and resource conservation.

Nano technology is one of the recent innovative sciences that has tremendous potential to enhance agriculture, horticulture, viticulture and allied fields.

Nano science coupled with nano technology is one of the most important emerging tools which can complement modern agriculture by providing sufficient amounts of agro-chemicals and new delivery mechanisms to improve crop productivity. Nano materials control the uptake and release of essential nutrients. This science promises to accelerate the development of biomass to fuel production technologies. Potential benefits of nano technology for agriculture need to be balanced for substratum, water and environment.

Farm Application Of Nanotechnology

Nanoparticles and nano capsules provide an efficient means to distribute bio fertilizer in a controlled fashion with high site specificity, thereby reducing collateral damage. Farm application of nanotechnology is gaining attention by efficient control and precise release of fertilizers. Nanoparticles have high surface area, enhance absorption capacity and controlled release kinetics to targeted sites making them smart and efficient delivery system. Investigations have reported that nanofertilizer can improve crop productivity by enhancing the rate of seed germination, early seedling growth, improved photosynthetic activity, nitrogen and sulphur metabolism, carbohydrates and protein synthesis.

To explore the possibility of *P.indica* to promote plant and soil health, the authors made sincere effects to observe interaction of fungus with ZnO particles. ZnO nanoparticles are among the most popular nanomaterials synthesised at industrial scale. It is an extensively studied material due to their high electron mobility, strong stability at room-temperature luminescence, low toxicity, broad band gap, high-quality clarity and photochemical stability.

The Role Of Zn In Human Nutrition

- The optimum dietary intake for human adults is 15 mg Zn per day. Zinc acts as a catalytic or structural component in various body enzymes.
- Human body has the ability to generate around two million different types of proteins which are coded with only 20,000-25,000 genes.
- Out of these, nearly 10% of the proteins are Zn dependent. Therefore, Zn deficiency in human is often associated with many complications related to human physiology leading to reduced physical performance, growth retardation, impaired brain development, increased susceptibility to disease such as pneumonia and pregnancy risk factors
- Children and newborn (0-5years) are at a higher risk to Zn deficiency which often results in fatality
- Due to Zn deficiency; the human body will suffer from hair and memory loss, skin problems and weakness in body muscles.
- Further insufficient intake of Zn during pregnancy also causes stunted brain development of the foetus. Infertility has also been observed

in Zn deficient men. Zinc deficiency may cause congenital diseases like Acrodermatitis enteropathica

About a third of the world's population is estimated to be at risk of Zn deficiency, which is especially prevalent in children under 5 years of age because of their relatively large demand for Zn to support growth and development

The Role Of Zn In Plant Nutrition

- Zn plays very important role in plant metabolism by influencing the activities of hydrogenase and carbonic anhydrase, stabilization of ribosomal fractions and synthesis of cytochrome
- Plant enzymes activated by Zn are involved in carbohydrate metabolism, maintenance of the integrity of cellular membranes, protein synthesis, regulation of auxin synthesis and pollen formation
- The regulation and maintenance of the gene expression required for the tolerance of environmental stresses in plants are Zn dependent
- Its deficiency results in the development of abnormalities in plants which become visible as deficiency symptoms such as stunted growth, chlorosis and smaller leaves, spikelet sterility
- Zinc seems to affect the capacity for water uptake and transport in plants and also reduce the adverse effects of short periods of heat and salt stress
- As Zn is required for the synthesis of tryptophan which is a precursor of IAA, it also has an active role in the production of an essential growth hormone auxin

Biosource In Nanotechnology

Agriculture is the backbone of the economies of the third world. Unfortunately, agriculture faces many challenges now. The problems faced by agricultural scientists include urban sprawl and change in climatic conditions, which promote environmental problems like acid rain, decline in soil organic matter, misuse of natural resources etc. These challenges are going to be more serious because of the rise in world's population from 6 billion to 9 billion by 2040. Logically, there is need to implement more resourceful techniques to make agriculture more effective and sustainable.

Agriculture nanotechnology is most promising new technology in the 21st century to conquer the challenges which are allied with conventional farming such as imbalanced ecosystem and low productivity. Earlier the use of nanotechnology in the field of agriculture was for most part theoretical. To accomplish the demand for agricultural needs for the ever-increasing global population, the green revolution technology using biosource in nanotechnology can bring significant revolution – more than the existing technologies.

The ZnO in combination with symbiotic fungus is considered to be the perfect biofertilizer for plants. Application of nanofertilizers to plants at the time of sowing is required to alleviate various problems like soil pollution which is due to overload of chemical fertilizers. The best part of these nanobiofertilizers is that they are required in a very little quantity.

Acadian Plant Health™ is bridging the gap between the biostimulant sector and the crop protection industry

Biostimulant market presents a unique opportunity for closer collaboration with major crop protection players

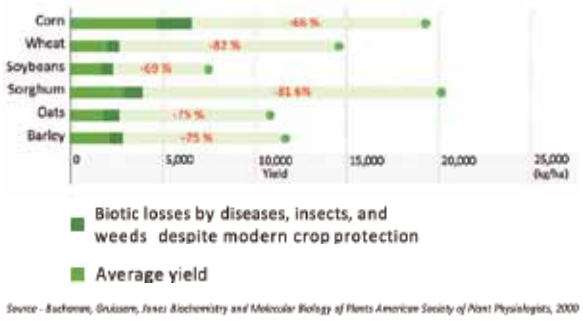
The effect of climate change on global agriculture is leading to increased pressure on all corners of the industry to mitigate crop stress. Acadian Plant Health™, a division of Acadian Seaplants Limited – the world's largest independent marine plant harvesting, cultivation, and extraction company – is responding to this growing need with solutions that help alleviate pressure on crops from drought and heat, frost, water, and other common stressors.

Volatile weather conditions continue to affect not just plant survivability but also crop yield, with losses related to climate stress increasingly felt by growers around the world. Coupled with a mounting public desire to see the crop protection market switch to more sustainable solutions, industry organizations are now exploring new partnerships with biostimulant companies.

Biostimulant companies are stepping up to meet this demand and capitalize on the opportunity for closer alignment with agriculture company portfolios. Acadian Plant Health™ is leading the charge, helping marry the high standards of the crop protection industry with sustainable biostimulant solutions. Acadian is outpacing its competitors with a high level of investment in R&D and field-tested data to support consistency and reliability of their *Ascophyllum nodosum* seaweed extract.

CROP YIELD LOSS CAUSED BY ABIOTIC STRESS

There is an inverse relationship in the value of the Crop Protection Market.
The global Ag chem market *243B$ (2019). **Biostimulants market 3B$ (2019)



Source - Buchanan, Gruissem, Jones Biochemistry and Molecular Biology of Plants American Society of Plant Physiologists, 2000

Crop protection companies expect proven results backed by data, and this is what Acadian brings to the table. The company's seaweed extract, *Ascophyllum nodosum*, is proven to stimulate plant physiology, improving crop survivability and productivity, allowing seed genetics to meet their full potential. Studies from the company also show improved soil and root health, which can contribute to increased carbon sequestration, a much-needed tool in safeguarding against the effects of a changing climate. Acadian's full access to the majority of Ascophyllum nodosum seaweed beds around the world means they can ensure supply to global partners with large portfolios.

This past year, fertilizer prices soared amid COVID-19 supply issues and the war in Ukraine. As well, new Green Deal initiatives were announced in Europe with an objective to decrease the use of synthetic fertilizers by a minimum of 20% by 2030. Sharing this new research with fertilizer companies, and the impact our seaweed extracts have on plant health, created new business relationships with these companies as they look for natural alternatives. This is a very positive move towards more sustainable agriculture and the fight against climate change.

Accordingly, Acadian has several leading brands in India used by farmers including SoliGro®, Stimplex®, Goldstar®, and Toggle® Plus. These products are utilized in various crops with different application methods including foliar, drench, and soil application or, as is recently the case, mixing with fertilizers. In the past, seaweed extracts were seen as an additive and not a necessity, so pickup in some of the agricultural markets was slower. But growers are savvy and are always looking for ways to further their business, and as they look for different techniques, they are seeing the value biostimulants, like seaweed extracts, can bring in supporting their financial sustainability and production.

As the gap between the biostimulant industry and major crop protection companies narrows, greater collaboration with strategic partners offers the prospect of mutual business growth for both sectors, stronger plants, and a more robust toolkit for growers – a win-win for global agriculture and the world's food supply chain.

Acadian Plant Health
Sustainably Empowering Plants.
AcadianPlantHealth.com

AGROCHEMICALS SECTOR

ROADMAP FOR GROWTH

The Indian economy is the sixth largest and one of the fastest growing economies in the world. It is largely dependent on agriculture, which contributes about 18% to the total GDP and provides employment to more than 50% of the population. Hence, the role of the agrochemical industry is undeniable in the economic development of country that ensures productivity and food safety.

From the application and manufacturing perspective, the agrochemical industry is segregated among Chemical Fertilizers, Organic fertilizers, Biofertilizers, Chemical Pesticides and Biopesticides. The chemical fertilizers and chemical pesticides segment is represented by large multinationals, national- and regional companies. The Organic fertilizers, Biofertilizers and Biopesticides segment includes mostly regional and local companies. Each segment has huge untapped potential, but the current and proposed regulatory framework is a major limiting factor for the development, growth and promotion of advanced and safer inputs. Regulations protect farmers' interests and environmental safety. They also remove counterfeit and substandard products from the market, assuring strict quality control. Regulations start from the registration of molecules.

About the **AUTHOR**

Dr Prafull Gadge is a scientist-entrepreneur & R&D strategist in the field of Agricultural Biotechnology. His expertise is in product innovation, process development and industrial problem solving

Challenges Posed By Registration Process

The current registration process is a major challenge before the agrochemical industries. It is a complex, time consuming and costly affair. This enables only large companies with strong financials and R&D infrastructure go through this process. It further increases the market price of those molecules and prevents them from reaching in the fields of small and marginal farmers. This leads to the use of low cost, comparatively toxic, generic molecules that have increased re-

sistance to pests, marked by low quality and productivity.

Several startups in the agrochemical sector are coming up with innovative molecules and formulations. These are efficient, eco-friendly and economical. But the startups are not able to grow due to the cost of registration.

The recent Biostimulants regulations are one of the most suitable examples to illustrate this. Potassium humate-fulvate, seaweed extracts and protein hydrolysates are essential inputs to restore soil conditioning and to mitigate abiotic stress. They are in use for more than 25 years.

Such inputs with fixed quality parameters should be taken under BIS certification standards like Bio-fertilizers. But they are subjected to expensive bio-efficacy and toxicity studies mandatory for registration. One, this will increase the price of these inputs. Second, it will shut down many small-scale manufacturing facilities, leading to unemployment and monopoly business of a few. Indirectly, this scenario of complex and expensive agrochemicals registration pose a major hurdle in the government's ambitious plan of doubling farmers' income.

Biopesticides are not only compatible in organic and natural farming. They are also effective in ensuring export quality residue free farming products, assuring food safety and health. Contrary to the government's promotion of organic and natural farming, registration for manufacturing of Bio-pesticide strains is an expensive and time-consuming process, as compared to that of chemical pesticides. Since Bio-pesticides are ecofriendly in nature, manufacturing permissions like biofertilizers will promote entrepreneurship, production and application of biopesticides. Instead of stringent registration norms, regulatory bodies should implement the molecular identification processes for sampling to effectively monitor quality and falsification of these living products.

Travelling, photography and amateur astronomy are my hobbies. They help me to understand, experience and evolve

Organic and biofertilizers are witnessing increased application and popularity among farmers. They reduce application of chemical fertilizers, reduce production cost and restore soil health. This segment is dominated by local companies, mostly established by agriculture graduates. There is urgent need to use this, and will lead to employment generation opportunities. Single window manufacturing and sale permissions will wider the production, promotion and applicability of these inputs. Promotion of rural entrepreneurship in this segment will promote the government's initiative for organic and natural farming.

Well-crafted financial and technical support is needed to ease the burden on startups and established agrochemical companies for registration of new molecules

Well-Crafted Financial And Technical Support Essential

Several technological, developmental and policy-based engagements demonstrate the government's commitment towards doubling farmers' income. Since R&D and product registration is expensive business, dedicated funding programs should be a part of policy. Well-crafted financial and technical support is needed to ease the burden on startups and established agrochemical companies for registration of new molecules. This will promote the development of safer, eco-friendly and economical inputs in farmers interests assuring food safety and health.

Agrochemical regulations assure human and environmental safety. But they will work only when end user is well aware of their application. Due to agronomic and agrochemical illiteracy, farmers are often recommended or sold extra inputs or agro-chemicals other than requirement. This is hazardous to our health, the environment and also increases the production cost of farmers without delivering appropriate results.

Usually, the application of pesticide at the right time, in the right amount, and at the right place demonstrates effectiveness. To make this happen, public private partnership should be encouraged or regularized at institutional levels such as ICAR research centers, agriculture universities and KVKs. Mandatory extension programs on label claim, maximum residue level (MRL), pre-harvest interval (PHI), harvesting period, etc. for respective inputs should be conducted for farmers.

Strict regulations for quality control will safeguard farmer's interest. Faster process and financial and technical support through dedicated schemes will encourage development and registration of safer molecules. Regularized extension will ensure productivity, food safety and health for all.

GLOBAL FOOD SECURITY

SAVING OUR SOILS IS CRITICAL

Soil is the foundation of agriculture, which makes it the most vital component of the food chain ecosystem. As aptly pointed out by Sadhguru, "Right now, the most important aspect of conserving nature is the soil. If we do not stop soil degradation, the planet will not be conducive for human beings to live upon it." Ensuring soil regeneration is the key to avoiding ecological disaster. Agriculture has to produce 60-70% more food to feed nearly 10 billion people. But how can we feed the 10 billion people with depleting soil and natural resources?

Secure the Soil

Food and nutritional security cannot be achieved without having healthy soil. Today, soils are under great stress due to various causes. Farmers are struggling to produce more crops due to soil degradation and desertification. Today, nearly one-third of agricultural land has degraded to the degree that it's no longer productive. Land degradation is creating an ecological crisis by converting soil into deserts leading to serious impacts:

- Loss of Soil fertility
- Depleted water resources
- Loss of soil biodiversity
- Soil has been stripped of its natural flora and fauna due to the intensive farming practices

Further increase in the cultivated area will have a further negative impact on forests and biodiversity. By 2050, the report estimates, 4 billion people will be living in dry lands.

About the **AUTHOR**

Mr Harshvardhan Bhagchandka is President, IPL Biologicals Limited

Pests And Diseases

Climate change and extreme weather conditions have a major impact on crop production and agricultural pests. Pests and diseases cause heavy crop losses. The extensive use of synthetic pesticides has ultimately resulted in increased pest resurgence and appearance of pest species resistant to pesticides. The organisms living in the soil suffer due to overuse of pesticides, leading to loss of soil fertility.

The irreversible consequences for the environment are resulting in severely depleted resources for humankind. It's time we started thinking about the next generations so that they don't face shortage of food, clean air and clean water. It is time to take pivotal steps to prevent the impending damage to our environment, extinction of the agricultural land, and the well-being of the generations to come.

Boosting Sustainable Intensification of Agriculture

In a recent event at Surat in Gujarat, PM Shri Narendra Modi said, "Adopting natural farming is akin to serving Mother

Earth and is also the basis for economic success". Saving soil health through sustainable agriculture is the key driver to saving the soil from nutrient loss, degradation, erosion, and depletion. There is need to organic matter and nutrient availability in soil. This will meet the nutritional requirement of the crops and help them become naturally resistant to environmental stressors. Microbes play a very important role in sustainable agricultural production due to their ability to promote plant growth and enhance biotic and abiotic stress resistance, remediate contaminated soils, recycle nutrients, manage soil fertility, and weather and mineralize rocks. Healthy soil is vital for our survival.

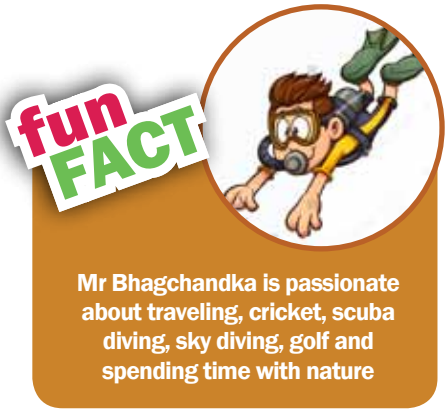
IPL Biologicals Limited offers 50+ innovative microbial solutions by "Unlocking the power of indigenous microbes" to help farmers in soil regeneration while increasing the productivity of their crops and delivering safe, healthy, and nutritious food to the end consumer's table. Our revolutionary microbial solutions with high CFU count, help farmers to achieve sustainable growth from seeds to harvest.

Now is the time that we bring more focus and increase awareness toward healthy soil management practices. The ownership of this responsibility is not limited to the farmers and food-producing organizations. This is a shared responsibility for everyone.

The government is making all its efforts to encourage sustainable farming practices. We recommend a few points.

* Act fast to reduce fertilizer subsidy and improve soil health: Fertilizer subsidy in India has significantly increased over the last few years. In the current year, the prices soared high and 2.3 L crore subsidy is to be borne by the government, exceeding the budget of 1.05 lakh crore for 2022-23. The government is looking forward to adopting biological solutions as an alternative channel, which is a great initiative. Adopting microbial will lead to lesser consumption of chemical fertilizers. This will help in controlling soaring chemical fertilizer subsidy, improving soil health and food quality.

There is need for focus on healthy soil management practices. This is the responsibility of not just farmers and food-producing organizations. This is a shared responsibility for everyone.



Mr Bhagchandka is passionate about traveling, cricket, scuba diving, sky diving, golf and spending time with nature

* Promote Integrated Pest Management: Awareness among farmers must be increased for the integrated use of pesticides. Along with chemicals, farmers should switch to alternate methods like microbial pesticides that maintain the ecological system of soil and enhance the nutrient efficiency in plants and produce.

* Making Biological solutions affordable: Biological solutions will be the future of sustainable agriculture. The government should consider exempting these from GST. This will encourage farmers to adopt biological solutions and reduce the cost of cultivation.

* Food quality: To ensure food safety and nutritional security, it is critical to monitor residue levels across India at the state level, as a part of IPM and GAP. India needs to aggressively conduct audits and assessments in all the states to identify the crops and regions with a preponderance of pesticide residues. There is need to prevent the entry of food and commodities with pesticide residues above the maximum residue limit.

Efforts toward Integrated Pest Management and the increased adoption of biological solutions in the food value chain is needed to protect soil health for sustainable agriculture and ensure food security. These efforts will boost the economy too.

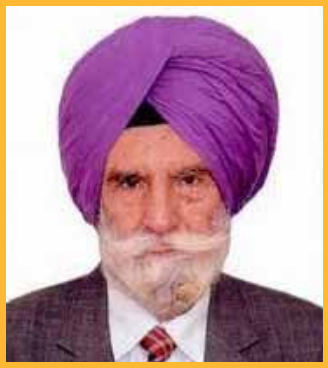
PUNJAB DECISION TO PROCURE ADDITIONAL CROPS

BIG BOOST TO CROP DIVERSIFICATION

The decision of Punjab government to procure Maize, Bajra, Moong and Sunflower along with other crops at the announced minimum support price is laudable. The decision has been appreciated by the general public including agricultural experts and economists.

Since long, a number of appeals were made to push for diversification in crops, but they made no headway. Lack of assured marketing for these crops was the only impediment. If marketing would have been assured, the stupendous results that had been obtained for wheat and paddy cultivation could easily be accomplished for these crops too.

It is a wise decision on the part of the government to procure these crops. These provide products of daily use throughout the country and abroad. The government must explore the potential of exports for products derived from those crops which are more suitable to the climate and the natural environment of the state.



About the **AUTHOR**

Dr SS Chhina is former Dean, Faculty of Agriculture, Khalsa College, Amritsar. He has written a number of books in the field of Economics and Agricultural Economy

Diversification Boost

Per hectare yield of sunflower in Punjab is 1795 kg compared to the national figure of 1043 kg. India produces just half of its total need for sunflower, and imports the rest. Ukraine is exporting about 70 percent sunflower seeds to India. Since Ukraine is involved in war, oil prices have risen.

If the farmers of Punjab are assured of MSP, Punjab can fulfill the needs of the country for sunflower seeds, and we can save precious foreign exchange.

Similarly maize, bajra and moong have a high yield in Punjab. These

must replace the area under wheat and paddy. The government should give MSP for some specific crops which are more suitable. For example, gram and arhar may be given such an assurance for Punjab.

Punjab has only 1.5 percent geographical area of the country, but is the largest contributor in the food stocks of India. In the initial stages its contribution of rice was low. It went on rising as more and more area was brought under paddy cultivation because of the surge in the number of tubewells.

These tubewells pump out ground water day and night along with the facility of free electricity. In 1966-67, Punjab was contributing only 5.2 percent rice in the food stocks of India, and its contribution in wheat was 63.8 per cent. In 2021, the contribution of rice and wheat was 22.6 and 30.5 per cent respectively. There were years when Punjab had contributed even more. In 1978-79 when there was drought in India, Punjab contributed 59.7 percent rice and 73.0 percent wheat. In 1968-69, Punjab contributed 78.5 percent of wheat in the food stocks of India.

We are now a food exporting nation. Punjab farmers have played a dominant role in this success. The state has paid a big price for this achievement in terms of depleting water level and environmental imbalance.

Dr Chhina is fond of reading, gardening, travelling and watching sports

Punjab has witnessed degradation of soil fertility with application of more and more chemicals and depleting water level. Due to the cropping pattern of wheat and paddy, there is underemployment among labourers employed in farming. This is vindicated by the fact that 50 percent of the population engaged in agriculture is contributing only 19 percent in the state domestic product. The other 50 percent and non-farming sector are contributing 81 percent.

The Income of the farming population is about one fourth of the non-farming income. This depicts under-employment in this sector, and that becomes a big impediment in raising their income.

With crop diversification, there shall be surge not only in human labour but also in capital, including machinery. There will be better distribution of work for labour as well as capital throughout the year.

Punjab is lagging behind in agro-processing industry. One of the constraints is lack of adequate raw material in vegetables, fruits, pulses oil seeds and other crops. Once the agro-processing industry starts thriving, it shall generate huge opportunities for the labourers who face unemployment. The state's decision to procure alternative crops shall boost the installation of agro-processing units. The decision shall promote confidence among farmers and also encourage new entrepreneurs that their investment will not go waste.

At the same time, the state will have to be cautious. It should not happen that only sunflower cultivation is boosted. There is lucrative business also for moong and other crops.

The Kerala model of procurement of vegetables can be emulated where one farmer can grow only two acres of one vegetable. The state can procure only from registered farmers

How To Go About It

The state will have to be divided in zones that can be based on districts or tehsils. Procurement can be made by registering the farmers who are willing to cultivate a particular crop. The Kerala model of procurement of vegetables can be emulated where one farmer can grow only two acres of one vegetable. The state can procure only from registered farmers, keeping in view the demand of the state, country or abroad.

Punjab Agri Export Corporation can be entrusted to look into the demand at national and international level. The required quantity can be procured under this scheme. The problem of the depleting water table can be addressed through this new policy. Alternative crops can be procured while planning for the required quantity of wheat and paddy. The other states must follow according to the respective crops grown in those states. It shall ensure the best use of resources and will enhance the most desired obligation of enhancing the farmers' income.

Making Crop Insurance Successful

Crop insurance (CI) schemes have been introduced from time to time to compensate losses due to natural calamities, but complexities involved in planning and execution have largely restricted their success rate. Most of such schemes involve the weather factor, since it plays pivotal role in realising the inherent yield potential of crops and greatly influences the occurrence of pests and pathogens.

Climate change has also intensified the yield risks, more in tropical and subtropical regions, which are caused due to undesirable and uncontrolled inputs. These are likely to remain so until certain mitigation strategies are widely adopted. Under such circumstances the role of formal risk mitigation mechanisms, of which CI is the one, becomes crucial to safeguard farmers.

Diverse Initiatives For CI

The first ambitious National Agricultural Insurance Scheme (NAIS) under the aegis of Agricultural Insurance Company of India on behalf of Ministry of Agriculture was implemented in 1999.

About the **AUTHOR**

Dr (Prof) SS Chahal is former VC, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, and the founding VC of Desh Bhagat and Khalsa Universities in Punjab

The sustainability of NAIS was seriously threatened due to the area covered under the scheme decreased from 15.69 million ha in kharif 2012 to 11.55 million ha in kharif 2014, while the claims increased from Rs. 27.86 billion to Rs. 29.20 billion during the corresponding period as reported by Indian Council of Food and Agriculture (ICFA).

This scheme was followed by Modified National Agricultural Insurance Scheme (MNAIS) with modifications like considering village panchayat as insurance unit, claim for prevented/ failed sowing, individual farm level assessment of losses, on-account part payment of claim providing immediate relief, threshold yield based on average yield of past seven years, 20% more minimum indemnity level and 40 to 75 % up-front subsidy in premium equally shared by Centre and States.

There were inconsistencies in number of farmers who opted for the scheme, sum assured and the equation between premium and claims, which might have occurred due to extreme weather calamities.

With certain corrections, the Weather Based Crop Insurance (WBCI) scheme was introduced in 2011. Due to some conveniences it received good response with increase in gross premium (Rs.15.66 billion) as well as claims paid (Rs.12.35 billion) in kharif 2014 by farmers and then offered as Restructured Weather Based Crop Insurance (RWBCI) scheme.

Pradhan Mantri Fasal Bima Yojna

The Pradhan Mantri Fasal Bima Yojna (PMFBY), introduced in 2016, is the most recent form of CI. It infuses lessons learnt from previous schemes and application of modern information and communication technologies. It was introduced with the objective of 'one premium one season'. Operating on an area approach, it covered all farmers including loanee, non-loanee, tenants and sharecroppers. Features which make PMFBY farmer friendly are that it covers risks from pre-sowing to post harvest periods, encompasses the modern techniques like satellite assisted global positioning system (GPS), remote sensing, smart phones and drones for precise and early assessment of yield losses for fast and fair settlement of claims.

Time taking assessment of losses through crop cutting experiments (CCEs) is conducted only where strong deviations are noticed from use of remote sensing and other technologies. Covering annual cash crops, all kharif and rabi crops at uniform premium rate of 5.0, 2.0 and 1.5 percent, respectively from farmers with remaining share from the Centre and States are unique features of PMFBY. Implemented in 27 States and UTs, 572.50 lac farmers were insured under this scheme in 2016-17 but their number decreased by 14.87 percent and area covered by 12.88 percent in 2017-18.

To accelerate the coverage and encourage wider participation of farmers, certain critical points including that there was inordinate enrichment of insurance companies, were addressed. This was done by making some amendments allowing voluntary participation of farmers, extended duration business allocation to insurance companies, limited premium subsidies and their date bound release by states, 80 percent increment in premium subsidies for north eastern states and freedom to states for selecting cop loss parameters.

Higher Awareness Needed

There is need to solve premium intricacies and to spread awareness among farmers by organising awareness campaigns, using social and digital media platforms and regularly updating PMFBY portals. It is vital to eliminate delays in claim settlements, ensure timely release of premium subsidies by participating states and simplifying the system for sustainability of CI schemes. States like Punjab have neither joined PMFBY, nor have their own such scheme, even though farmers are exposed to frequent catastrophes. Farmers are compelled to agitate for compensation, which are mostly decided arbitrarily without reliable supporting data on crop loss.

Challenges

Even with repeated revisions and relaxations, this flagship scheme is facing rough weather and is gaining slow popularity. States like Bihar and West Bengal withdrew from it in 2018 and 2019 respectively. Andhra Pradesh, Gujarat, Telangana and Jharkhand discontinued its implementation in 2020 because of low claim rate and other financial constraints.

West Bengal and Andhra Pradesh have formulated and launched their own CI schemes for farmers. Maharashtra may exit due to increased burden of premium subsidy share under the new amendments, revised guidelines and denial and delay of claims. It may also replace it with its own scheme.

Its proposal for remaining as a part of PMFBY is that there should be share of states in premium collected from insurance companies during a non-payout or normal year, popularly called as the Beed Model. This needs serious consideration to check the exodus and building interest and confidence of the states in the scheme. A new thinking to have risk mitigation measures separately for high risk area/crops and low risk crops needs to ascertain its viability as it will require to identify such area in each of the 15 agri-climate zones spread over a vast and varied geographical areas in the country.

Dr Chahal is fond of gardening, growing organic vegetables and listening to music

Boosting Agriculture

ENERGY TRANSITION CRUCIAL

The now-famous motto *Jai Jawan Jai Kisan* was given to us by our former prime minister Shri Lal Bahadur Shastri to honour the contributions of our troops and farmers. Years later, it appears that the general public has forgotten about the kisan and the agricultural industry. No more is it a 'desirable' sector for the youth, as more and more individuals migrate to our cities in search of the coveted life. The agricultural sector employs more than 40% of the workforce and accounts for close to 20% of the GDP. However, the industry has lost its luster and now faces major challenges in terms of empowering its resources. To say that our agricultural industry needs a major haul would not be an exaggeration.

One of the challenges faced by the sector is the slow adaption of non-conventional resources of energy as the dominant power source that could propel the sector to a global front-runner. The majority of farm owners still follow traditional practices. This is continuing despite awareness of the practices and resources that are making the life of their counterparts around the world easier. While there have been policy and reform announcements, the implementation still

About the AUTHOR

Mr Ishver Dholakiya is the Managing Director and Founder of Goldi Solar. The company is part of a larger conglomerate that operates profitable businesses across a gamut of industries such as finance, diamond, jewelry, aviation, construction, land development and many more

leaves much to be desired.

Renewable Energy Conversation

India has been at the forefront of renewable energy conversation and is expected to become a pioneer in energy transition globally. With effective and efficient implementation, transitioning to energy can lead to the socio-economic development of the sector. The impact is expected to be multifold, from irrigation to lifestyle upliftment. The domino effect is a given! The realization is reflected in the recent announcement by the government wherein it has set 2024 as the target to make the agriculture sector diesel-free and replace it with renewable energy.

This commitment toward the sector is also reflected in recent developments at the ground level. Take the example of the adoption of solar-powered pumps by the women farmers in Vidarbha. These women, who are mostly widows of the farmers who committed suicide, some being the sole earning member in their families, are paving the way for the rest of the country. The upliftment in their livelihood and living standards, powered through solar energy, can be an ideal case study for states to take inspiration from. While these developments might not be drastic, they share similar sentiments of creating an industry that is seen as leading the narrative on energy transition and becoming an example to emulate.

The Challenges We Face

However, the road ahead lies full of hurdles. The urgency shown by the central government is lacking at the state level. Over the years, there have been a plethora of policies and regulations that were announced, the implementation of which has been haphazard at best, with multiple delays and pending amendments. This has led the industry to become wary and every new announcement is seen with hope and a raised eyebrow, both.

Even the difference between the sanctioned and implemented numbers under the PM KUSUM scheme is a clear indication of the long path that needs to be traversed if we want to see the tangible impact of the energy transition. To state an example, out of the total sanctioned solar capacity of 4909 MW, only 53.25 MW has been installed.

Reliance on electricity subsidies available during the night has led to farmers irrigating their farms at night. This has worked against transitioning to solar energy, given the reliance on the sun and lack of awareness about energy storage solutions

Encourage Energy Storage Solutions

To achieve our target of 2024, the conversion from sanctioned to installed must increase exponentially. Another aspect that needs to be considered is the reliance on electricity subsidies available during the night. This has led to farmers irrigating their farms at night. It has worked against transitioning to solar energy, given the reliance on the sun and lack of awareness about energy storage solutions (ESS). With Indian manufacturers foraying into ESS, and with a push from the authorities, leading to more awareness, farmers can be found moving away from conventional sources of energy.

As a result of the global climate change 'red alert', nations all over the world are choosing renewable energy over traditional sources. To secure the growth of the heartland in India, it is now even more important to have consistent support for bringing this energy shift to the agricultural sector. To get closer to the goal more quickly, the steps that are already being taken must be made larger. This would not only provide farmers some much-needed relief from their financial burdens and redundant practices, but it will also give the agriculture industry the much-needed push to once again become attractive to the nation's youth.

Mr Dholakiya is an avid flying enthusiast. He obtained his Private Pilot License in just 18 days. In pursuit of his passion, he also launched a regional airline – Ventura Airconnect. The company was awarded as "The Most Innovative and Unique Project of the Year in Tourism"

UREA : BIOCHAR COMBINATION
THE WIN-WIN FORMULA

While it is acknowledged the plant needs major nutrients like N:P:K, Nitrogen in the form of urea is used more than other fertilizers. The availability of chemical fertilizers at highly discounted rates makes farmers use them indiscriminately, with no dramatic increase in yield. Availability of free water and fertilizers at subsidized cost encouraged monocropping in certain pockets that increased the use of chemical fertilizers multifold. Heavy use of urea has resulted in undesirable changes in soil fertility like depletion of organic carbon essential for normal growth of the plants, declining fertilizer efficiency and salinization of soil and water.

Subsidy Support to Agriculture

In India, the price of imported Urea prices have risen by more than 145%, from $930 a ton in April 2022 from $380 a ton a year ago. However, our farmers continue to be insulated from the relentless rise in global prices of urea, as the retail price is capped through subsidy. In the 2022-23 budget, the government allocated Rs 1.09 lakh crore for fertilizer subsidy, with Rs 42,000 crore for P&K fertilizers and Rs 67,187 crore for urea. It is obvious urea takes the major share in subsidy. Farmers pay a fixed price of Rs 266.5 per bag (45 kg) which covers about 20% of the cost of production. The balance is provided by the government as subsidy to fertilizer units.

About the **AUTHORS**



Dr P Sugumaran is Senior Scientist and Dr N Unnamalai is Principal Scientist at Shri AMM. Murugappa Chettiar Research Centre, Chennai. Dr S Seshadri works at Indigenous and Frontier Technology Research Centre, Chennai

Problems of Excessive Use

Only 20 to 30% N in the fertilizers is taken up by crops and plants. The remaining 70-80% of the nitrogen is lost, resulting in low efficiency of N utilization, high economic costs and environmental pollution.

Excessive use of N fertilizers in agroecosystems negatively impacts the environment. It causes severe pollution of surface water, groundwater and atmosphere. It also severely undermines the quality of farming lands via soil hardening, salinization and depleting organic matter resulting in loss of soil productivity. Therefore, improving the Nitrogen Use Efficiency (NUE) in agriculture and reducing the negative impact of nitrogen on the environment is essential to address challenges in food security, environmental degradation, and climate change.

Biochar as an Additive to Conserve Urea in Soils

Biochar is a carbonaceous porous material produced through the thermochemical transformation of biomass at an elevated temperature ranging between 350 and 700 °C under limited oxygen status. It has been acknowledged globally as an organic material for sustainable management of agricultural waste. Biochar displays outstanding features for the potential application, such as large surface area, porous micro-morphology, graphitic structure, and abundant surface functional groups. It has the potential to improve N recycling in agricultural soil–plant systems, reduce N_2O emissions, decrease N leaching, improve soil nitrogen availability, increase crop productivity, and promote the activity of soil microbes. Recent studies also show that biochar-based fertilizers can significantly increase the productivities of rice, cabbage, and green pepper, while enhancing total nitrogen use efficiency.

Field Experiments

A Farmers Participatory Field Demonstration programme was conducted to study the impact of

Urea:Biochar combination is simple and adaptable by farmers. This practice should be made mandatory by the government

Urea:Biochar mixture by farmers instead of Urea alone during Samba season (2021-22). This was conducted in Sivaganga, Pudukkottai, Trichy and Kallakurichi districts of Tamilnadu with 270 farmers dedicating 236 acres of land and 19 ruling paddy varieties of respective places for the study. The main objective of the study was to demonstrate the use of Urea:Biochar mixture and help them adopt optimized chemical fertilizer use to enhance soil health and reduce the cost of cultivation.

The farmers were randomly selected for the study. The lands were divided into two sizeable portions viz. a) one part for 100% urea application and 2) second part for 80% or 60% urea application. The farmers were encouraged to cultivate paddy as per their usual practices.

Urea:Biochar Preparation

Farmers were trained to produce biochar in their farms to convert the biomass using a small, simple, locally fabricated biochar kiln. Farmers were trained to mix the Urea with Biochar at least 12-24 hrs before application.

Experimental Design

For the sake of understanding, convenience, and to obtain concordant results, the ruling varieties cultivated in the region during the season in respective habitations were selected. For all practical purposes, the farmers were encouraged to use Urea:Biochar in 60:40 and 80:20 ratio along with 100% Urea as followed by the respective farmers. As per prevailing practices, the farmers applied the mixture in two doses viz. 25th day and 45th day after transplantation.

Observations

The results of the both the demonstration plots were encouraging. The results varied according to the area, paddy varieties, package of practice, soil type and water availability, with clayey soils registering better results. The 80% Urea:20% biochar demonstration fields registered better results. Area, varieties, and package of practice played a significant role in determining the yield. Ruling varieties like BPT and Ponmani registered better yield in 60% Urea+40% BC.

In other varieties like JCL and CR1009, the CR1009 responded well to 80% Urea + 20% Biochar. This was a surprising experience for farmers, with many fields registering increased tillers and normal yield like 100% Urea applied fields. The simple study resulted in saving more than 8000 kg of Urea amounting to savings of Rs. 0.47 lakhs to the farmers and 3.88 lakhs to the Government.

The Urea:Biochar combination can be a significant replacement to the standalone Urea application to paddy.

Future Outlook

Urea:Biochar combination is simple and adaptable by farmers. This practice should be made mandatory by the government. Training and demonstrations should be organized for farmers to help them understand the concept, produce biochar and use it in their own fields.

PROSPECTS FOR ANIMAL HUSBANDRY
HUGE POTENTIAL, NEEDS CONCERTED EFFORT

There are only few sectors in India that at once matter for macroeconomic indicators such as GDP growth and exports, as well as livelihood, employment opportunities and health at the poorest base of the economic pyramid. Animal husbandry sector is one such area that makes sense for sustained attention and investment regardless of the shifting priorities. Although historically neglected, the sector has started to gain the attention it deserves.

Formation of a dedicated Ministry in the form of Ministry of Fisheries and Animal Husbandry in 2019 was a major milestone. This has led to the focused attention on the sector and accountability towards progress. A desire for change and major reforms by the Ministry and the Government is reflected in the forms of various ambitious programs and reforms launched in recent times.

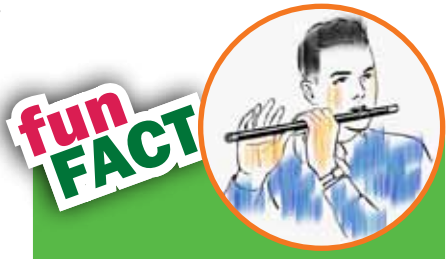
With the support from the Office of the Principal Scientific Adviser (PSA), DAHD and NDDB have launched the ambitious National Digital Livestock Mission (NDLM) (https://dahd.nic.in/sites/default/files/National%20Digital%20Livestock%20Mission-Blueprint-Draft%20%28002%29.pdf), which will reshape the sector in a major way. This mission aims to build a farmer centric, national level digital architecture that covers all the major livestock species, allowing for all the government schemes to seamlessly integrate, while at the same time providing a much-needed interface between the farmers

ABOUT THE AUTHOR
Dr Sindura Ganapathi works at the Office of Principal Scientific Advisor to the Government of India as a visiting PSA Fellow and Senior Visiting Scholar at Huck Institutes, PennState University. He is currently focused on building national programs in Animal Husbandry sector. He is also currently working with Union Ministry of Environment and Forests to help set up surveillance and disease management program for wildlife

and the markets, which is currently largely informal and fragmented. With their animals uniquely identified and linked to all the transactions, farmers will be empowered with the information and means to access government services, insurance for their animals and loans. The digital backbone built on top of animal identification will enable traceability of livestock products through blockchain based technologies. This will provide the ability for the consumers to track the lifecycle of the livestock products, thus enhancing information on quality and other key parameters at the consumer's side resulting in the ability to realize higher prices for such products through growing premium domestic markets and exports.

Robust Regulatory Systems in Animal Health

Covid-19 crisis in India showed why having a robust R&D, regulatory systems that are rigorous and can function in an agile manner are critical for life saving drugs and vaccines to reach people, resulting in one of the largest vaccination programs in the world and saving millions of lives. However, regulatory systems in animal health have lagged in its maturity. As a result, quality of medicines for the livestock sector has suffered, and has limited Indian industry's foray as a global force.



Learning and playing flute (Carnatic classical style). And then there are books of all kinds!

Over the last year, sweeping reforms have been made with concerted effort by DAHD, CDSCO, Indian Pharmacopoeia Commission and ICAR with support from the Office of the PSA. An Empowered Committee for Animal Health (ECAH) as the nodal advisory body with representation from all the allied sectors as well as independent input has been created with PSA as the Chair and Secretary, DAHD as the Co-Chair. ECAH has been identifying and taking up major policy changes and programs needed for the sector.

This includes initiating end-to-end online portals for product applications, simplified and predictable processes for approvals and transparency on timelines being introduced in the system. Goal is to enable a robust animal vaccine, pharma, and diagnostic industry in the country with quality products reaching the farmers in a timely manner. These reforms will also enable Indian industries to support global markets in a similar manner to Indian human pharma and vaccine industries.

Similar changes are being introduced in better testing of vaccines before they are approved, streamlined processes for procurement of vaccines by the government and implementation of vaccination programs in the field. While these changes are going to be far reaching, more efforts are needed if we were to realize the full potential of

The digital backbone built on top of animal identification will enable traceability of livestock products through blockchain based technologies

this sector.

Integrated Disease Surveillance System

An integrated disease surveillance system that enables tracking of diseases and linked to appropriate control measures are needed for India. FMD alone is estimated to cost over Rs. 20,000 Cr loss per year. If we need to reach the highest level of OIE certification of 'Free from FMD without vaccination' to unlock economic and trade benefits, a robust disease surveillance and control program is crucial.

Initial steps towards establishing 'FMD free compartments or zones' shall be useful. This builds on the NDLM ecosystem to track vaccinations, outbreak of diseases and animal movement control. Radical changes to disease surveillance are needed so that the insight into the disease prevalence in the field is dynamic and with good geospatial resolution. Introduction of novel approaches such as molecular environmental surveillance which have aided polio eradication successfully from the country are needed urgently. Building a robust disease modeling capability in the country to guide the disease eradication holistically is needed to guide the disease control in a rational, data informed manner.

Solving the problems of animal husbandry requires engagement of not just life sciences but technologies from across the spectrum

More Focus On R&D

More focus on R&D is needed in the sector across health, breeding and nutrition. While more resources are necessary, the bigger bottleneck is the limited engagement by the brightest of our minds and institutions in the country. Solving the problems of animal husbandry requires engagement of not just life sciences but technologies from across the spectrum.

Therefore, it should be a collaborative endeavor of not just ICAR and State agricultural or veterinary universities but the entire R&D, industry, and academic ecosystem of India. This includes institutes of DBT, DST, CSIR, DAE, wider premium academic institutions such as IITs and IIMs as well as the industry, both small and large.

We need to have a clear list of priority problems or gaps in the sector that is visible to the entire ecosystem. These include specific problems that need solutions such as digital solutions for better identification of animals, indigenous low-cost solutions for various breeding services such as in-vitro fertilization (IVF), novel and more efficacious vaccines, better and affordable solutions for mastitis in cattle and so on.

This should also include gaps in market linkages such as ability for the farmers and markets to find each other, and ability for the farmers to realize market prices at their doorstep, trading platforms that link vast expanse of this country as well as traceability solutions that can cater to quality livestock products for domestic and export markets which will over time lift the entire sector. Having clear set of problems that need to be solved and setting up these collaborative ecosystems with complementary skills can produce breakthrough solutions even with modestly incremental resources.

This will drastically reduce the time taken currently between an innovation such as mRNA vaccine becoming mainstream in human health and making it across to animal health. I believe the future of this sector is bright and filled with possibilities. What we need is to focus on creating 'enabling ecosystems' so that there is a thriving, innovative environment across education, R&D, manufacturing systems in India for this sector so that the resulting solutions reach the farmers in a timely and affordable manner.

AGRI-FOOD TECH EXPO ASIA 2022

www.agrifoodtechexpo.com

26 - 28 OCT

SANDS EXPO & CONVENTION CENTRE SINGAPORE

REGISTER NOW

7 KEY EXHIBIT THEMES TO PARTICIPATE IN

- FOOD PROCESSING & PACKAGING
- URBAN / SMART FARMING
- AQUACULTURE
- SUSTAINABILITY & RESOURCE MANAGEMENT
- FOOD SAFETY & SECURITY
- NOVEL FOOD TECHNOLOGIES
- DELIVERING THE FUTURE OF FOOD BUSINESS

EXHIBIT WITH US

Enquire with us today at
enquiry@agrifoodtechexpo.com

An Event Of

constellar

International Partner

DLG

A Participating Event Of

SIAW

SINGAPORE INTERNATIONAL AGRI-FOOD WEEK

FMC | An Agricultural Sciences Company

Your Progress, Our Nature

Now, with a bigger family