PROMOTING HEROES THAT DON’T WEAR CAPES

At NPPL, we are working with thousands of small & marginal organic farming families located in Seven states across India. We ensure them a regular marketing of their crop produce at most remunerative prices, thereby helping them improve their financial & social status. We take immense pride in improving the bio diversity & ecology of the area around the organic farming projects thereby improving the soil health and crop yields of our farmers.
Do the ordinances mean that farmers can now choose who gets to exploit them?

The pandemic has turned our lives topsy turvy…

Health and job security have never been more precarious than now. Already reeling under an economic slowdown, many industries are fighting a battle of survival in the times of Covid. Hiring freezes, salary deductions and layoffs have become the mantra of many businesses to remain afloat. On a positive note, the reverse migration compelled by the lockdown is prompting new opportunities for strengthening the rural economy as skilled human resource with urban exposure is now a part of the rural landscape.

Amidst this mayhem, Modi government’s three rushed ordinances in Agriculture have created a paradoxical situation. Policy makers and experts have welcomed the much-awaited reforms. But farmer associations and organizations fear that the three ordinances might end up being a source of distress, rather than helping millions of small and marginal farmers in the country.

This reform package combines three laws! Amendment of the Essential Commodities Act removes the existing restrictions on stocking food produce. The FPTC Ordinance ends the monopoly of APMC mandis. FAPAFS legalizes contract farming so that big corporates can cultivate land on contract. It is apparent that this bold step of announcing reforms without parliamentary debates and state consultations will have varying impact depending upon India’s huge geography.

Farmers feel that these three agriculture ordinances are an existential threat for them. They are apprehensive that the government is planning to stop procurement of produce at Minimum Support Price. Farmers say these ordinances are “undemocratic” because the government has brought them when the country is busy fighting the Coronavirus pandemic and the Parliament is not in session. They have also strongly opposed that there has been no consultation with farmer organizations regarding the ordinances. They state that the Centre has issued the three ordinances by taking advantage of the lockdown due to coronavirus. Farmer leaders say the government thinks that at this juncture, they cannot collectively agitate against the “anti-farmer reforms.”

On the other hand, policy makers, analysts and many noted economists believe that there will be different understanding among different stakeholders. It is possible that the ordinances may not have been properly understood and there are some concerns of stakeholders which need to be addressed. Judging by media reports, there are issues which do not exist or are mere apprehensions. Legislation is a continuous process. There can always be amendments based on feedback. An open house discussion will help in clearing doubts and letting the stakeholders appreciate each other’s concerns.

Farmers are conscious of their rights. They need to work towards deriving benefits from the new dispensation by forming robust FPOs which can empower them. The government should be seen doing much more proactive work by handholding the farmers and ensuring good prices to reassure them.

Unless there is legal backing, ensuring that trading does not take place below MSP… It won’t work!

Let’s see how the future unfolds…

Happy Reading!
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NAFED undertakes sale of grocery and food products in consumer packs through convenience stores at discounted prices.

- Items are sold through NAFED stores as well as franchisees and superstockist distribution channels.
- Popular NAFED brand Consumer Products:
  - Pulses
  - Spices
  - Tea
  - Organic Products
- Consumer Business undertaken through network of retail outlets by the name of NAFED BAZARS across Delhi and other states.
- NAFED's Retail outlets at Delhi, NCR:
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  - Lawrence Road
  - Krishi Bhawan
  - Rohini
  - Dwarka
  - Narela
  - GTB Hospital
  - Haryana Institute of Public Administration (HIPA), Gurugram
  - Moti Bagh
- Variants of NAFED brand Tea:
  - CTC PREMIUM, CTC (REGULAR)
  - TEA BAGS in 10 flavors: Assam CTC, Green Tea, Green Tea (Tulsi), Green Tea (Lemon), Earl Grey, English Breakfast, Masala Tea, Slimming Tea, Jasmine Tea and Rose Tea
- NAFED undertakes institutional supply of grocery and food items to prestigious organizations including IRCTC, Hospitals, Public Sector Undertakings, Schools, Hostels, various Ministries of Govt. of India, IITs etc.
Opportunities Galore for Indian Agro Exports

Post the Covid disruptions, analysts, economists and trade experts are busy examining the challenges and opportunities for various sub-sectors of the economy. Agri-food economy has gained worldwide, along with the health sector and digital technologies. Indian agriculture is estimated to grow at over 4%. The growth in the sales of agri-inputs and the jump in share prices of most agri and rural focussed companies is an indicator of things to come. The growth of tractors @18 - 20 % in May-June 2020 fits this new normal.

As India boosts its farm production with a huge surplus to export, many countries from the Gulf to Europe are facing challenges to ensure timely and adequate supplies of food products, especially the fresh segment. This promises a growing opportunity for India to tap the global agro-food market. Currently, India has only $39 billion exports and stands eighth in the ladder of exporting countries. The second largest agri producer globally is the eighth largest exporter, below even Indonesia and Thailand. The top exporters are EU ($181 billion), the US ($172 billion), Brazil ($93 billion), China ($83 billion), Canada ($69 billion), Indonesia ($46 billion) and Thailand ($44 billion), as per WTC Report 2019. The report says India can become the fifth largest agro exporter by taking some proactive steps. The report comes at a time when the Centre has announced reforms in the farm sector.

The New Agri Exports Policy (AEP) 2019 rightly focuses on taking states on board. APEDA has moved in right direction by signing up specific MoUs with 14 states on one hand, and national level MoUs with five important organisations. These include Indian Chamber of food and Agriculture (ICFA), IIT Delhi and Quality Council of India. The ICFA MoU is the most comprehensive. It proposes a 12-point action plan to be implemented, including helping states with studies and export plans, preparing state export baskets, organising capacity building programs, engaging with states to promote precision farming in clusters, creating 1,000-plus agri export startups, creating commodity specific bodies and continental platforms for Gulf, EU, Latam, ASEAN and Africa, preparing logistic protocols and taking up GAP certification in association with Global G.A.P, ICFA being the Country Partner for India. Through focused interventions, India can enhance its agro exports to surpass Thailand and Indonesia in just two years.

The major challenge remains cost and quality competitiveness. The state governments will have to take up precision farming projects under RKVY and NHM on large scale to improve cost and quality to global standard. The success of TNPFP in Tamil Nadu is a classic example. Such measure will also significantly improve the profitability of farming. The ICFA Zoom conference on July 24 has come out with 10 recommendations that need to be implemented by export promotion bodies. It is heartening to note the speed and the sense of urgency with which the Central Government and some of the state governments are working to promoting agro exports. After the launch of ICFA Exports Council in November 2019 in New Delhi, the Chamber is launching several commodity-specific boards to focus especially on small untapped exportable crops such as Quinoa, Chia, Methi, Moringa, Millets etc. I am confident that the nation shall achieve the target of $60 billion well before 2022 and $100 billion by 2025, as per the call given to the nation by the Hon’ble Prime Minister.

Dr. MJ Khan is chairman of the Indian Chamber of Food and Agriculture and can be reached at chairman@icfa.org.in
When the farmer discovers the power of the Self

Working in the agriculture media, I encounter on a regular basis farmers writing about farm distress. There are evocative poems in our mother tongue on the abject helplessness of the farmer. There are harsh facts that one must face. And yet, through all this, human spirit shines. Just as it has shone through these harrowing Covid times.

The achievement of a farmer named Bappa Rao Athota of Andhra Pradesh is one such account. The story aptly appeared on a website named thebetterindia.com. Truly, this is one of the millions of stories of The Better India. Far better than the pathos-and-everything-gone-wrong that the media largely feeds us daily.

I am recounting the story to illustrate that our farmers, our youth have the ability to turn around adverse situations if they believe in themselves and move forward with conviction. Yes – handholding by the government and non-government agencies shall immensely help. But human initiative must flower and blossom in order to make things happen.

Bappa was formerly a graphic designer working in Hyderabad’s robust corporate sector. He is now a happy farmer who toils on his small landholding. He does not dress up in shirts and trousers any more. A dhoti and kurta are his attire. Bappa does not use any chemical fertilizers or pesticides on his land. He does only organic farming, and has grown about 280 varieties of rice – plus more!

A few years ago, Bappa’s grandmother fell gravely ill with cancer and died. The doctor told the family that a major reason for rise in cancer cases was the indiscriminate use of chemical fertilizers and pesticides in fields.

Bappa was moved. He decided that he would become a farmer and do organic farming only. Ironically, his family and friends opposed him. His father did not want that Bappa should leave a well-paying corporate job and become a desi-dehati.

But in 2016, Bappa returned to his roots. His target was completely swadeshi agriculture, and growing produce that boosts immunity. The farmers around him had no idea of organic farming, so Bappa researched the subject extensively. He concluded that Indian farmers use chemical fertilizers and pesticides extensively because they are not using Indian seeds in their fields. He found that if agriculture is done properly, farms don’t need any chemical fertilizers or pesticides. Bappa also found earthworms to be the best friends of a farmer.

In the first year of farming, output was reduced to 50 per cent of the previous year’s produce. It rose to 80 per cent in the second year. In the third year, Bappa was able to record the same produce as the pre-organic farming period with low cost. And in the fourth year, the produce from his land is set to overtake highest previous output. Bappa has started direct sale of his farm produce to consumers since it fetches a better price.

Bappa realized the need to save the best seed for the next crop, in line with the Indian farming tradition. This made him embark on the project of One Village One Seed. In addition to farming, Bappa is now engaged in the development of a completely swadeshi seed bank.

He believes that the goodness of seed determines not only crop health but also the health of the large populace at the crop feeds. Bappa Rao’s dream is that every village or mandal must have a stronghold of seed varieties of local crops. Indeed, there is no holding back the individual who discovers the power of the self.
EXponential Growth of E-Commerce, Home Services Sectors

Covid Crisis Has Led to Rapid Evolution of Workforce Ecosystem
India shall see a surge in many manufacturing sectors since dependence on China is expected to diminish exponentially. Which are the major sectors in which the Ministry shall need to skill the labour to eliminate dependence on China and build an Aatmnirbhar Bharat?

Being the youngest nation in the world, we have an enviable resource pool, and we must ensure we tap India’s huge demographic dividend to the fullest. The Skill India Mission was conceived with the very idea of unlocking the intrinsic value of this resource through skill building so they can take part in the road to progress. As we work towards accelerating India’s journey on the ‘Road to Recovery’, our focus is on exploring existing as well as emerging possibilities to strengthen the skilling ecosystem and reduce dependency on imports from China and other countries.

While there would be enhanced focus on emerging technologies like AI, IoT, Cloud Computing, Data Analytics and Cognitive Sciences, emphasis is also on opportunities in priority sectors such as Healthcare, Agriculture & Allied Services, IT, Logistics, Retail, Infrastructure and Waste Management. We are tasked with reinventing ourselves and building a robust training delivery mechanism that follows highest standards and quality parameters to meet the demand for a skilled workforce of the future. We are also working towards enhancing the existing infrastructure and resources to leverage the sustained growth of power and renewable energy sectors.

A resilient skillset can help workers mitigate challenges and be industry-relevant and ready for jobs of the future. We aim to create a large base of skilled workforce that can domestically manufacture everything that is required to help the Indian economy set course on its growth trajectory by eliminating the need to import products and equipments from China and other countries.

Which new sectors shall witness growth and expansion due to the impact of the Covid crisis? Please elucidate with reasons.

Despite the global pandemic’s adverse impact on the Indian economy, some sectors like Rural Logistics, Sanitation, Agriculture, Horticulture, Animal Husbandry, Healthcare, Infrastructure, and Waste Management have shown positive signs with increased demand for qualified and efficient workforce. Healthcare and pharmaceutical sectors especially have been witnessing an unprecedented surge in demand for skilled workers to strengthen our ongoing fight against Corona virus. The pandemic has also given rise to huge demand for skilled workforce to take up the task of disinfection and sanitization of private and public spaces as well as various modes of transport. Also, as a result of mass reverse migration of skilled workers to their native places, agriculture and allied services will continue to see significant growth in the future as well.

With a new normal coming into place, the significance of new-age job roles such as Artificial Intelligence, IoT, Cloud Computing, Machine Learning, Blockchain Management, Data Analytics and Robotics will grow further. Jobs are going to become more specialised.

China factor, what would be the blue print adopted by the Ministry to skill the youth in the sectors that shall witness a spike in demand?

There must be quick and continuous assessment of demand and blended models for learning which are scalable, qualitative and have quick turnaround time. There will be heavy focus on re-skilling and up-skilling. With lesser dependency on China, India will see several opportunities come its way. We will have to uplift and enhance our manufacturing and industrial output to reduce external dependency, while also catering to international demands. This recovery will be driven also by the entrepreneurial spirit that we have been inculcating in our students over the years and the focus we have laid on new-age skills that will become increasingly important to ensure a promising future.

The country has 2,700 government-run Industrial Training Institutes (ITIs) and 300 government-run polytechnics. They have been lying closed due to the pandemic. How does the government plan to use this massive infrastructure to train youth in skills where there is demand and supply gap?

All the government and private ITIs...
have been extended to the Ministry of Health and Family Welfare and State Governments, to be used as quarantine/isolation centers depending on local requirement. The Institutes will resume training only when directed from the Ministry of Home Affairs and local State governments. They will ensure that they adhere to the new norms of social distancing and direction from the government on taking precautions while training.

**How can the agriculture sector benefit from the skills imparted by the Ministry of Skill development and Entrepreneurship?**

In the last five years of our journey towards ‘Skill India Mission’, we have been working closely with Agriculture Skill Council of India (ASCI) towards building capacities and upgrading the skills of farmers, wage workers and self-employed workers engaged in organized and unorganized sectors. Under our flagship scheme Pradhan Mantri Kaushal Vikas Yojana (PMKVY), we laid special emphasis on the agricultural sector and 3.42 lakh candidates have been trained in special farming. We have been working consistently to bridge the existing gaps through skill empowerment and help farmers adopt innovative farming technologies for increased agricultural production and prevention of crop loss.

The aim is to integrate best practices and to improve the agri-marketing reforms since 44% of the country’s labour force is engaged in this sector. We have aligned our efforts to give a huge impetus to skilling in agriculture and allied sectors through strategic interventions and structural reforms.

The self-employment opportunities in agriculture for the workers returned to their native places can be created in allied sectors by re-skilling them. In a large number of village industries, cottage industries, and microenterprises ranging from textile to food processing, agricultural products are used as raw materials. For the expansion of industrialization in villages and towns, skilled agricultural labourers can be used by appropriate re-skilling.

In recent years agri-business has emerged as a specialized profession. Hence for any start-up in this sector needs adequate skilling and working capital. The credit linkage will be crucial. These workers can be linked to MUDRA loans or provided loans under the Priority sector.

Post Covid, we expect stricter food safety norms in many countries impacting our exports. A heightened concern for hygienic methods of production will now be the new normal. We need to be prepared for it through continuous training of our labour force. In the present scenario, food and nutrition security of the labour households get prime importance. Hence, training on backyard farming/kitchen garden is most important for the migrant labourers of both rural and urban sectors.

**Sectors like home services and e-commerce saw an impressive growth following the lockdown. Did the Ministry study the home services which were most in demand?**

In line with our commitment to strengthen the skilling ecosystem in the country that spurs business competitiveness and economic growth, we keep heavy focus on closely monitoring and evaluating the changing patterns of demand and supply of jobs across sectors. The Covid crisis has resulted in rapid evolution of the workforce ecosystem. E-commerce and home services sectors have seen exponential growth over the last few months. The demand for skilled workforce in home services will continue in near future. Our Sector Skill Councils which are industry autonomous bodies, are consistently mapping such change work environment. Accordingly the working guidelines and curriculum are being altered, especially for job roles which demand close human contact like beauty and wellness.

**With a significant number of skilled and semi-skilled laborers going back home, how can their services be utilized locally? Can the Ministry provide the essential linkages for this large workforce in the rural areas?**

The outbreak of the global pandemic has resulted in millions of workers moving back to their homes, in the hinterland. This has also caused a reconfiguration of the supply and demand balance as new demand patterns for jobs have arisen. More and more workers are also looking for job prospects closer to home to be able to support their families and...
navigate through the current period of economic uncertainty. Rural Logistics, Sanitation, Agriculture, Horticulture, Animal Husbandry, Healthcare, Infrastructure, and Waste Management are some sectors where demand for skilled workforce has been witnessing a surge in the post-Covid era.

The large-scale reverse migration has led to rise in availability of skilled workforce in semi-urban and rural areas to take up various job roles across these sectors. With the recent launch of Aatmnirbhar Skilled Employee Employer Mapping (ASEEM) portal we aim to provide a match-making engine for our skilled workforce and reconnect them to employment opportunities in their native places. Many of them are highly skilled and experienced. We are working closely with various state governments and district administrations to enable these workers to explore relevant employment opportunities to sustain themselves while supporting the local industries.

We also expect a lot of migrant workers returning to their hometowns would want to re-skill and up-skill themselves according to the demand of the local economy. Hence, the mapping plan will attempt to classify them as per their existing skill-sets and a skilling plan would be drawn according to demands of native businesses. The district/cluster administration will help deploy skilled labour locally while the semi-skilled workforce will be re-skilled and connected to relevant industries. This will help migrant workers earn a livelihood and may immediately provide industries much-needed workforce to resume operations to their full potential.

Our Prime Minister in his address on July 15th, which marked 5 successful years of the Skill India Mission, on the occasion of World Youth Skills Day, said that it is imperative that to skill, upskill and re-skill ourselves to remain relevant in the market. His mantra of consistently upgrading oneself in lieu of the new normal and the changing work environment, inspires our nation’s youth to opt for online and offline courses in market relevant job roles.

Is the Ministry compiling data of skilled persons across the country? The data is being compiled in how many categories? What is the target date of completion?

Driven by Hon’ble Prime Minister’s vision of Aatmnirbhar Bharat, we recently launched Aatmanirbhar Skilled Employee Employer Mapping (ASEEM) portal to help skilled people find sustainable livelihood opportunities. The AI-based platform has been envisioned to improve the information flow in the skilled workforce market and help qualified workers explore emerging job prospects. Database of 24 lakhs candidates trained under the PMKVY and Fee-based courses is available on ASEEM. 1.5 lakhs candidates trained in ITIs under DGT have been added. Also, the data captured under the SWADES initiative is available for employers.

SWADES (Skilled Workers Arrival Database for Employment Support) is a collaborative initiative of the Ministries of Skill Development & Entrepreneurship, Civil Aviation and External Affairs, to map skilled workforce returning from other countries under the Vande Bharat Mission. Through this initiative, we aim to create a database of qualified citizens returning from overseas based on their skillsets and experiences, to tap into and fulfill demand of Indian and foreign companies. In addition to this, we are working on adding data of all the candidates trained under PMKVY 2.0 on the portal as well.

The ASEEM portal has been envisioned as a long-term project to give a huge impetus to our persistent efforts to bridge the demand-supply gap for skilled workforce across sectors. Taking cognizance of the rapidly changing nature of work and how it impacts the workforce is crucial in restructuring the skilling ecosystem with the new normal settling post-pandemic.

We have also undertaken an extensive exercise of skill mapping of migrant workers across 116 districts in 6 states which are labour-intensive. We are working closely with the Ministry of Rural Development and other related entities under the Garib Rozgar Kalyan Yojana to re-habilitate migrant workers who have returned to their home state.
PADMASHRI DR. M.H. MEHTA

Dr. Mehta is the Chairman of the National Working Group, Indian Chamber of Food and Agriculture (ICFA), Chairman, The Science Ashram and Gujarat Life Sciences, and former Vice Chancellor of Gujarat Agricultural University (GAU). He is recognized for leadership to Asian and African countries for Eco Agri Revolution.

Dr. Mehta pioneered the development of several eco-friendly processes, earning about 17 patents and setting up country's first semi-commercial plants for bio-fertilizers and bio-pesticides and helped start several units.

He is founder Director of a number of world class institutions, industrial establishments and NGOs like The Science Ashram, Gujarat Life Sciences, GSFC Science Foundation, Gujarat Green Revolution Co., National Bio-Shield Society, Vishwamitri River Revival Projects etc.

Dr. Mehta is the recipient of several awards / honours including Padma Shri, Millennium Leader of Asia Award, Honours by Cornell University (USA), Royal Institute (Stockholm) Beijing University, Indian Science Congress. With a missionary zeal, Dr. Mehta is leading the Eco Agri Revolution for Ever Green Revolution so important for the future.
The Rotary Club of Madras East (RCME) has decided to confer on Dr Raj Paroda, Chairman, TAAS very prestigious Dr. M.S. Swaminathan Award for Environment Protection 2020 for his enormous and significant contributions in the field of plant breeding and genetic resource management.

Dr. Paroda received the Padma Bhushan in 1998, a prestigious civilian award from the President of India. He is also the recipient of several national and international recognitions for his outstanding achievements.

Dr Paroda, under his leadership of ICAR, established a large number of institutions (more than 30) in the field of crops, horticulture, livestock, natural resource management, fisheries, agricultural engineering, and social science sectors. Besides national Genebank, he established a strong genetic resource management system in India though creation of Bureaux on animal, fish, insects and microorganisms. The gene bank at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad has been named as ‘Rajendra S. Paroda Gene Bank’ in recognition of his enormous contributions in the field of plant genetic resources.

Dr Paroda will be the first Indian to receive this award. The past recipients of this Award include: Dr Ismail Serageldin, former Vice-President of Sustainable Development at the World Bank and chairman, CGIAR, Dr Jeffrey Sachs, former Head, Earth Institute, Columbia University, Dr. Sartaj Aziz, former Foreign Minister and Principal Advisor to Prime Minister of Pakistan, Dr Bruce Alberts, former President, National Academy of Sciences, USA, Dr David Bergvinson, former Director General, ICRISAT and Ambassador Kenneth Quinn, President, The World Food Prize Foundation.
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Rattan Lal, Ph.D., is a Distinguished University Professor and Director of the Carbon Management and Sequestration Center at The Ohio State University.

He is Adjunct Professor at the University Iceland, and holds a Chair of Soil Science and Goodwill Ambassador position with Inter-American Institute of Cooperation in Agriculture, San Jose, Costa Rica. He was President of the Soil Science Society of America (2006-2008), and the International Union of Soil Sciences (2017-2018).

INDIA MUST HAVE
A NATIONAL SOIL PROTECTION POLICY

ABOUT THE AUTHOR
Prof Rattan Lal is a Distinguished University Professor of Soil Science and Director of the Carbon Management and Sequestration Center, The Ohio State University, USA
During the early 1960s, faced with a serious food deficit and a heavy tax on imported grains, India was considered a basket case. It was said that India cannot be saved. There were serious concerns whether India could ever be food self-sufficient. Contrary to these domestic prophecies, the growth of agronomic production—not only in India, but in the whole of the South Asian region—was not only dramatic, but largely unpredicted.

Between 1947 and 2020, the population of India increased from 330 million to 1.38 billion, by a factor of 4.18. In comparison, food grain production increased from 50 million Mg in 1947 to 298 million Mg in 2020, by a factor of 5.96. Thus, per capita grain production increased over this period despite a rapid increase in population. India’s food grain production can be doubled to about 550 million Mg by 2050 and beyond through adoption of scientifically proven and innovative technologies for soil, water, crops, forests, and livestock management.

Environmental Footprint of Agricultural Production

Despite the unpredicted and unprecedented success in achieving agricultural production, there is no cause for complacency. Even bigger and more daunting challenges lie ahead. These challenges are specifically related to the high environmental/ecological footprint of agro-ecosystems with severe issues of soil degradation, depletion of groundwater, contamination of surface and groundwater, air pollution and loss of biodiversity both above and below ground. Similar to plant and animal species, soils are also prone to being extinct through irreversible degradation. Some soils are endangered because of land misuse and soil mismanagement.

Land area affected by a wide range of soil degradation processes in India is conservatively estimated at 114 to 147 M ha. Of this, 64 M ha is affected by water erosion, 9 M ha by wind erosion, 14 M ha by water logging, 7 M ha by alkalinity/salinity, 16 M ha by acidity, and 7 M ha by complex processes (ICAR/NAAS 2010; Bhattacharyya et al., 2015).

Important among unaccounted processes of soil degradation, despite the extent of the land area affected and severity of adverse effects on productivity and environment quality are: depletion of soil organic matter (SOM) content in the root zone because of extractive farming practices, elemental imbalance because of unbalanced use of fertilizers, truncation of the top approximately 1-m soil because of scalping for brick-making, dwindling of soil biodiversity because of removal or in-field burning of crop residues, soil pollution and contamination because of indiscriminate dumping of industrial effluents and chemicals, etc.

Degradation of soil health, denudation of hills and landscapes, depletion and contamination of water, pollution of air, and severe loss of biodiversity are among the ecological footprints of agricultural intensification since the mid-1960s. Food self-sufficiency has been achieved at the heavy price of soil degradation and environmental pollution. This situation
must be reversed by restoring soil health and improving the environment through adoption of best management practices.

**Rapid Urbanization**

Rapid and often ad-hoc urbanization is among the major drivers of soil degradation/depletion and environmental pollution. Between 1950 and 2030, population will grow by a factor of 30.0 for New Delhi, 4.2 for Kolkata, 10.0 for Pune, 11.6 for Hyderabad, 21.1 for Bengaluru and 9.9 for Chennai. Annual increases of 11.5 million in India’s population (equal to the entire population of Tunisia, Bolivia, Belgium, Haiti, Cuba, South Sudan, Benin or Burundi), encroaches upon a land area of about 0.5M ha/yr. Prime agricultural land must be protected against urbanization and other non-agricultural uses. By 2025, India will have seven cities of more than 10 million people. A city of 10 million requires 6000 tons of food per day. Thus, 10-20% of fresh vegetables and fruits must be produced within the city limits by recycling the city’s waste by promoting home gardening and urban agriculture.

The number of bricks made in India by removing surface soil is approximately 700 million per day. The soil-destructive practice of brick making by removal of productive surface soil must be discouraged. It is important to identify a few sites within a district or town from where clay can be mined to deeper depths for brick making rather than removal of fertile topsoil. Alternatives to clay (i.e., fly ash, rice husk) must also be identified.

**Need for Paradigm Shift**

Along with the impressive progress in enhancing agronomic production, there is a strong need in India to restore degraded soils and restore the environment (i.e., air and water quality, biodiversity). India must reconcile the need for increasing and sustaining food production with the urgency of improving the environment and restoring degraded soils. These are not mutually exclusive goals, and India must achieve both.

The paradigm shift lies in adopting the strategy of making agriculture integral to improving the environment. Therefore, the next Green Revolution must be:

1) soil-centric, based on enhancing soil resilience
2) eco-system oriented, based on enhancing eco-efficiency of inherent and applied resources
3) knowledge-driven, based on scientific concepts, basic principles of sustainability
4) nutrient-focused in food, emphasis on nutrition-sensitive agriculture (i.e., micronutrients, protein, water is either volatilized or leached into the groundwater. This leads to air pollution and water contamination. Use efficiency of nitrogenous fertilizers may be less than 30%. Attendant with the low use efficiency of irrigation water is the decline in renewability of water resources. Soil degradation also leads to loss of soil biodiversity. This further weakens some essential ecosystems services by degrading and depleting soils and polluting the environment. Hence both the quality and nutritional quality of the food produced is severely jeopardized. Important issues which need to be addressed are those related to wasteful flood-based irrigation, excessive and unnecessary plowing and puddling, severe post-harvest losses of grains and of fresh fruits and vegetables, and stagnating and low crop yields, especially under rainfed conditions.

**Challenges Facing India’s Agriculture**

There is an urgent need to restore and enhance soil health of agro-ecosystems. Therefore, soil organic matter (SOM) content in the root zone (approximately 30 cm depth) must be increased. Most soils, especially those of the agro-ecosystems, have a low SOM content of 0.1 – 0.5% as compared with an optimal range of 2 to 3%. Consequently, use efficiency of water and nutrients is low. A large proportion of fertilizers broadcasted on soil surface or in standing paddy
vitamins)
5) sustainability-driven, based on restoration of basic resources (i.e., soil, water, biodiversity) and enhanced over time
6) farmer-centric so that wellbeing, respect, integrity of farmers is enhanced

The paradigm shift towards eco-agriculture is based on the following premises:
1) soil fertility cannot be managed by indiscriminate use of chemical fertilizers
2) drought cannot be managed by flood-based irrigation
3) accelerated soil erosion cannot be controlled by installing terraces, land-forming, establishing other engineering devices
4) soil compaction cannot be alleviated by frequent, extensive plowing
Soil functionality, affected by optimization of physical properties with chemical and biological attributes, must be used, improved, and restored. Soil must never be taken for granted.

The Law of Return
Soil-centric and ecosystem-oriented agriculture must be based on the Law of Return outlined by Sir Albert Howard (Howard 1943). It states that all that is harvested from agricultural ecosystems must be replaced in one form or another so that soil productivity and functionality are sustained in perpetuity. With the objective of restoring SOM content in depleted agricultural lands, the mission is to create a positive ecosystem/soil carbon budget by increasing input of biomass-C more than the losses caused by erosion, decomposition and leaching.

A judicious use of The Law of Return is also essential to realizing the Sustainable Development Goals of the U.N or the Agenda 2030. Soil must be managed through adoption of conservation agriculture or regenerative agriculture. Organic farming can be a component of CA or RA but it is not a necessary condition for a site-specific package of regenerative agriculture.

The package comprises of the following:
1) Using no-tillage
2) Retaining crop residue as mulch
3) Establishing cover crop or forage during off-season
4) Adopting integrated nutrient management
5) Integrating crops with trees and livestock

Incentivizing farmers is essential
For adopting this eco-friendly agriculture, farmers must be rewarded through payments for strengthening of ecosystem services. Such payments must be based on fair and just prices as determined by the societal value of the service provided, and can be Rs 1200 to Rs 1500 per acre per year. The strategy is to produce more from less by increasing the use efficiency and narrowing the yield gap.

There must be a road map and plan for reducing the use of fertilizers, pesticides, flood irrigation, residue burning and scalping surface soil for brick making beginning with 2020, and assessing the impact on evaluating soil health on national basis every five years. The area equipped for irrigation can be increased using micro-irrigation. Total amount of water withdrawal must be decreased because of reduction in evaporation and seepage losses. Increase in SOM content through carbon sequestration will decrease need for irrigation and input of chemical fertilizers. Restoration of soil health will enhance disease-suppressive attributes of soil and reduce need for pesticides.

India must have a national soil protection policy. Being a living entity, soil has a right to be protected, restored, thrive and managed judiciously. Simply having ownership of land does not give anyone an excuse to misuse and jeopardizing its life-supporting capability. Prime agricultural land must also be protected against non-agricultural uses including urbanization, surface sealing and disposal of industrial effluents.

Soil Health and World Peace
Hunger, malnutrition, and desperateness comprise the most dangerous weapons of mass destruction. Degraded soils and denuded landscapes coupled with drought and low productivity have caused hardship, internal displacement, civil strife and political instability. Restoring and sustaining soil health is critical to realizing global peace and prosperity, and realizing Sustainable Development Goals of the United Nations. The threat of soil degradation to global peace and harmony must not be under estimated.
THE AGRICULTURE TODAY GROUP ORGANISED AN E-CONCLAVE ON JULY 8 ON POST-COVID CHALLENGES AND ECO AGRICULTURE. THE CONCLAVE ALSO FOCUSED ON THE RECENT BAN ON SEVERAL CHEMICAL PESTICIDES AND CROP RESIDUE BURNING – SOLUTIONS AND URGENCY OF IMPLEMENTATION AFTER COVID.

THE DISTINGUISHED PANELISTS INCLUDED WORLD FOOD PRIZE LAUREATE PROF RATNAN LAL; PADMA shri DR MH MEHTA; DG NATIONAL MISSION FOR CLEAN GANGA (NMCG) MR RAJIV RANJAN MISHRA; AGRI SCIENTIST, AUTHOR AND THOUGHT LEADER MR DEVINDER SHARMA; DR SURESH MOTWANI, PROGRAMME HEAD, PALM OIL AND SOYA, SOLIDARIDAD SOUTH; WORKING PRESIDENT ALL INDIA FARMERS ASSOCIATION MR SANJAY NATH SINGH; FORMER ADVISOR (ORGANIC PRODUCTS) APEDA DR PVSM GOURI AND AGRI-SCIENTIST DR EAKPREET SINGH.

A LARGE NUMBER OF PARTICIPANTS FROM VARIOUS PARTS OF THE COUNTRY ATTENDED THE CONCLAVE.

SETTING THE TONE FOR THE CONCLAVE, CEO-CUM-EDITOR OF AGRICULTURE TODAY GROUP MS MAMTA JAIN SAID THAT AS THE WORLD TALKS ABOUT THE RESPONSE MECHANISMS FOR COVID, IT IS IMPORTANT TO START ADDRESSING SUSTAINED RESILIENCE, AND HOW WE MAY ACHIEVE IT. TECHNOLOGY, SHE SAID, PROVIDES US A POWERFUL TOOL FOR THE PURPOSE.

PADMA shri DR MH MEHTA, CHAIRMAN ICFA WORKING GROUP ON ECO AGRICULTURE AND CHAIRMAN THE SCIENCE ASHRAM, GUJARAT LIFE SCIENCES SAID THAT COVID HAS SHARPENED GLOBAL UNDERSTANDING OF THE NEED FOR ECO AGRICULTURE. IN THE LAST FEW YEARS, THERE HAS BEEN AN INCREASE IN THE DEMAND FOR BIO FERTILIZERS, BIO PESTICIDES, BIO STIMULANTS AND OTHER BIO INPUTS.

DR MEHTA ADVOCATED THE 20:20 MODEL AS BUDDHA’S MIDDLE PATH OF TRANSFORMATION. THIS MODEL, HE SAID, ENABLES FARMERS TO REDUCE INPUT COST BY 20 PC AND IMPROVE FARM PRODUCTION BY 20 PC WITH NEW GENERATION AGRI BIO INPUTS. SUCH A MODEL WAS APPROPRIATE AT FIELD LEVEL RATHER THAN A SUDDEN CHANGEOVER.

PROF LAL BEGAN HIS ADDRESS BY CONGRATULATING INDIA’S FARMERS, AGRI SCIENTISTS AND POLICY MAKERS FOR ACHIEVING BUMPER HARVESTS YEAR AFTER YEAR. HE CAUTIONED THAT INDIA MUST RECONCILE THE NEED TO ADVANCE FOOD AND NUTRITIONAL SECURITY WITH THE NecessITY TO RESTORE/IMPROVE THE ENVIRONMENT. THE NEGATIVE PRACTICES IN AGRICULTURE WE SEE TODAY, HE SAID, ARE NOT THE FAULT OF GREEN REVOLUTION OR ANY PARTICULAR CONCEPT BUT MISUSE OF TECHNOLOGY.

“If we do agriculture properly in India, the potential of grain production in India can be almost double of what we have now. It can be 550 million tonnes a year from the
current 298 million tonnes. We have a great opportunity to achieve an even bigger revolution. But we also have to be careful of the environmental footprint, the cost of food,” Prof Lal said.

He emphasized upon The Law of Return in agriculture: that the substance we take from nature must be returned to the place from where it was taken.

Speaking at the e-Conclave, Mr Rajiv Ranjan Mishra, Director General, National Mission for Clean Ganga (NMCG) said that conventionally, priority had been accorded to using water for drinking purposes, agriculture and industry. “The river has the right on its own water. If we don’t acknowledge this, we face problems of river health. It is important to keep the river flow virial and nirmal.”

Mr Devinder Sharma said the shift has begun from intensive agriculture to ecological agriculture. “The world will have to move in that direction sooner or later,” he said. Mr Sharma highlighted that it’s time we learn from the farmers instead of the other way round.

Working President All India Farmers Association Mr Sanjay Nath Singh said the majority of Indian farmers have small landholdings. They shall not be able to shift to eco agriculture without government support. He recommended the certification of ecological farms and of farm produce, and setting up of a separate supply chain for these products.

Dr Suresh Motwani revealed that Solidaridad has developed a digital app which provides one-stop solution on crop production, solution to farmer’s problems through expert advice and location specific package of practice of crops like Pulse, Cereal, Oilseed, vegetables and Nutrition. He added that Solidaridad has also developed a series of crop specific short video modules in local dialect which can be accessed through the digital app.

In her address, former Advisor (Organic Products) APEDA Dr PVSM Gouri said the package of practices for eco agriculture must be standardized to enable farmers to adopt them. Self-certification and reliable third-party certification of organic produce would build consumer trust in organic products, she said. Dr Gouri said it was the responsibility of the state governments to encourage eco agriculture among farmers by standardizing the practices.

Agri scientist Mr Eakpreet Singh said that human health, plant health, environmental health and animal health – all depend on soil health. Hence soil health was essential not only for agriculture but for ecological balance. He said that agro waste management using microbial processes can be the first and very important step towards Eco-Agriculture Revolution. There was immediate need to scale up this approach. Combining it with 20-20 model, we can slowly move towards Eco-Agriculture Revolution, he said.

**Recommendations at The e-Conclave**

* Setting up of National Soil Health Mission
* Economic incentives to farmers for eco protection, not burning crop residue
* Adoption of micro irrigation
* Direct seeding of rice
* Reduce post harvest losses
* Reduce food wastage
* Recycle bio waste
* Practice controlled grazing
* Encourage farmers to use green pesticides
* Certification of ecological farms, produce
* Separate supply chain for organic produce
* Learning from traditional wisdom, farmers’ wisdom
15th July 2020

Dr M.H. Mehta
Chairman, National Working Group on Eco-Agriculture / Organic Farming – ICFA
Chairman, The Science Ashram / Gujarat Life Sciences
Ex-Vice Chancellor, Gujarat Agricultural University

Sub: Global Webinar and recommendations for implementing a solution to the crop residue burning problem

Dear Dr. Mehta,

At the global webinar organized by Agriculture Today on the 8th of July 2020, several global experts gave detailed presentations about the state of agriculture in India, addressing its admirable successes as well as the current challenges it faces. Discussions with farmers and other community leaders and experts followed, which resulted in the development of several actionable recommendations to improve areas of India’s agricultural systems.

Overall, the importance of adopting sustainable eco-intensification in the agricultural sector cannot be overemphasized. This “Eco-Agriculture” could bring about a “Second” or “Ever Green Revolution” in India.

The most impactful action that India can take immediately is to halt all burning of crop residue, such as rice stubble, in the Northern Indian states and elsewhere. The practice of crop residue burning is extremely harmful for soil, water bodies, and air. Not only does burning residue destroy important resources, but it also creates terrible health hazards, particularly during the winter months.

The scientific solution, which involves in-situ preparation of mulch to sequester carbon and the use of no-till seeding methods, offers a practical, economically attractive, climate-smart, and farmer-friendly improvement to this issue. This solution is clearly supported by evidence from industrial and scientific bodies, and its benefits have been clearly demonstrated by several governmental and non-governmental organizations. It is now time to scale up this solution on an urgent basis, adopt soil protection policy, and support farmers with payments for ecosystem services.

We hope that the concerned Ministry will implement this program in the coming season, especially in the Northern states of Punjab, Haryana, Uttar Pradesh, and Delhi. All necessary scientific support and advice will be available for such a noble work.

Sincerely,

Dr. Rattan Lal
World Food Prize Laureate, 2020
Distinguished University Professor of Soil Science, SENR
Director, Carbon Management and Sequestration Center

CC: Dr. Mamta Jain
Editor and CEO Agriculture Today Group
New Delhi
TIME TO TAKE INDIA FORWARD AS ORGANIC PRODUCTS HUB FOR GLOBAL MARKET:
SHRI PARSHOTTAMBHAI RUPALA

The Association of Indian Organic Industry (AIOI), a membership-driven non-profit organization registered under Section 25 of the Companies Act, 1956, has members from different sections of the organic industry such as exporters, importers, traders and others involved in organic sector. AIOI aims at building capacity of stakeholders and create valuable resources through skill development, thereby enhancing employment opportunities and to engage in advocacy with policy makers, market development and research.

The launch of the website and first newsletter of Association of Indian Organic Industry (AIOA) was done by Shri Parshottambhai Rupala, Minister of State, Department of Agriculture, Cooperation and Farmers Welfare, GOI. Speaking on the occasion, he stressed that this is a timely and much needed initiative to bring together stakeholders, industry experts, commodity boards and farmers in taking India forward as the main organic products hub for the global market. He congratulated AIOI members for taking this lead and expressed support to the organic industry to enable the Association build develop capacity for strengthening the organic food sector in India. He echoed the vision of the Prime Minister to double farmer income and export of agricultural products. He informed that a scientific research institution has been set up in Sikkim to encourage work in the organic foods sector.

In his keynote address, Padma Shri Dr. M H Mehta, Chairman, ICFA National Working Group on Eco-Agriculture highlighted that product integrity, consumer trust and branding will further elevate the potential of organic outputs.

Alongside the launch, the virtual meeting saw insightful panel discussion amongst eminent experts. The panelists noted that there was a need for associating farmers in the policy making process to ensure fair income for farmers and growth in the organic sector. It was highlighted that integrity of organic foods was critical for consumer trust. Hence the credibility of the organic certification system needed to be strengthened through training programmes. It was also pointed out that engagement at the international level to improve the standards would help enhance bilateral trade in organic products.

The e-interactive session had around 150 participants from different ministries, state government, commodity boards, academia, farmer associations, exporters, certification bodies and food experts from India and abroad.
Eco Agriculture balances the need for food production and ecological factors. The development of eco-friendly (bio-ag) inputs will play key role in this. In an interview with Agriculture Today, Padma Shri Dr MH Mehta, Chairman ICFA Working Group on Eco Agriculture and Chairman The Science Ashram, Gujarat Life Sciences elaborates on the relevance of this system of farming, and highlights the role of bio ag inputs. Dr Mehta is known internationally for his leadership and contribution on ecology and agriculture.

Bio Inputs for Eco Agri Revolution

It is said that after the Green Revolution, it is now time for Eco Agri Revolution for Ever Green Revolution. What is Eco Agriculture?

Eco Agriculture or Agro Ecology is the approach capable of producing enough accessible food without harming the environment. It is based on the convergence of two scientific disciplines, agronomy and ecology. This is a broad term that includes organic farming, biological farming etc. The coming decades will be the Evergreen or Eco Agri Revolution or Sustainable Ever Green Revolution.

Please tell us about your 20-20 Model for Eco Agri Revolution and its acceptance for Asian and African countries.

The 20-20 Model is about increasing farm production by 20% with lowering of input costs by 20% in a sustainable way. It is based on using new generation eco-friendly bio inputs like bio-fertilizers, bio-pesticides (both microbial and botanicals), farm agro wastes to bio composts and bio-stimulants.

It is the Middle Path of moving from chemical to eco-friendly farming. It is also a practical model. We can’t wish away chemicals overnight and there are many failed examples of such sudden switchovers. It is possible to have stepwise
change over by including eco-friendly products that help reduce input costs on one hand and at the same time improve farm productivity sustainably. Once this is demonstrated, in the next years the bio inputs can be doubled and tripled and even total switch over. It is good to see the gradual adaptation of this model in the different parts of India and even other countries in Asia and Africa.

You have conducted successful trials in Punjab to address crop residue burning. What challenges are you facing in scaling up these efforts?

Despite successful trials, there seem to be problems of large scale adaptation. In the last few years, our attempt to bring all the states together and have a co-ordinated program has not been successful for several reasons.

What is the major learning for the agriculture sector post the Covid crisis?

Reverse migration, worldwide emphasize on ‘Glocality,’ the new marketing and MSME incentives (Atma Nirbhar) are clear signs to help acceleration of our mission. The significance of a holistic way of life and harmony with nature and have been appreciated at all levels, and that is a good news.

Do you think the Covid crisis has made farmers favour organic farming? Has it led to a surge in consumer demand for organic products?

We are not sure how much the demand for organic products has gone up post-COVID crisis. The trend towards Glocality and the new marketing incentives are likely to add to the demand for eco-friendly products.

Sir, you have stated in your report that a small amount of increase in air pollution leads to high rate of Covid deaths. Please elaborate on this.

There are clear reports as stated by Harvard University as well as confirmed by the President, Indian Chest Society that an increase of just 1 microgram is likely to increase COVID-19 death rate by 15%. We know that among other things crop residue burning greatly increases air pollution and can become a much bigger danger in winter months. It is therefore necessary that we implement the solution which we have suggested and demonstrated.

Even as we discuss these issues in earnestness, there is fear that eco agriculture shall remain largely confined to academic discussions only. How do you rate the attitude of state governments in promoting eco agriculture?

We know that the chemical inputs cannot be wished away overnight. But awareness and demand for eco-agriculture practice and products is certainly increasing. Even at government levels, there are states which have taken big initiatives to encourage organic farming and eco agri practices. Eco agri revolution is the future.
Sustainable agriculture is essential for rejuvenation of Ganga, the holy river which also provides economic sustenance, water and food security. Availability of water resources, fertile soil and suitable climate in its basin supports large agriculture-based population. Soil and Water are two most critical inputs for agriculture and the two main physical resources of a river basin supporting all life in the basin.

Namami Gange, an integrated mission for rejuvenation of the Ganga Basin, focuses on pollution abatement, as also improving ecology and flow. This is achieved through wetland and biodiversity conservation, afforestation, water conservation, aquifer recharge and sustainable agriculture with organic and natural farming, improving water use efficiency and conserving water, soil and biodiversity while ensuring community participation in all aspects.

Green revolution helped us achieve substantial increase in food production and bring food security, but has come with environmental footprints. When farmers use chemical pesticides, only a small portion remains on the plant. The rest gets into the soil and also the river, degrading their quality and harming biodiversity. The toxic contaminants may reach the human body through the food chain and be health hazards.

Agricultural soil erosion is outpacing soil production by a wide margin. Regular tillage and the extensive use of chemical fertilizers and pesticides have affected soil fertility by debilitating soil’s nutrient cycles.

Ganga River Basin Management Plan
This was prepared by a consortium of IITs. It identified sustainable agriculture as the key mission area. It recommended promotion of conservation agriculture practices to prevent soil erosion and maintain soil fertility. No till or minimum tillage of soils, permanent organic soil cover, crop diversification, promotion of organic farming, resource use optimization by extensive soil testing were some of the methods to achieve this.

Eco agriculture can be understood as meeting current needs without sacrificing future needs. It resembles organic farming but takes things further by considering the entire ecosystem. It protects the soil, water & climate and utilises agri-bio inputs, farm residue/waste and nature based solutions. It includes protecting water quality by avoiding chemical inputs, good soil management practices like spreading manure, no or reduced tillage, trees on field borders etc. No encroachment of natural habitat by riparian habitat and protection of biodiversity is attempted. Proper crop and water management practices including micro irrigation, pest management through organic and natural processes and crop diversification hold important place.

The driving force to adapt this emerges from the negative impacts of conventional agriculture, decreasing farm productivity, reduction in soil organic
carbon, contamination of natural habitat. Organic movements, bio-pesticides and bio-fertilizers are growing. Covid has further made people more conscious of healthy lifestyle and food. A working group on eco agriculture has been set up by ICFA.

The government is promoting organic farming along the banks of the river to help in achieving nirmal and aviral dhara. The National Ganga Council (NGC), chaired by the Hon’ble Prime Minister accorded top priority to promoting organic clusters in a 5-7 km stretch on both sides of the river. It was also decided to encourage natural farming along the Ganga and suitably train farmers. Water conservation and improving water use efficiency through micro irrigation and natural shades is aimed. PM Krishi Sinchai Yojana, campaigns like Per drop more crop and Jal Shakti Abhiyan help greatly.

NMCG is also assisting to regenerate forest cover in the catchment, strengthen floodplain stability and develop natural resources. These include herbal, medicinal plants, fuel and fodder for communities and conservation of wetlands up to 10 kms from the river through special projects. This gives natural support to eco-agriculture.

**Challenges faced**

Some of the challenges are immediate loss of income in transition from conventional agriculture, and marketing constraints. Non-availability of quality organic and biological inputs, quality control requirements of bio fertilisers, organic fertilisers and certification systems need to be taken up with user-friendly approach. NMCG has been coordinating the efforts at national, state and district level through several schemes. NMCG has also coordinated for developing strategic brand positioning for expanding the organic corridor.

To convince farmers, attention is given to demonstration, training and support through adequate infrastructure for transport, storage, processing and marketing. We need community-driven gradual approach and increasing consumer awareness. Once consumers are convinced and generate demand, farmers will opt for organic farming. We need to campaign for a movement like Swachh food. NMCG with Wildlife Institute of India has trained Ganga Praharis and other volunteers for outreach and coordinating through District Ganga Committees (DGC). This year, Namami Gange is included in Prime Minister’s Awards for Excellence in Public Administration for best DGC. Progress of organic farming is given high priority.

**Focus areas**

We need to respect and document good traditional nature-based practices and also impart scientific knowledge and strategic skills to farmers. We need to increase supply of organic seeds, soil testing facilities, organise aggregators, create farmer institutions like Farmer Producer Organisations (FPOs), encourage corporates in marketing and also capacity building exploring CSR component; create database on rainfall, ground water, land use, cropping pattern etc. at different levels.

Uttarakhand is turning itself into an organic state. UP has scaled up and is working for turning the lands along the banks of the Ganga into an organic, natural and herbal corridor. Kisan Pathshalsas have been launched. Progressive farmers and experts are being involved to train and motivate farmers.

Earlier states had small pilot scale clusters for organic farming of less than 5000 Ha. Now, work is happening on 78000 Ha in Uttarakhand and 45,780 Ha in UP. Bihar has announced developing organic corridors in 13 districts along the Ganga with allocation of Rs 155 crore. IUCN is developing sustainable agriscapes with a pilot in Munger, Bihar.

West Bengal is encouraging organic by promoting aromatic rice, only possible organically. The recent Atmanirbhar Bharat announcement for creating a corridor of medicinal plants along the banks of the Ganga will supplement NMCG’s efforts.
Post independence, India was going through a crisis of food shortage. In 1964-65, then Prime Minister Shri Lal Bahadur Shastri initiated the Green Revolution. With the government's supportive policies and initiatives for agriculture, the brave farmers of India toiled to change the country’s status from “ship to mouth” to that of food surplus – especially with regard to food grains.

The Green Revolution was marked by bulk usage of fertilisers, pesticides, flood irrigation, new technologies and improved seeds. Intensive farming was the need of the hour. It gave excellent results. India became not only self sufficient but also surplus in grains, especially wheat and rice.

As time went by, intensive farming took its toll on ecosystem and biodiversity, and their enrichment. Soil degradation and wastage of water were a natural corollary of intensive farming. But all this cannot be blamed on intensive farming alone. Indifference and insensitivity towards ecology of our growing population and also the authorities is a major cause as also a concern. Policies were not framed taking a holistic view of the needs of the growing population and their demands on the natural resources.

**Ecological farming is economical farming**

It has been recognized now that ecological farming is economical farming. Eco Agriculture is not essentially organic farming, though they have many similarities and are compatible. Eco-agriculture includes

**ABOUT THE AUTHOR**

Mr Sanjay Nath Singh is the grandson of former prime minister Shri Lal Bahadur Shastri. He is the Working President and Secretary General of All India Farmers Association.

The author at Tashkent, paying homage at the bust of his grandfather, former prime minister Shri Lal Bahadur Shastri.
all methods of farming provided it conserves and regenerates ecosystems and supports agriculture. It must address concerns regarding soil erosion and degradation, water conservation, carbon sequestration, increased biodiversity etc.

India’s agriculture is faced with the challenge of ever increasing population and depletion of arable land. Climate change is affecting crop patterns and productivity. Each year we lose almost 25% of potential production of crops to pests, insects, weeds and crop related diseases. Rising water and soil contamination is affecting the quality and quantity of farm produce.

Against this background we have to examine the adaptation of Eco Agriculture by Indian farmers. While doing so one must bear in mind that majority of India’s farmers are small landholders and marginalised. Farming in India is a non-remunerative proposition. The Indian farmer is in distress.

**Distressed farmers, low motivation**

Eco agriculture requires identifying landscapes which may be defined as a cluster of local ecosystems. This is a configuration of topography, vegetation, land use and settlements. Elements of the landscape, the forests, water bodies, wild bio diversity are interlinked and influence each other. Management of these various elements through their respective stakeholders is imperative for ecological farming.

How can India’s distressed farmers be expected to take the lead in implementation of landscape management? They do not have the resources. They need the money for today rather than invest in a futuristic hope. Stuck in debt traps, lakhs of farmers have committed suicide. According to NCRB, 3,33,407 farmers committed suicide between 1995 and 2016.

Farmers have also seen that Green Revolution’s methods of agriculture enabled higher or rather surplus production despite increasing population and losing 30,000 hectares of arable land each year since 1988-89. While acknowledging the disadvantages and harm caused by intensive farming to ecology, the farmers feel helpless. Given the right support by the government, they made Green Revolution possible. They will do the same if they get the support for ecological farming.

**Incentivize stakeholders**

A major factor which will help adaptation of eco-agriculture is incentivizing all stakeholders for their respective activities within their identified landscapes. The landscapes will have to be identified through government policies and initiatives. Contract farming terms and conditions must ensure that the corporates have to adhere to the principles of eco-agriculture. Cooperatives should be formed. FPOs should be brought in to support and implement the movement. Information and technology must support the transition. Most importantly, women in agri households must be imparted training and skills for ecological farming. This shall be the game changer.

**Kneejerk reaction against chemical industries**

Newer and mutated pests and worms are threatening crops globally. With the permafrost of Siberia also melting, we do not know what new germs, worms and viruses will be unleashed. How does the farmer in a given landscape handle the foreseeable and unforeseeable attacks on crops? What is available immediately to them are proven fertilisers and pesticides, with an established supply chain. The present policies of the government do not encourage the extremely expensive development of newer and greener molecules by the chemical industry. The industry must adapt nano technology to deliver plant nutrients so that with a small quantity of molecules, the desired effect is imparted. The government must encourage this through correct policies. We need to upgrade and increase the arsenal available to the farmers at reasonable cost to fight the pests and worms.

Kneejerk reactions against the chemical industries through draconian policies or sudden ban on existing pesticides will not help the farmers. What is required is a pragmatic approach by encouraging the Indian chemical industry to introduce newer and greener molecules and gradual replacement of the existing molecules. This way the industry can remain financially viable to invest in technology and R & D. Technology has to be a part of the Eco-Agriculture movement. Make the chemical industry a stake holder in this movement and not an adversary.

The government must start a certification programme for ecological farms and their produce. The produce should be certified as Safe Food. It must have a separate supply chain and markets for better price realisation. Production is one thing, getting remunerative price is another.

Add science and technology to the skills of the farmers and bring to them the markets. This will encourage them in adapting ecological farming. The government must incentivize the direct and allied activities all stakeholders. This shall promote sustainable agriculture.

Jai Jawan, Jai Kisan!
Mr Devinder Sharma, an award-winning journalist, writer, thinker and researcher, tells Agriculture Today that with Atmanirbhar Bharat, the Prime Minister spoke of turning agriculture into the powerhouse of India’s economy. He believes that the three Ordinances do not match up with the vision that has been spelled out.

You have termed the three ordinances passed by the Centre a threat to Indian agriculture. Why so?

Several decades back a former US Secretary of Agriculture, Earl Butz had famously said to farmers: “Get Big or Get Out” I thought this prescription, good or bad, meant only for American farmers. A couple of years ago, Dr Shengann Fan, DG International Food Policy Research Institute (IFPRI) spelt out almost the same strategy to pull Indian agriculture out of the crisis. I never thought Indian policy makers would be more than willing to push it – not even caring to know whether this prescription is what the country needs.

Dr Fan had said: “Move Out, Move Up.” He explained this meant bringing in economic policies to facilitate outward migration or ‘move out’ people from rural to urban areas. Those who stayed back had to ‘move up’ in farming. After pursuing an unwritten policy of moving out a large section of the rural population over the past several decades to meet the growing demand for dehari mazdoor in cities, I find the three farm Ordinances in line with the remaining part of the prescription – ‘move up’. The three Ordinances point to a clearly laid out roadmap towards Corporate Agriculture, with the guidelines for FPOs if read in contiguity, paving the way for a build up of supply chains for the industry and that too at the Government expense!

I thought the massive reverse migration we witnessed would open our eyes to how flawed the policy prescription of ‘move out’ was. Millions of people who had walked back to their villages were Agricultural Refugees. They had moved out of the villages over the years when farming failed (and that was deliberate) to economically sustain their livelihoods.

You recently stated that the recent changes made by GOI in the agriculture sector are based on the US model. Please explain.
I am surprised the way policy makers have simply gone for a cut paste. All that is now being spelled out as agricultural market reforms have been in existence in America for more than six decades. It has been ‘one country, one market’ in America. Farmers can sell anywhere within and outside the country. There is contract farming. There is no stock limit on big retail. There is commodity trading. Despite all these ‘market reforms’ in existence, American farmers are passing through a terrible crisis.

The Chief Economist of US Department of Agriculture (USDA) is on record stating that farm incomes have seen steep decline since 1960s. Majority of US farmers are bankrupt, with the total bankruptcy touching $425 billion. Rural suicides are 45 per cent higher than the urban centres.

American/European farmers survive on subsidies. Since WTO came into existence in 1995, US/EU agricultural subsidies have remained a bone of contention. In 2018, the OECD provided a total farm support of $246 billion. This huge subsidy support actually decks up market inefficiency. Even agriculture exports are heavily subsidised. An UNCTAD-India study in 2007 had shown that if green box subsidies (protecting domestic support in agriculture) in developed countries withdrawn, agricultural exports from US, EU and Canada would drop by about 40 per cent.

Why resurrect a failed policy? Why borrow a system that has crumbled in America and Europe? Why can’t our policy makers come up with policies that suit national interest, conform to India’s needs, and meet emerging challenges of the future?

Given the scenario described by you, post the agricultural ordinances how shall the dots join for India?

These are questions I have been seeking answers for. I wonder whether our policy makers are aware of these harsh realities. They rarely step out of their air-conditioned offices, and at best are seen hobnobbing with agribusiness leaders. That is why the policy direction is taking us towards corporatisation of agriculture.

Several decades back, the UK Food Group said that every minute a farmer was quitting farming in Europe. Already less than 2 per cent of the American population is engaged in farming, which also is on its way out. The prevalent economic design tells us that to attain a higher GDP growth people should be moved out of agriculture into the cities. Agriculture has to be sacrificed to keep economic reforms viable. The exodus from the cities back to the villages should tell us how flawed that economic prescription was. This happened also in Bangladesh, Pakistan, and almost across the developing world although the scale may be not as large as India.

The answer lies in revitalising farming operations. That will be possible if farmers are assured of monthly income package. They too have aspiration, and families to take care of. Just because the ideology behind neo-liberal economics is built on strengthening open markets does not mean we refuse to see where it has failed.

Among the several measures I have time and again suggested to prop up agriculture, I have been calling for setting up a Commission for Farmers Income & Welfare with the primary objective of ensuring how a farm family can be assured of at least an income package matching the monthly income of the lowest Government employee. My argument is very clear: Give farmers his rightful income, and he will turn farming into a powerhouse of economic growth.

Noted industry leaders have called the recent agri reforms the “1991 moment for agriculture”. But the 14-year-old Bihar experiment of doing away with APMC mandis failed. Those who compare recent agricultural reforms as the 1991 moment are industry voices. What is good for industry does not automatically become good for farmers.

In India, only 6 per cent farmers get the benefit of MSP. The remaining 94 per cent farmers have been dependent on markets. If market were so benevolent, why would agrarian distress have grown, why thousands of farmers would be ending their lives every year, why an estimated 9 million people should be...
abandoning farming and migrating to cities for menial jobs?

The Bihar failure with market reforms should be a lesson for future. I remember the excitement all around when in 2006 Bihar threw away the APMC Act. We were told that Bihar will be the harbinger of a new agricultural revolution based entirely on markets. Private investments will flow, private market yards will spring up and farmers will get price discovery - a higher price. In short, it will usher in rural prosperity. For 14 years, the nation waited for that miracle to happen. It didn’t. Even now unscrupulous traders transport large quantities of wheat and paddy to be sold in Punjab and Haryana mandis at MSP. If Bihar had laid out a network of APMC mandis and provided farmers with an assured MSP every year, outward migration from Bihar would have dropped drastically.

Bihar is a classic example of the failure of agricultural markets, a lost opportunity. This experiment played out on millions of farm families in Bihar, for whom it was a lost decade and a half. Let’s not repeat the mistake.

What is the role played by public sector in agriculture?

If India had continued with heavy public sector investment, over the decades it would have laid a strong foundation for resurgence in agriculture. Unfortunately with World Bank/IMF breathing down the neck, and our economists parroting the failed prescription of moving people out of agriculture into cities, the easiest way was to reduce the investments in agriculture. According to RBI, between 2011-12 and 2017-18, public sector investments in agriculture had remained between 0.3 and 0.4 per cent of the GDP.

What miracle can you expect from agriculture, which involves roughly 50 per cent of the population, when the sector is deliberately kept starved of public investments?

Compare this with the industry, which receives 6 per cent of the GDP by way of tax concessions alone. The industry thrives on subsidies. This is cleverly covered by a switch in vocabulary. Financial support given for agriculture is called subsidy – a demonized word. Massive subsidies provided to industries are called incentives. The impression created is that subsidies are a drain on the exchequer but incentives are essential for growth!

It is a question of priorities. Since the intention was to move people out of agriculture, investments were brought down. To restore pride in agriculture, there has to be a renewed effort in boosting public-sector investments and large investments. Private sector investments in agriculture will follow once the Government makes its intent clear.

For a country like India, public-sector’s role in agriculture is non-negotiable. Agriculture is the biggest employer in the country. The effort should be to strengthen farming. This will revitalise rural artisans and farm-based rural industries. Agriculture alone has the potential to reboot the economy. The way to boost demand lies in improving agriculture, sustainably and economically. I fail to understand why mainline economists fail to see this simple but vital connection.

In wake of the three Ordinances, what is your suggestion for bringing prosperity to our farmers?

The Ordinances have been notified. There have been huge farm protests in Punjab and Haryana. These are growing. The industry, the economists and the Government are saying is that farmers are being misinformed, and these measures will boost farm incomes. I don’t want Indian agriculture to forever remain in subsistence. Economic Survey 2016 said the average income of a farming family in 17 states, which means roughly half the country, is only Rs 20,000 a year – less than Rs 1,700 a month. This is not even enough to rear a cow. I shudder to think how these families survive. Another study by OECD-ICRIER calculated that Indian farmers suffered a loss of Rs 45-lakh crore between 2000 and 2016-17. This is a clear pointer to an extraordinary farm crisis. Studies by Niti Aayog have shown that growth in real farm income after 2015-16 and 2018-19 have remained near zero.

This is not what Indian farmers deserve. Yes after year, farmers have worked hard to produce a bumper harvest. Yet their incomes remain frozen or are on the decline.

They too need a bright future. Let us think of policies and measures that can pull them out of grave agrarian crisis. It is primarily a crisis of income insecurity. The problem is not in the crop field, but in economics. The crisis is not because of productivity shortfalls but because we have denied farmers their rightful income over the decades.
Joint venture between AlgaEnergy Spain and KREPL India

OUR VISION
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Creation of skilled, talented and entrepreneurial human resources to harness our demographic dividend in an equitable manner is one of the crucial parameters for sustainable development of agriculture in India. Hon'ble Prime Minister Shri Narendra Modi, while reviewing the activities of Indian Council of Agricultural Research (ICAR) on July 4, 2020, exhorted that traditional knowledge of Indian communities should be coupled with technology and skill sets of youth and Agriculture graduates to achieve the full potential of Indian agriculture in transforming rural areas.

Indian agriculture has continuously evolved to remain responsive to meet the growing and diversified needs of stakeholders in the entire production to consumption chain. Economic Survey 2017-18 says that with growing rural to urban migration by men, there is feminisation of agriculture sector, with increasing number of women in multiple roles as cultivators, entrepreneurs, and labourers. In India, 85% of rural women are engaged in agriculture, yet only about 13% own land. This makes skill development and entrepreneurship even more important in rural areas.

Role of ICAR for Quality Agricultural Education
ICAR, through its Agricultural Education Division, is involved in strengthening and streamlining of higher agricultural education system. This is essential in order to enhance the quality of human resources in the agri-supply chain to meet the future challenges in the agriculture sector of the country. The division strives for maintaining and upgrading quality and relevance of higher agricultural education. One of the ways to achieve this is through partnership and efforts of the ICAR-Agricultural Universities (AUs) system comprising of State Agricultural Universities.

ABOUT THE AUTHOR

Dr. R.C. Agrawal is Deputy Director General (Agricultural Education), Indian Council of Agricultural Research (ICAR), New Delhi. He can be reached at ddg.edu@icar.gov.in
Deemed to be universities (4), Central Agricultural University (3) and Central Universities (4) with Agriculture Faculty.

**Entrepreneurship skills through NAHEP, a GOI-World Bank assisted project**

The Council commenced National Agricultural Higher Education Project (NAHEP) with the assistance of Government of India (GOI) and World Bank (WB) in November 2017 with an overall objective to support participating agriculture universities and ICAR in providing more relevant and higher quality education to students. NAHEP endeavors increased agricultural productivity and supports quality improvements of higher education to create a more skilled workforce that continuously improves the productivity of key sectors, including agriculture. Overall, the project aims to develop resources and mechanism for supporting infrastructure, faculty and student advancement, and providing means for better governance and management of agricultural universities. This is crucial so that a holistic model can be developed to raise the standard of current agricultural education system that provides more jobs and is entrepreneurship oriented (Table 1) and on par with the global agriculture education standards.

### Revision of under-graduate programs for greater emphasis on agri-entrepreneurship

As foremost step for quality improvement of education, ICAR has periodically been appointing Deans’ Committees for revision of course curricula of under-graduate programmes of agricultural education. In this series, the Fifth Deans’ Committee has developed the report by undertaking comprehensive consultations and a bottom-up approach for curriculum development. Inputs from different stakeholders of agricultural education were obtained at different levels. In the report, the course curricula have been restructured and reoriented. The purpose is to develop much-needed skills and the entrepreneurial mind-set among the graduates to take up self-employment, to sustainably enhance rural livelihood security, and to propel agricultural transformation through science-informed policy options and actions.

### Table 1: National level skill development programs (communication, entrepreneurship, extracurricular, personality development) organized under NAHEP by partner AUs

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To reorient graduates of agriculture and allied subjects for higher employability and greater entrepreneurship, the Student READY (Rural Entrepreneurship Awareness Development Yojana) programme has been introduced in all the agricultural universities as an essential prerequisite for the award of degree to ensure hands-on experience and practical training. Further a course on “Entrepreneurship Development & Business Management” has been made compulsory to all the UG students.

Keeping in mind the latest scientific developments impacting food and agriculture systems, considering new societal needs and demands, and in line with current national policy thrust, the Fifth Deans’ Committee also introduced the new courses. These are B.Tech (Biotechnology), B.Sc. (Hons) Sericulture, B.Sc. (Hons) Community Science (Home Science renamed), B.Sc. (Hons) Food Nutrition and Dietetics, which also help in students in choosing the areas where they may want to be entrepreneurs.

<table>
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<tr>
<th>Year</th>
<th>No of students</th>
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<tr>
<td>2016-17</td>
<td>11685</td>
</tr>
<tr>
<td>2017-18</td>
<td>18103</td>
</tr>
<tr>
<td>2018-19</td>
<td>16178</td>
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<td>2019-20</td>
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**Rural Entrepreneurship through RAWE Program**

The Rural Awareness Work Experience (RAWE) imparts diagnostic and remedial knowledge to students relevant to rural field situations through practical training. The communication skills of students are strengthened by the use of extension teaching methods for the transfer of technology. Students are encouraged to develop their confidence and competence to solve agricultural problems. RAWE (one of the four components of Student READY program (Figure 1) also acquaints students with ongoing extension and rural development programs.

The internship programs have immensely helped the youth who are part of the Student READY initiative. Students get the experience of functioning in an industrial environment, which provides them valuable working
experience. The internship familiarizes the students with diverse materials, machines, processes, products and their applications along with relevant aspects of management. The students are able to understand the value of individual decision-making, team-work and the psychology of co-workers. They are able to evolve a functional approach to problems and understand the practices followed in the industry. Tie-ups are provided in various departments of the organization to make the students understand the scope, functions and undertake job responsibility.

The duration of the EL programme is for six months. RAWE/In plant Training/ Industry attachment/Internship of Student READY programme is another six months as per the requirements of the discipline. The student placements and expertise gained in different disciplines is given in Annexure 1 and Annexure 2.

Approximately 80 percent of the students are undergoing RAWE, 15 percent for Industrial attachment/Internship and around 5 percent for In Plant Training and Student Project every year. As per rough estimates around 5 percent of students take up self-employment whereas 20 percent go for jobs in private companies.

A total of 485 ICAR sponsored Experiential Learning Modules have been established and are operational in different agricultural universities. The number of students may vary every year in different EL units according to discipline etc. On average 20-30 students are associated with each EL programme every year.

Summer/Winter Schools and Short Courses
Since 1967, ICAR has been sponsoring the organization of Summer School/ Winter School/Short Courses in the disciplines of Agriculture, Veterinary, Animal Sciences, Fisheries and Food Technology, etc. across the ICAR-AU system. This activity has been brought out to bring qualitative improvement in their pedagogical skills and also update their knowledge in the specialized/ emerging areas. The activity contributes to the development of skilled human resources for making research and education more relevant. A Capacity Building Program (CBP) portal (http://education.icr.gov.in) is operational as a workflow-based online management system of all training programs sponsored by the Agricultural Education Division. It provides information on all training programmes, training proposal submission and evaluation, submission of application by a trainee, availability of e-books/lecture notes of a training and reports for all categories of users and several other features. Figs. 2 and 3 indicate the number and gender-wise distribution of faculty/Scientists trained under ICAR’s CBP over the years. From 2014 till December 2019, around 22,000 teachers/scientists have been trained through this programme.

Training of teachers for teaching at different levels needs to be provided at regular intervals. Such trainings and re-trainings need to be made mandatory for senior teachers also in order to keep them updated with the latest developments in the field of agricultural science & technology, extension and education etc.

Conclusion
A Scheme for Promoting Innovation, Rural Industry & Entrepreneurship (ASPIRE) of the Government of India is to create new jobs to reduce unemployment, boost grassroots economic development, promote entrepreneurship culture and promote innovation to strengthen the competitiveness of the MSME sector. This objective can be better achieved with more trained manpower in agriculture and allied sectors. The growth achieved in the agricultural sector has been attributed to the concerted efforts of skilled human resource developed through Agricultural Education System. After independence, from the state of deficiency, India has moved to the stage of self-sufficiency in food grain production. The dynamic business environment necessitates the need to inculcate and instil employable skill-sets among agriculture graduates. On the completion of their studies, agriculture graduates must be well-equipped to face the challenges posed by the emerging national needs and the globalized environment. They must possess the required professional capabilities and skill-sets to deal with the concerns of sustainable development of climate-resilient agriculture in all its aspects and focus on addressing the challenges, especially those confronting farmers in rural areas.
EMPLOYABILITY CENTRIC INTERVENTIONS IN AGRICULTURE AND RURAL DEVELOPMENT

Education and Skill are two driving forces of the economic growth and sociological development for any country. India is recognised as the youngest nation globally, with 60 pc of its population belonging to the working age group. India is an agrarian economy, and 60 per cent of our population lives in villages. Agriculture still employs about 50 per cent of the national workforce. The recent boost given by the Prime Minister for Atmanirbhar Bharat re-emphasizes the need for a skilled youth workforce that can build the India of tomorrow.

The necessity of skilling in the sector is also highlighted from the fact that agricultural share of GDP contribution is as low as 14 % and is declining continuously.

All India Council for Technical Education is dedicated for proper planning and coordinated development of technical education in the country. Since last five years, AICTE is contributing towards sustainable development of rural India in various ways.

Under the Unnat Bharat Abhiyan and Sansad Adarsh Gram Yojna, AICTE has the objective to build institutional capacity in technical institutes relevant to national needs – especially those of rural India. These initiatives emphasize on the skilling of rural youth and women, enabling them to take up employment or entrepreneurial activities.

AICTE is implementing the PMKVY for Technical Institutes scheme through AICTE-approved technical institutions in the country. Under this scheme, AICTE through its affiliated Institutes/

ABOUT THE AUTHOR

Prof. Anil Dattatraya Sahasrabudhe, Professor of Mechanical Engineering at Indian Institute of Technology (IIT), Guwahati is currently Chairman of All India Council for Technical Education (AICTE). He has held several important academic, research and administrative positions at Indian Institute of Science, Bangalore, Tata Consulting Engineers, North Eastern Regional Institute of Science and Technology (NERIST), Itanagar (Arunachal Pradesh) and IIT Guwahati. He also served as Director, College of Engineering, Pune (CoEP) since 2006 on deputation from IIT Guwahati prior to joining as AICTE Chairman. As an academician and researcher in NERIST and IIT Guwahati, and as an administrator in the capacity of Director, CoEP, he has taken up several new initiatives for academic, curricular & co-curricular activities, entrepreneurship, research and good governance. Prof. Sahasrabudhe is Chairman, Basic Scientific Research (BSR), Empowered Committee of UGC & SWAYAM Board. He is Fellow of ISTE, IET, Institution of Engineers (IE), INAE. He has been bestowed with several awards which include Maha-Intrapreneur Award-2011 of Praj Industries, Jeevan Gaurav Puraskar (Life Time Achievement Award) from MIT World Peace University, Pune in 2019, Mahatma Gandhi Leadership award from Indian Achievers Forum and CSR Times (2019).
Polytechnics has introduced 11 courses/qualifications in agriculture for skill development. These skills are governed by the National Skill Qualification Framework (NSQF) and help student find placements in the private sector. In the year 2017-18, 16 AICTE affiliated institutions had applied for opening these courses in their premises in order to utilize the infrastructure. This number rose to 25 in 2018-19. Average intake in each of these qualifications is 25 students, and average training hours are 240. The assessments are conducted as per the guidelines and recommendations issued by NSDC.

AICTE has been making considerable efforts towards connecting academia with the industry to ensure job-relevant skill sets for their students. There has also been need to address the educational needs of students (youth) who cannot catch up with the pace of conventional degree education. One initiative in this direction is the Pradhan Mantri Kaushal Vikas Yojana (PMKVY). The convergence of technical institutions and vocational courses through PMKVY has accelerated the skill development pace in technical areas.

PMKVY trains students in job roles which include roles for Agriculture. Some of the roles defined under various training modules include: Agriculture Machinery Operator, Agriculture Greenhouse Operator, Agriculture Operator-Reaper Thresher and Crop Residue Machinery, Agriculture Seed Processing Plant Technician, Agriculture Service and Maintenance Technician, Farm Machinery, Agriculture Hatchery Operator, Agriculture Irrigation Service Technician, Agriculture Tractor Operator, Agriculture Harvesting Machine Operator, Agriculture Solar Pump Technician, Agriculture Soil & Water Testing Lab Assistant, Agriculture Crop Production Green House Fitter, Agriculture Crop Production Micro Irrigation Technician.

AICTE has also initiated the “AICTE Vishwakarma Awards” for promoting innovative mind-set and scientific temperament among students for societal development. The theme of AICTE Vishwakarma Awards 2018 was “Empowerment of Villages through Technologies”. Eight themes, namely Water & Irrigation, Sanitation & Solid Liquid Waste Management, Rural Infrastructure, Tourism, Agriculture & Food, Education, Skill Initiative & Startups, Rural Craft & Livelihood, Any other Rural-Appropriate Technologies were suggested to students. Approximately 3500 students participated in this.

During Vishwakarma 2019, students were suggested to innovate on the theme “How to enhance the income of a Village”. Approximately 6,000 students participated and innovated various models for supporting the village ecosystem.

Rural Internship Programme
AICTE has recommended the Rural Internship Programme for technical students and has suggested various activities for overall development of a village. It is also recommended that if a student prepares and implements a plan to create local job opportunities, skilling of rural youth, improve education quality in village etc. and contributes required duration in the said activity, his credit requirement for internship will be fulfilled.

World’s largest hackathon
Smart India Hackathon was conceptualized to give students with an innovative mind, a platform to showcase their skills and at the same time connect them with the real industry problems. SIH has become the world’s largest hackathon with more than 4,00,000 students participating this year. This is facilitated by 7218 educational institutions and 256 Industry organizations (which include ministries and departments). More than 243 problem statements were given by the Government and the Industry for students to solve in SIH 2020.

In the year 2018, seven problem statements were given by the Ministry of Agriculture and Farmers welfare. 12,047 Ideas were submitted by more than 100000 students studying in 1315 institutions.
In Bollywood blockbuster Ram Lakhan (1989), Anil Kapoor’s character Lakhan advises his friends through a song how to make one two ka four. A study by the United Nations’ Food and Agriculture Organisation (FAO) says an investment of Re 1 in India in the business of livestock, dairying and fisheries has the potential to yield Rs 4.

A formidable challenge before the state governments today is creating remunerative avenues of employment. Dairying and fisheries can provide the answer. With such handsome profitability, it is surprising that livestock and fisheries management has either been a victim of apathy or low on governance priority. Till a few years ago, the Department of Animal Husbandry, Dairying and fisheries was part of the Ministry of Agriculture. The vocation of rearing animals and fish is hardly attractive or enticing. But now there is a bright ray of hope for this sector.

In February 2019, the central government carved out a separate Department of Fisheries, which till then was a part of the Department of Animal Husbandry, Dairying and Fisheries. The importance of fisheries was underscored in 2014 with the launch of the ambitious scheme Blue Revolution. The focus and outcomes of the scheme fell short of expectations because fishery was tagged with animal husbandry and dairying. It did not receive the required attention.

India - world’s second biggest fish producer
Besides being a major provider of food and nutrition, fisheries and aquaculture are an important source of livelihood and
income. According to government estimates, about 25 million people directly work as either fishermen or fish farmers. Close to 5 crore people are engaged in the production, post harvest and supply chain of fishery and aquaculture. With 13.7 million tonnes production, we are the world's second biggest fish producer behind China. Valued at approximately Rs 2,13,000 crore, this constitutes 1.24% of the national GDP and 7.28% of the GDP of agriculture sector.

Last year, we exported fish and fish products to Rs 48,000 crore approximately, making it the number one export amongst all agriculture commodities. We are world leaders in shrimp export, accounting for 25% of the global supply. The sector has been consistently registering a growth rate of over 7%, higher than other sub-sectors of agriculture. The creation of a separate department of fisheries and subsequently the Ministry of Fisheries, Animal Husbandry and Dairying has been a necessary and much-awaited step.

The Prime Minister, in his first address on June 10 to the GOI Secretaries, made the government's intent clear by stating that fisheries, dairying and animal husbandry would be accorded high priority. He reiterated his government's commitment in the meeting of the Governing Council of NITI Aayog. The budget for FY 2019-20 included the announcement of a new scheme for integrated and holistic development of fisheries, namely the Pradhan Mantri Matsya Sampada Yojna (PMMSY). The stakeholders of the sector have been eagerly awaiting its structure and detailed components. The government recently accorded formal administrative and financial approval to the scheme.

Fisheries governance, management institutions must improve
At a proposed outlay of Rs 20,050 crore over a five-year implementation period, this is India's biggest and most ambitious scheme of fisheries. The outlay of PMMSY is almost ten times greater than the expenditure incurred under its precursor the Blue Revolution. An increase of this magnitude is unprecedented. In addition, the government had established a separate Fisheries Infrastructure Development Fund worth Rs 7552 crore. This fund can be accessed for creation of infrastructure in fisheries and aquaculture at a concessional rate of interest – at almost 3 to 4% interest subvention. The financial resources now available to the sector far exceed the expectations of the stakeholders. Fisheries governance and management institutions and entities need to improve and strengthen their capacities for effective and productive use of these resources.

Productivity, quality of fish a matter of concern
The productivity and quality of our fisheries remains a matter of serious concern. The gap between our potential and achievement is huge. Fulfilling this gap is one of the primary objectives of PMMSY. Emphasis has rightly been placed on introduction of modern and appropriate technology, creation of basic essential infrastructure and facilities, sustainable development through responsible management of resources etc. A special feature of the scheme is recognising the weak and vulnerable social status of fishermen. Suitable provisions have been made for social security of fisher communities. Apart from addressing productivity, expansion and diversification, the scheme targets reduction in post harvest losses. Rough estimate puts the loss of harvested fish at 20 to 25% of the total yield. The target is to bring it down to 10%. Another dominant theme is robust fisheries management to obviate adverse effects on environment, and ensure stability and continuity in development.

Department of Fisheries must deliver
Due to Covid crisis, supply chains all around got disrupted. Fisheries has a special situation, because fish follows a biological cycle. Its harvest has to obey the dictates of biology and not economy or human order. There cannot be a compromise as to when fish is to be taken out of water. Special interventions shall be required to recover the real and possible loss to fish harvest on account of disruption in the business environment in general and the supply chain in particular. The ball is now in the court of the Department of Fisheries.

Mr Tarun Shridhar likes to insert light hearted anecdotes while writing on serious subjects, to keep the reader engaged. Sometimes Bollywood trivia, sometimes folk wisdom - all are woven seamlessly into his writing
Rural development has been one of the key focus areas for public policy in India. A plethora of issues affects the rural economy. Socio-economic issues such as poverty, illiteracy, unemployment, malnourishment, lack of basic amenities, etc. have remarkable impact on individuals in rural areas. Periodic Labour Force Survey (PLFS) 2018-19 estimates that 69.6% of people in India reside in rural areas. Most of the unemployed persons also reside in rural areas. This makes it a pressing issue suggesting the need for a paradigm shift to enhance the role of vocational training and skill development in every part of the country.

The United Nation’s 2030 agenda for global sustainable development adopted in New York expanded the fourth goal on education and lifelong learning, wherein technical and vocational...
skills for employment, decent jobs, and entrepreneurship were featured. Education and training are the pillars of augmented economic growth, employment, and social development. These create the foundation for an informed citizenry. Within this framework, skill development aims towards empowerment to foster a culture of innovation and entrepreneurship, generating sustainable livelihoods.

**Pradhan Mantri Kaushal Vikas Yojna**

With the mission of making India the skill capital of the world, Skill India Mission was launched in 2015. One of the initiatives under the mission includes the flagship program of Ministry of Skill Development and Entrepreneurship (MSDE) called Pradhan Mantri Kaushal Vikas Yojna (PMKVY). Till now, over 87 lakh individuals have been provided training as part of PMKVY.

Encouragingly, impact evaluations show program success. As per one such evaluation of PMKVY, trained and certified individuals earn a 15% higher monthly income compared to their peers. Under the Skill India Mission, MSDE also initiated the establishment of state-of-the-art, visible and aspirational model training centres, Pradhan Mantri Kaushal Kendras (PMKKs), in every district of India, ensuring coverage of all the parliamentary constituencies.

Since the coverage is across all districts, youth from rural areas stand to benefit significantly from this initiative. PMKKs support the delivery of training under PMKVY. This enables youth even from remote regions of India to access high quality vocational training. As of June 2020, a total of 812 PMKKs have been allocated covering 707 districts and 540 Parliamentary Constituencies (PCs) of India. Out of the 812 allocated PMKKs, 738 PMKKs are established across 649 districts and 518 PCs.

There is a clear structural shift of workers from agriculture to the non-farm sectors. Nevertheless, rural regions account for more than 70% of the country’s workforce (Periodic Labour Force Survey 2018-19). Seasonal unemployment is tenacious in rural India as agrarian sector workers are employed only during times of sowing and harvest. The cyclic nature of unemployment adversely affects the welfare of individuals in this sector. Thus, vocational training programs during the off-season can help empower the youth to attain jobs. These will enable them to receive an income and eventually improve their standard of living.

**Technology shall speed up benefits**

Increasingly technology is being leveraged by firms to directly reach the farmers. Innovative offerings such as agri-advisory services, integrating mandis and connecting farmers to consumers are making headway into the traditional agricultural sector in India. Therefore, programs to incorporate a modern level of agriculture, including agri-tech, could keep youth engaged in the sector interested and their skills updated while also enhancing this important sector.

Combining skill-training with the idea of a “Digital India” can foster sustainable growth in agri-tech space. As per a report by Nasscom (Agritech in India – Emerging Trends in 2019, NASSCOM),
450 startups are currently operating in agri-tech, which could redefine the future of this industry. Encouraging and advancing agricultural-based start-ups and easing interest rates on loans could profoundly reduce the rural-to-urban migration.

Digitalization has enabled the country to be the largest and the fastest-growing market with 578.2 million wireless data subscribers in 2018 (36.36% growth as compared to 2017). India is the second-largest market for e-learning, second only to the United States. The digital revolution in India has taken a step closer to eradicate geographical barriers when reaching every rural district in the country. It has also united us and made the world smaller to tap for knowledge and resources while making reaching out to remote areas cost-effective. This could further be leveraged to provide counselling and skill-training to rural youth. Traditionally, knowledge was only obtained through trainers and maybe a few available books. Digitalization has shown that knowledge can be sought from multiple sources.

Huge demand for eSkillIndia portal

The uptake of e-learning has been increasing recently. NSDC’s online learning platform – eSkillIndia portal has seen tremendous growth, especially during the nationwide lockdown. As of June 30, 2020, course enrollments on eSkillIndia have crossed the 2 lakh mark, registering a growth of over 1,400% since early March 2020. The portal offers more than 400 courses, and 60% of these are available free of cost. These are curated from best-in-class knowledge providers such as BSE, Apollo, TCS and SAS.

To add to its course catalogue, eSkillIndia recently partnered with UpGrad, British Council and Saylor Academy with the aim of providing high quality online skill development courses to skill seekers in areas such as data analytics, customer relationship management, and entrepreneurship. Through our partnership with British Council’s English Score application, we are providing English language skills to 1 lakh students, along with free assessment and certification. Already, 24,000 students have taken the English score assessments and redeemed their certificates. With Britannia, we will provide digital and entrepreneurial skills to 10,000 homemakers through e-SkillIndia. So far, we have received entries from more than 15 lakh homemakers.

The Road Ahead

Using technology in the right way will be fruitful in the future as the rural youth make use of such opportunities and compete in the national and international markets. Socially, this could be a step towards reducing gender inequality in rural areas. Most women in such households are not allowed to physically go to training centers, perhaps because of infants at home and household chores etc. However, with workshops teaching them on how to leverage technology, they can take advantage of the 21st century technological advancements to learn necessary skills enabling them to even become entrepreneurs. Taking digital skilling to rural women has the potential to improve the low female labour force participation in India which stands at 24.3%.

Sustainable economic and human development shall be achieved in India once there is rural development. Skill development models are expected to improve gender equality and social inclusion in rural areas to amalgamate a larger section of society. Navigating rural development closely by communicating clearly and passing on the right information about incentives for start-ups can go a long way. Taking inputs and suggestions from individuals in rural areas can help in creating a better suited public policy for skill development. Further, marketing about the benefits of government-run initiatives on vocational training in rural areas will familiarize people about the many avenues that they can take advantage of. Sustainable ecosystems in the rural fringes of the country would enable us to collectively move forward in achieving the aim of making India the skill capital of the world.
The green farmlands, the golden harvest, the livestock represent life.
The concrete roads and bridges lead the path to prosperity.
From oppression to empowerment, SHGs show the way to women folk.
Artisans not only create crafts, they create boundless possibilities.
Financial inclusion makes village communities inclusive too.

NABARD is proudly at the forefront of creating countless such success stories.

38 YEARS OF TRANSFORMING LIVES IN RURAL INDIA

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A good organic farmer understands the importance of biodiversity and tries to mimic nature and design the farm so that it resembles a complex ecosystem, an agri-ecosystem. Like in nature, niches are provided for diverse crop plants, weeds, microbes, insects, small and large wildlife, all co-existing within a balance. Within such an “idyllic” human-created, natural farming system, there are multiple benefits if balances are allowed to determine how the agricultural systems work. Pestilence and disease are kept under check, soil nutrient cycles are replenished through composting systems, and water cycles are recharged by catching every drop that falls on that land.

We have a 25 acre farm in the Kodagu district of the Western Ghats of southern India. The geographical and climatic conditions allow us to cultivate coffee and spices under the canopies of the rain forests of this region. Since we are reluctant to cut back the trees on our farm, we restrict our choice of crops to those which will grow under the shade of these magnificent trees. The trees themselves create the foundation of this land. If one is to look at them through the eyes of a biologist, they anchor the land through times of heavy, excessive rainfall during the monsoons, bring the nutrients from the depths of the land up to the surface through leaf fall, which, when they degrade, add to the nutrient pool of the soil. The trees also create niches for epiphytes like the native species of lichens, mosses, ferns, wild orchids and other plants. These in turn, provide habitats for so many other diverse species of insects, herps, amphibians, fungi, and microbes. Thus, they create the foundation of an amazing web of life, so intricate, where every little wasp, dragonfly or cricket has a story to share.

A cidal spray destroys this all
All it takes is one cidal spray of a pesticide, fungicide, nematocide, herbicide, to wipe all this luxuriant life away. Over the years, this has succeeded in losses beyond imagination of species which enriched our planet through their presence, and the roles they played within that web network of life.

So what does all this mean in practical terms? This actually involves much of what traditional subsistence farmers and progressive organic farmers are already doing. Organic farming practices work with nature, not against it. They enable conservation of a diverse range of plant and animal species by integrating them into the farming ecosystem. Fallow lands are used to provide native habitats that encourage diversity and enable a constant flow between species, maintaining ecosystem connections between farms.

As a result, beneficial micro-organisms contribute to increased detritus (underground detritus) and aerated soil, which helps micro-organisms in the root zone to break down the dead organic material, and helps in the conservation of humus, making the soil more fertile and increasing the production of food crops. This is a very natural, organic system of farming.
biological activity of the soil), increased nitrogen fixation, increased nutrient cycling, and a continuous replenishment of depleted nutrients. Areas where grasslands are encouraged become sponges for harnessing rain water to recharge water tables and aquifers. Fallow lands integrated into the cultivated areas enable pest-predator balances, and attract pollinators with the weed flowering plants.

On organic farms which have no trace of chemicals, parasitic insects are known to colonize native plant species and play significant roles in controlling pest populations. Such areas also provide breeding areas and habitats for birds, amphibians, reptiles and a range of predatory insects all contributing towards keeping the pest populations in a balanced check.

**Western Ghats – a global hot-spot of bio-diversity**

The Western Ghats are internationally recognized as one of the global hot-spots of biodiversity that are under threat from human activities. Hence it is very important to adopt sustainable methods of cultivation. Most plantations in Kodagu are abundant with many species of trees, birds, amphibians and reptiles, small mammals and a fascinating array of spiders and insects. Heavy use of fertilizers, toxic pesticides, fungicides and herbicides has been a constant threat to the biodiversity of this region. It is therefore critical to adopt sustainable agricultural practices. We have been completely organic for over the past 23 years and encourage others to do the same.

We have endeavored to develop this plantation along the principles of agro-ecology. Our cows and goats provide us with nitrogen-laden dung which is used for the microbial-dependent composting system and for generation of energy through bio-fermenters and bio gas. Cow urine is a rich source of nitrogen for the crops, and this along with the compost prepared from animal waste and weeds growing on the farm have been invaluable in creating an integrated holistic farming system. Our aim has been to strike a balance between time-tested traditional practices and modern scientific approaches.

One of the features of a natural forest that we have tried to conserve on our farm is the rich biodiversity prevalent under the canopy of rain forest trees. By leaving uncultivated sectors of natural weeds and fauna in each valley, we now have excellent populations of spiders, wasps, dragonflies, frogs, lizards, snakes, and an amazing range of birds, all of which contribute towards building up of a diverse and healthy agri-ecosystem. Birds, of course, are remarkable for their ability feed on insects and caterpillars. Spiders are indiscriminate trappers of a whole range of insects. Wasps lay their eggs on beetle grubs and caterpillars, which hatch and being carnivorous, start feeding on the hosts which would otherwise be a part of the pest population on the crops. Bats, frogs, salamanders, lizards, shrews, mantids – all are insect feeders, and form a link in the intricate food web of a forest ecosystem.

Finally, we have come to realize that it is only when farming is based upon natural principles can it be truly sustainable. Ecological farming is based on nurturing and nourishing the soils. Having healthy predatory populations within the agri-ecosystem naturally reduces the pestilence damage. Having genetic diversity amongst the cropping system also enables us to select and maintain resistant varieties. The heavy rainfall zones in the Western Ghats have a fragile ecology and are extremely prone to soil erosion. It is important to try and adopt agricultural practices which emphasize conservation of both, soil, and of the rich biodiversity intrinsic to this region.
The large and growing population, coupled with rising incomes and a burgeoning middle class, will continue to drive demand for food and agricultural commodities. Food production will have to be increased drastically. There will be competition for natural resources. This shall have a negative impact on the environment and also livelihoods of billions of people, especially smallholders.

Conventional agricultural practices have had significant successes, but also major adverse impacts in recent decades. Some key issues are as follows:

- Yields have risen, are slowing
- Over-dependence on synthetic fertilizers, pesticides; increasing input costs
- Soils, environment are being massively damaged; poor soil fertility, land degradation
- Poverty has fallen, not eliminated; inequalities are rising
- Risk related to climate change, smallholders’ livelihood
- Farmers’ and public health undermined

Addressing these challenges requires new and innovative approaches. An Eco Agri Revolution is essential for a hunger-free, sustainable world. Eco-friendly technologies, resource efficient and circular agriculture practices must be translated into action to address the food and smallholders’ challenge while creating a balance with the nature.

**Sustainable Eco Agri Revolution**

With rich experience gained through industrial research and farm demonstrations in different parts of the world, Padma Shri Awardee Dr M H Mehta developed the 20:20 model of Eco Agriculture. The model gives practical insight to have 20% higher crop production with more than 20% reduction in input cost in a sustainable and evolutionary manner. The model applies technological advancement in areas of bio-fertilizer, bio-pesticide, bio-compost and agro waste management in crop production.

These bio-inputs are classified in three main categories: nutrient management (bio fertilizer, enriched compost,) bio pesticide (multi microbial botanicals, pheromone) and growth enhancer (Amino acid, micro nutrient, sea weed extract, growth promoter and hormones etc). This model has been worked out based on a number of field demonstrations studies in different parts of India, Africa and far-eastern countries. Dr M H Mehta has also published a book on Eco Agri Revolution which contains comprehensive details on the practical methods, lessons and the way ahead for the 20:20 Model for Eco Agriculture.

**Solidaridad’s Sustainable Soy Program in MP**

Madhya Pradesh is one of the largest producers of soybean in the country. The kharif crop grown over 50 lakh hectares with production recorded at 101.55 lakh tonnes, followed by wheat and gram in rabi. Pulses, oilseeds and vegetables are also grown in the state. Farmers practice intensive farming for high yield and productivity. This has led to use of agro chemicals, fertilizer, heavy farm.
machinery like tractor, combine harvester etc. The cost of all inputs including labour has seen significant rise, though the price of soy remains the same. This has generated concerns for farmers, specially small and marginal farmers with low ability to bear losses. The ecological losses in terms of soil hardness, soil pollution, depletion of water table is also on rise. It has also exposed farmers and their families to chemical hazards, food chain pollution, bio magnification, loss of useful soil micro-organism and fauna. Solidaridad has been mandated to create awareness on sustainable production practices which are socially, economically and ecologically sound.

Strategic Interventions with 20:20 Model
Solidaridad has been working with over 30,000 smallholder soy farmers in MP for promotion of sustainable production technology under integrated farming system approach. We have made efforts to adapt the 20:20 model through extension activities and frontline demonstrations. The following are our objectives to ensure sustainability.

- Integrated farming system approach
- Improving soil health and water use efficiency
- Adopt agro ecological approach for pest and disease management
- Input use efficiency; produce more with less
- Promotion of climate resilient production practices

Some key practices of the 20:20 model that we have adapted in our soy program are in-situ utilization of crop residue, adoption of optimum seed rate, application of green manure, desi manure like Jivamrut, Matka Khad, balanced nutrition, application of GLS Product like Wonder life G for slow release crop nutrition, GLS Kelp Extract for good flowering and pod development, seed treatment with Trichoderma, seed inoculation with freshly prepared bio fertilizer, timely hand weeding instead of chemical weeding/intercultural operations and (hand hoe/Dora/Kulpa), re-incorporate uprooted weeds in the soil etc.

Outcome and Impact
These practices have contributed significantly towards reduction of input costs as well increase the yield. There are major benefits in terms of soil health, crop yield and agro-ecology. Some key outcomes are as follows:

- Improved soil moisture and soil organic carbon content
- Almost 30% reduction in use of fertilizer
- 20-30% decrease in use of pesticide, insecticide due to protective IPM methods
- Improved soil fertility with use of waste decomposer, desi manure and enriched compost
- Decreased exposure of farm workers, farmers to agro chemicals
- Cost of production reduced by 15-20% on average
- Productivity improved by 20% on average

Way Forward
The 20:20 Model adopts the middle path between chemical intensive and pure organic system of production. India is on the path of moving from green revolution to Eco Agri revolution. The role and potential of agri -bio inputs is increasing at all levels. Their demand is increasing at 14% (CAGR) per annum with entry of small and medium industries with new generation green products.

The 20:20 model has shown higher productivity in diverse environments such as Bihar, Rajasthan, Tamil Nadu, Kutch in Gujarat etc. It is technically, socially and ecologically a viable model. They can be adopted by smallholders across Asian and African countries.
The current pandemic has shown that there is no going back to agriculture as usual. Even the usual will need serious technological intervention. According to FAO, agriculture is expected to be a trillion-dollar market by 2030. While climate change, sustainability, yield improvement and income distribution and other old challenges remain, we are now confronted with uncertainties in global trade, fragmented supply chains, doubts about safety and origin of food and more.

Digitally enabled agriculture could revolutionize how grass-root communities access real time actionable, accurate agricultural information and thereby improve their livelihoods. Certain developing countries have been fortunate to get support from the United Nations International Fund for Agriculture Development. Remote sensors have been deployed to help farmers optimize water and fertiliser levels for their crops, and drones are being used to identify plants in poor health so that remedial action can be taken.

**Critical innovations in digital data-driven agriculture**

Such critical innovations in digital data driven agriculture can aid farmers increase their yields and incomes by adopting locally suited seeds and fertilisers, protecting crops from diseases and pests (such as fall armyworm or locusts), adapting to climate change, selling at the best possible price, and accessing financial services.

When all of these aforesaid applications can be made available to farmers with training and initial handholding and support, the potential to expand farmers’ opportunities and reduce their risks is humongous.

Significant yet slower growth was observed in digitalisation for agriculture (D4Ag) in the last decade. In 2019, both the European Union-African Union Task Force Rural Africa Report (TFRA) and the Communiqué from the Global Forum for Food and Agriculture (GFFA) highlighted the power of digitalisation in transforming agriculture. But technology remains distant for small landholders in parts of Africa and other arid regions in the world.

Digitization has the potential to transform the agricultural sector in developing countries. This requires further innovation and strong partnerships between governments, businesses, and farmers, as well as a regulatory environment to ensure that technology remains affordable and accessible.
Challenges remain

The challenges are not confined to developing economies only. Developing nations are concerned about food safety as well as ethical and sustainability footprint of the food they consume. Food systems are no longer compartmentalised. As the lockdown has shown, disruptions in any part of the world can affect food availability and consumption in other parts. How do we keep this globally integrated food system sustainable, safe from contamination and disruption is a question that coming generations will need to answer.

The time has arrived to exploit all modern tools available by bringing information technology and agricultural science together for improved economic and environmentally sustainable crop production. Solutions that combine agri-tech with food-tech and logi-tech and integrate or the complete the value chain is what the future needs.

We at SourceTrace, are committed to resolving a two pronged problem: make agriculture more sustainable and bring transparency and trust into food consumption, impacting food safety. We do this by providing a solution that works on both the ends of the food value chain – production and consumption. We provide businesses with digital tools to have a better view of and control over their operations – from identifying farms and farmers to conducting trainings and facilitating certifications to market linkage to providing complete traceability of the produce from the farm to retail.

Post-Covid, the world needs to massively upgrade basic conditions of digital infrastructure that encompasses IT infrastructure and physical networks at grassroots level. Digital literacy among rural communities are other critical factors to consider. Institutional support, policies and national programs that enable digital agriculture would be the foundation stones towards success.

Technology platforms should empower all stakeholders

Global companies that are tech-enablers for this transformation are ensuring increasing their bandwidth and reaching to rural population and farmers. The pace of reducing the digital skill gap between urban and rural, increasing adoption of simple technologies and ICT tools, and most importantly, promoting digital and innovation culture worldwide needs to be fastened. For the gap to close, all stakeholders need to come together. There is a need to connect the most backward farming communities and the most advanced consumers through technology platforms that empower both ends of the spectrum.

In the coming times, farm area will shrink due to climatic conditions. Global supply chain networks will be affected by geo-political changes. The cost of production will rise as we battle erratic weather, locusts and diseases. In the next couple of years, the pandemic will cause the global economy to contract, making more and more people dependent on the state for food.

The good news in all this is that technologies are already available to make farming in adverse conditions rewarding; to reduce food loss and wastage at every step of the value chain and to do all this at a minimal cost to the planet. Here is what we need to do on an urgent basis:

1. Scaling up innovation - move from proof of concept to large scale implementation in a short period
2. From competition to collaboration – be it technology companies or legacy ones, upgrading the system will need all stakeholders to join hands
3. Future readiness fund – governments, agri-businesses and multi-lateral bodies need to increase funding of targeted interventions that aim to make agriculture disaster proof
4. Linking agri and food – while agri has been slow to change, food systems are evolving faster. It’s time to link both so that we see them as one ecosystem that can be impacted by digital innovation similarly.
5. Cross-sectoral knowledge sharing – the agencies of innovation are currently fragmented. Research organisations, government institutions and corporations need to evolve delivery methods that increase farmer’s access to innovation at the earliest.
6. Global innovation, local application – it is time that farmers, whether in developed or in developing economies, have the same access and ease of doing business.

In each of these steps, digital technologies can make transformational impact at the fastest pace. Delivering on these promises shall require an all hands on deck approach.
“Instead of writing someone else’s account through wage employment after three to five years of collegiate education, it is more meaningful to write one’s own account by embarking upon some self-employment.”

This is the Mission statement given by the founder of RUDSETI (Rural Development and Self Employment Training Institute) movement Padmavibhushan Dr D Veerendra Heggade.

The unique initiative started by Dr Heggade from a remote coastal village of Ujire in South Kannada district of Karnataka with this mission in 1982 has now grown into a country-wide movement of training rural youth for self employment.

The otherwise small initiative of RUDSETI took its leap-jump in the year 2009 when the Ministry of Rural Development and Self Employment Training Institute (RSETI) spread across 33 States/UTs of India. Mr Rajesh Ranjan Singh is Director General of National Academy of RUDSETI (NAR), leading a chain 585 Rural Self Employment Training Institutes (RSETIs) spread across 33 States/UTs of India. He is also heading the NAR as National Resource Organization under World Bank-assisted National Rural Economic Transformation Project (NRETP), aimed to create sustainable livelihood opportunities for poor rural women and youth of India.
Development, Govt. of India adopted the model in the form of Rural Self Employment Training Institutes (RSETIs). Now, there are 585 RSETIs spread across the states and UTs of the country. The RSETIs are one of the largest chains of training institutions under a single brand in our country, available at the remotest corners. By training over 4 lakh rural youth every year, RSETIs are proving to be one of the very potent district level skilling Institutions. Over 3 million rural unemployed youth have so far been trained by the RSETIs with an impressive settlement rate of over 70%.

**Unique Association**

The Ministry of Rural Development anchors the programme by formulating policy guidelines, funding the cost of training and extending infrastructure grant assistance of Rs 1 Crore per RSETI. State governments provide free land to the institutes and also help in mobilising eligible trainees. Banks run and manage the institutes and also provide credit assistance to desirous entrepreneurs trained there. This tri-party association provide a strong footing to the RSETIs to meet the challenges of mobilising right candidates, funding the cost of training and providing financial assistance for future businesses.

**Model of Training**

The core offering of RSETI model is Intensive Short Term Residential Training for skill development and motivation to rural youth coupled with long term post training escort and hand holding services. This is done to ensure establishment of micro enterprises by the trainees and their sustainability. The activities of RSETIs are divided into 3 phases: Pre-training, Training and Post Training.

**Distinctive Training Segments**

The acclaimed effectiveness of RSETI training programs is due to its unique training methodology where participants are stimulated to develop interest in learning through structured psychological exercises in their vernacular languages. Behaviour simulation games, exercises, field visits, hands on experience, interface with supporting system, group discussions, case study etc. are effectively used in the training.

Topics covered under the soft skills segment are- Developing Entrepreneurial competencies, Motivation, Personality development, Positive attitude, Time management, Leadership qualities, Effective communications skills etc.

The RSETIs focus on experiential learning and achievement motivation. Trainings are mostly residential which facilitates in long hours of learning. In-campus life also helps in developing overall personality of the trainees by following a disciplined routine starting from yoga, shramadaan, etc.

**Post Training follow-up or Escort Services:**

Short-duration training followed by long-term handholding of trainees is the hallmark of RSETI philosophy. Post Training follow up of RSETI trained candidates has been found effective in facilitating launching of self employment ventures.

The RSETIs maintain follow-up cards for every trainee and record the progress of their enterprise establishment through personal visits, cluster/block/district level meetings, telephonic follow-up, etc.

Every Institute has not only to achieve the target of total candidates trained but more importantly, achieve a certain percentage of candidate success, as only this proves the efficacy of training.

**Aligning with new skilling ecosystem**

RSETI functioning has been aligned with the stipulations of the Common Norms Notification of the Ministry of Skill Development and Entrepreneurship, Govt. of India. Its courses have been aligned with the National Skills Qualification Framework (NSQF). To assess the outcome of training, all the candidates undergoing training at RSETIs are third-party assessed by an independent assessment and certification agency. Only those candidates achieving a certain minimum percentage of marks in the assessment are awarded trained certificates.

**National Academy of RUDSETI (NAR):**

To maintain the uniformity and standard of operations of the RSETIs, the promoters of RUDSETI has established NAR head quartered at Bengaluru. The NAR has been made National Resource Organisation (NRO) for RSETIs. The NAR is mandated to work as repository of knowledge for RSETIs and taking all the steps to ensure that the true essence of the model of RUDSETI is maintained by all the RSETIs across the country.

**Way forward**

Recent technological advancements in various sectors have opened new employment opportunities for unemployed youth in India. India’s youth demand to be equipped with proper employable skills through Entrepreneurship Development Programmes (EDP). RSETIs play a vital role in this sector.
Biochar is obtained by carbonizing (Slow Pyrolysis) of various types of biomasses to achieve properties suitable for remediation of degraded soils. Research studies and field reports have confirmed that with addition of biochar and biochar products viz. biochar compost and other biochar-based formulations to the soils, farmers can achieve 20-30% increase in crop yield. Bio-char usage minimizes the consumption of chemical fertilizers and pesticides and farmers need to use lesser water, resulting in savings.

In Europe and USA, popular applications of biochar began in 2007. Its consumption has grown by about 19% annually with growing awareness as indicated in the graph below.

In Europe and US, research labs and commercial organizations discovered other applications of biochar, such as addition for animal feed (1%) and also for health products. The market potential for biochar products in USA for 2019 is $8.9 billion, as estimated by a Florida company. The consumption domain-wise is given below:

In India, the Central Research Institute for Dryland Agriculture (CRIDA-ICAR) along with other R&D institutes and universities has undertaken research in the area of production and applications of biochar in rural regions. This has been done as part of the National Initiative on Climate Resilient Agriculture (NICRA). In 2013 bulletin was titled Use of Biochar for Soil Health Enhancement and Greenhouse Gas Mitigation in India. The second bulletin, in 2018, was titled Biochar Products and its
have been established in other counties to promote biochar culture.

Bamboo biochar

This is a new product in the family of biochars. In 2015, the Energy Research Centre of the Netherlands (ECN) had claimed that bamboo biochar has better properties than biochars. They also reported the following yields from their pyrolysis plant during processing of the bamboo species, Bamboosa Vulgaris:

<table>
<thead>
<tr>
<th>Markets</th>
<th>Annual Biochar Sales Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury removal from coal fired power stacks</td>
<td>$2,000,000,000</td>
</tr>
<tr>
<td>Animal Feed Additive</td>
<td>$2,000,000,000</td>
</tr>
<tr>
<td>Nutrient Pollution</td>
<td>$1,000,000,000</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>$950,000,000</td>
</tr>
<tr>
<td>Lawn and landscape</td>
<td>$600,000,000</td>
</tr>
<tr>
<td>Waterway restoration</td>
<td>$500,000,000</td>
</tr>
<tr>
<td>Plastic lumber</td>
<td>$350,000,000</td>
</tr>
<tr>
<td>Specialty Ag (hemp, fruits, vegetables)</td>
<td>$350,000,000</td>
</tr>
<tr>
<td>Biochar manure and fertilizer pellet</td>
<td>$325,000,000</td>
</tr>
<tr>
<td>Drought relief</td>
<td>$300,000,000</td>
</tr>
<tr>
<td>Mine Reclamation</td>
<td>$250,000,000</td>
</tr>
<tr>
<td>Activated Carbon Replacement</td>
<td>$150,000,000</td>
</tr>
<tr>
<td>Asphalt filler</td>
<td>$100,000,000</td>
</tr>
<tr>
<td>Concrete filler</td>
<td>$100,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$8,975,000,000</strong></td>
</tr>
</tbody>
</table>

Use in Rainfed Agriculture. Both bulletins highlighted the potential benefits of using biochar and suggested the method of manufacture of biochar in rural areas and their applications.

They have also identified areas for further research. One of their strong recommendations is not to burn agri waste but convert into biochar. They recommended that there is need to develop suitable technologies and processing equipment with smaller capacity, to manufacture biochar in rural areas.

In US and Europe, professional societies have played an important role in promotion of biochar products. Two major organizations are International Biochar Initiative (IBI) headquartered in New York and European Biochar Organization headquartered at Switzerland.

These organizations are supported by government agencies, biochar manufacturing industries, farmer organisations and other philanthropic agencies. These organizations issues quality certificates for biochar products manufactured in their countries for various applications. Similar societies to manufacture bamboo biochar. He has reported similar outputs as mentioned in the report by ECN, Netherlands. BBI has also been able to convince CSIR-IICT (Indian Institute of Chemical Technology), Hyderabad, to offer testing services for various manufacturers of biochar.

India must establish the National Biochar Mission with sufficient funds to promote research required in this emerging sector and also promote export of biochar products. It can support programs for interaction amongst farmers from overseas who are successfully using biochar products. The Mission needs to have an action plan for 10 years.
Organic farming has been the soul of the Indian agricultural tradition. The competition to produce more and more has almost ended it. There is need for inclusive policy reforms by eliminating exploitation at government and non-government level towards organic farming. Only then the goal of natural agriculture revolution and skill development can be achieved.

We are witness to the negative dimension of agricultural productivity, an off-shoot of the Green Revolution. The use of chemical fertilizers and poisonous pesticides to maximize agricultural production has affected the cycle of exchange between natural and inorganic substances of nature (ecological system), destroying the fertility of the land. The balance of the chakras has continued to deteriorate. Now the atmosphere is polluted, affecting human health.

In 2001-02, organic farming was started in every village in every development block of every district in Madhya Pradesh. These villages were termed organic villages, and the initiative was publicized. But even after two decades, the scale of organic farming in India is disappointing. In rural areas, natural agriculture revolution and skill development were not taken forward in a planned manner. Only the dugdugi of organic farming was played.

Organic farming is being talked about loudly these days by government and non-governmental social organizations. Industries which have caused maximum damage to the environment have joined the bandwagon. It is discussed in government conferences, seminars, workshops and demonstrations.

Paper Departments, Paper Trainings
The government has made new departments to boost organic farming. If we call them paper departments, it will not be an exaggeration. Almost the entire farming budget benefits big domestic and foreign companies and institutions. Grants for chemical fertilizers, hybrid seeds and poisonous chemical medicines abound. In the name of organic farming, the name of Zero Budget is handed over to the farmers with much cacophony. This way, our dream of organic agriculture can never be fulfilled.

Many NGOs are engaged in the task of training farmers in the name of eco-friendly farming. Budget is allocated for skill development of youth in rural areas and everybody wants to have a share of the pie. No skill development happens.

To galvanize the politics of votes in rural areas, governments have launched schemes to distribute grains, food grains, salt, oil, seeds, fertilizers, plants etc. for free. There are attractive...
slogans to attract voters. This has largely converted the rural society to freeloaders. Contempt of physical labour is increasing in villages too.

These are the times of muft-khori. Farmers are shown rosy dreams of Zero Budget farming method to get abundant organic produce. Which foolish farmer will then spend from his pocket and invest in organic farming?

Inter-state camps are working to raise money across the country selling dreams of eco-friendly and sustainable farming. They give us impractical slogans like Zero Budget and claim to engage in skill development of farmers. In every district, they manage to connect with some local farmers and non-governmental organizations. In alliance with the central and state governments, they claim to organize training for rural unemployed youth in the name of skill development. In the name of eco-friendly farming, this circus keeps moving and big money exchanges hands.

These camps working for skill development are so powerful that in many states, they even get their schemes passed to suit their convenience. They have such a strong hold with the Centre and state governments that they are able to get Padma Shri awards for the purpose of giving government recognition to progressive farmers, who indirectly help in their work.

For the budget for FY 20-21, the Central government announced efforts to promote zero budget farming. The question is: If this zero budget farming can be done without spending a penny, then why not extend it to all the agricultural universities, agri science centers, government seed production centers, farms owned by the defense services? What is the need to allocate crores of rupees to them? Let all farming be zero budget here.

All these ineffective, impractical solutions are for distribution among farmers, and by so-called trainers. It is claimed that most of these trainings are free. But the expenditure incurred on these trainings is ultimately public money.

Most of the trainers themselves have no farming experience. Neither are they able to train farmers in successful marketing of agricultural products. With paper training sessions of skill development, trained youth are unable to use these constructively. They are not able to promote the value of their products in the market.

Covid has taught us that strong personal immunity is of paramount importance in fighting diseases. It has taught us the importance of a balanced environment and chemical-free foods. Now organic farming is the wise option for every agri commodity including grains, fruits, flowers, vegetable spices, milk etc.

Farmers need to pump in more and more chemical fertilizers in their fields every year, and get caught in debt trap. Several recent studies have established the negative correlation between fertilizer consumption and production. Where fertilizer consumption is low, crop yield is high. It is unfortunate that fertilizer companies have not bothered to balance the soil nutrients to avoid harmful accumulation of chemical elements in the soil.

We are paying a price for our tendency to blindly accept Western inputs and technologies, and fall for their shiny temptations. After investing in the crop, whatever money the farmer has left goes into the purchase and maintenance of these technologies. Profitability of farming is decreasing. The farming crisis is deepening.

The situation can be resolved if every farmer makes organic manure for his fields. Organic farming is the future of Indian agriculture. It is not possible to achieve this goal without approaching it in an organized manner. We need eco agricultural revolution and skill development at ground level. We need proper planning, adequate budget and forgetting empty slogans like Zero Budget farming.
The problem of crop residue burning is extremely serious, particularly in Haryana and Punjab. Harvard University announced in April 2020 (https://projects.iq.harvard.edu/covid-pm) that a 1% increase in air pollution (PM 2.5) results in 8% higher Covid death rate. There is urgent need to provide an eco-sustainable in-situ solution to the problem of crop residue burning. Punjab Pollution Control Board (PPCB) and Indian Automobiles Manufacturers (SIAM) came forward to sponsor this initiative with Gujarat Life Sciences to provide a solution to the straw burning problem using multi-microbial spray Re-Life. SIAM coordinated with IPS (India Paryavaran Sahayak Foundation) Foundation and Confederation of Indian Industry (CII) and Thapar University for large field trials with different farmer groups.

The Problem
The burning of crop residue after the harvest is a menace in northern states like Punjab, Haryana, UP, Delhi, etc. Apart from creating alarming air and soil pollution and loss of resources, it reduces sustainability and causes economic loss to farmers. There is crying need for practical, eco-friendly, farmer-friendly and economically attractive solutions.

The Solution
After years of R&D, field demonstrations have given us the solution. There is strong need for upscaling implementation. This is a two-step in-situ process that involves:
1) Preparation of mulch from crop residue using machines like Super Seeder, Rotavator, Mulcher, etc.
2) Multi microbial spray Re-Life which helps in in-situ conversion of mulch to bio compost. This increases the availability of nutrients, micronutrients, increases soil health & microbial counts.

Research Trials With Collaborative Partners
Trials were conducted in various districts/villages of Punjab by different organizations to evaluate and demonstrate the impact of Re-Life on rice stubble. The details regarding machinery and methodologies used for agro waste management is described in the following table:

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<td>Agriculture Welfare Department and TIET</td>
<td>1. Mixing of straw in soil using a Rotavator and plough 2. Before and After samples taken</td>
<td>Amritsar: Guru Ki Wadali Village</td>
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</table>

Results and Discussions (CNPK Microbial Count)
Increase in Total Organic Carbon (TOC) or soil organic carbon is very important for soil health, carbon sequestration to...
mitigate climate change, micro-macro aggregation of soil particles. At the e-Conclave organized by the Agriculture Today Group on July 8, World Food Prize Laureate Prof Rattan Lal spoke of the importance of soil organic carbon and soil health. There was an increase in soil organic carbon in every set of trials with Re-Life. Crop Residue and agro waste management contribute to soil organic stores and further will help improve soil properties.

### Increase in Total Aerobic Microbial Count

This study also encourages microbial diversification, root exudates and fungal hyphae which is very important to improve soil structure and soil health. Micro-organisms further help to form soil aggregates that are very useful in moisture retention and water infiltration. Agro waste management using microbial processes is a very important component for Eco-Sustainable Development and Eco-Agriculture Revolution.

### Increase in NPK (Nitrogen, Phosphorous, Potassium)

Agro Waste Management using multi-microbial spray Re-Life will help to solve the menace of crop residue burning. It shall also help in recycling nutrients back to the soil.

Use of Re-Life offers the potential of economic benefits. Large scale application after Mulch preparation etc. will help improve the quality of air and soil. It shall also considerably improve water use efficiency and bring attractive economic benefit to farmers.

### Way Forward, Recommendations

- Re-Life will be the first step towards Eco-Agriculture Revolution and Carbon Sequestration. Combining with 20-20 model will help farmers to improve productivity as well as soil health, reducing diseases in humans and animals.

- There is a need to scale up this approach. We propose to take up implementation over 1 lakh acres in Punjab and Haryana in the coming season. This is less than 1% total area of each state.

### Acknowledgement

We are thankful to our associate farmers, Punjab Pollution Control Board, Punjab Agriculture Welfare Department, Society of Indian Automobile Manufacturing (SIAM), Indian Paryavaran Sahayak (IPS) Foundation, Confederation of Indian Industry (CII), scientists of Science Ashram & Gujarat Life Sciences, Vadodara and Thapar Institute Of Engineering And Technology.
Sustainable development in all walks of life is the only way to our future well-being. The same holds true for agriculture to feed the growing population. We have a plethora of technologies available with us to support this endeavour.

No single technology can offer solutions for all crops that we grow in different regions of the country for various agri-businesses and consumer needs. A selection of technologies suitable for a community/region would be the best way forward towards a sustainable future. In this regard, besides hybrids, GM traits, gene editing, novel pesticides and innovative agronomic practices, Biologicals are getting a lot of attention. Biologicals for agriculture include naturally occurring beneficial microbes, plant extracts and organisms that can improve growth, stress and disease tolerance of the crop.

There are growing concerns about chemical residues on the produce, soil and water body pollution and also greater consumer awareness. Hence farmers are actively looking into supplemental options for integration into current practices to reduce their dependence on chemicals. This can ensure better growth and protection of their crops, and biologicals can help them achieve it.

Biological stimulants refer to bacteria, fungi, growth enhancers or plant extracts that increase the availability of soil nutrients and water by increasing soil water holding capacity. They contribute to robustness and vigour of the crop, making it more resilient to adverse climatic conditions while yielding quality produce.

The many benefits

Biological stimulants can complement and enhance the effect of chemical fertilizers in multiple ways. They can increase the germination and root development in early growth of the crop, positively impacting nutrient uptake, transport and efficient energy use. By improving the plant’s metabolism, the bio-stimulants can improve the defences and stress-tolerance strategies of the plant to make it healthy, resilient and less prone to disease and environmental stress. They also improve soil fertility by decreasing nutrient runoff, nutrient leaching and growth of complementary soil microorganisms.

The agricultural biological’s market was valued at USD 8.8 billion in 2019. It is projected to grow to USD 18.9 billion by 2025. The Indian bio agriculture market was estimated to be worth INR 52,026 in 2019. The cost of developing biological stimulants or pesticides is almost 1/20 of the cost of chemical.
based pesticides. As per 2016 data, around 500 biologicals have been registered in India with equal numbers for biological stimulants and bio control agents.

**Bio-pesticides**

Bio-pesticides that include bacterial, fungal concoctions or plant extracts, are most relevant in fruit and vegetable production. As per 2016 data, globally 80% of the biologicals were utilized by the fruit and vegetable growers. Fruits and vegetables are marketed as fresh produce. Therefore, damaged and unhealthy produce fetches low prices. To keep the produce fresh, farmers tend to spray their fields multiple times with chemicals having different modes of pest control.

Other than the cost of multiple sprays, over-spraying may also lead to pests developing resistance to the chemicals as well as increasing time intervals before the produce can be harvested. This impacts farmers in near and long term. An integrated approach of using bio-pesticides along with chemicals is proposed to be the safe and economical way for growing nutritious crops. Since bio-pesticides degrade quickly, they do not pose any harm to humans, environment and do not impact non-target organisms in the field biosphere. Also, their different mode of pest control compared to chemicals could help delay possible development of pest resistance to chemicals, thus contributing to a sustainable long-term pest management strategy.

**Higher adoption needed**

Biologicals have been more readily adopted in the developed world than in the third world as the small holding farmers are unwilling to make any changes to their proven cultivation practices. Since the performance of biologicals depends on multiple factors in the field, it can be variable over a period of time and across different fields. Such inconsistencies across time and space can be addressed by better awareness regarding the product and its use in the field. Developers and distributors need to educate the farmers regarding agronomic parameters for using biologicals, their dosage, time and frequency of application along with associated agronomic practices for best results.

Widespread acceptance of biologicals in a tropical country like India would depend on several other factors including the prolonged shelf life of the biological, its compatibility with chemicals, easy availability, cost of application and farmer awareness through extension programs to avoid inconsistent results in the field. Since India makes paltry amount of biologicals and imports most of the biologicals in the market, stability and cost remain as issues. The use of biologicals to reduce dependence on chemicals would contribute to sustainability. This requires research and development of products suited for our soils and environment, infrastructure for production and a focussed extension program for educating and training farmers. This road less travelled might lead us to better solutions for our small farms and diverse agro-climatic zones.
AGRICULTURE TODAY
August 2020

VITAL ROLE OF ASSOCIATIONS

REVOLUTIONIZING ECOLOGICAL AGRI-PRACTICES

Agriculture needs to be more sustainable, ensuring the food security of the people, and reaffirming our sovereignty over the most essential of human needs: Food.

Post the green revolution we were looking for alternative solutions as we lived through turmoil, economic, political, and environmental threats. These have become more brutal after the Covid pandemic. We need to strengthen and adapt our agro-ecology strategies with greater social commitment. This is important in order to accelerate innovation in the countryside. We need to transmit the highest quality of knowledge among farm workers, and encourage farmer-to-farmer knowledge-sharing. It is important to ensure that the farming community is receptive to these ideas. There is a need to bring them together to develop a national movement of agro-ecological producers. That's where the role of associations kicks in.

Ecological farming involves the introduction of symbiotic species, where possible, to support ecological sustainability of the farm. Associated benefits include a reduction in ecological debt and elimination of dead zones. It is a pioneering, practical development which aims to create globally sustainable land management systems. It also encourages review of the importance of maintaining biodiversity in food production and farming end products.

**Diversified Farming Systems (DFS)**

We refer to a farming system as “diversified” when it intentionally includes functional biodiversity at multiple spatial and/or temporal scales, through practices developed via traditional and/or agro-ecological scientific knowledge. Farmers manage this functional biodiversity to generate critical ecosystem services to agriculture. At the plot (i.e., within-field) scale, diversified farming systems (DFS) may include multiple genetic varieties of a given crop and/or multiple crops grown together as polycultures, and may stimulate biodiversity within the soil through addition of compost or manure. By crops, we mean either annual or perennial crops, including tree crops.

At the field scale, DFS may include polycultures, non-crop plantings such as insectary strips, integration of livestock or fish with crops (mixed cropping systems), and/or rotation of crops or livestock over time, including cover cropping and rotational grazing. Around the field, DFS may incorporate non-crop plantings on field borders such as living fences and hedgerows. At the landscape scale, DFS may include natural or semi-natural communities of plants and animals within the cropped landscape/region, such as fallow fields, riparian buffers, pastures, meadows, woodlots, ponds, marshes, streams, rivers, and lakes, or combinations thereof. The resulting heterogeneous landscapes support...
both desired (beneficial) components of biodiversity and “associated biodiversity”; together these two elements make up agrobiodiversity.

**Not an alternative to agro-ecology**

Diversified Farming Systems should not be understood as an alternative to agroecology. It can be considered as a framework that draws from integrating agroecological, social, and conservation sciences to focus analytical and action-oriented attention toward farming systems in which cross-scale ecological diversification is a major mechanism for generating and regenerating ecosystem services and supplying critical inputs to farming. Agroecological principles and methods can be used to evaluate DFS and to design or revive processes of diversification.

At their core, DFS depend on the core of agroecological principles, developed within and through the social relationships among working farmers, their communities and environments, researchers, including ecologists, anthropologists, agronomists, and ethnobiologists.

DFS are basically, components of social-ecological systems that depend on certain combinations of traditional and contemporary knowledge, cultures, practices, and governance structures.

**Vital role to play**

Having understood the basic concepts of the ecological agri-practices, we come to the role of associations addressing various farming aspects to pitch in, in order to promote and address the issues related to ecological agri-practices in our country. Here are a few highlighted issues that need to be further advocated:

i. The challenge for ecological farming science to achieve a mainstream productive food system that is sustainable or even regenerative. To enter the field of ecological farming, location relative to the consumer, can reduce the food miles factor to help minimise damage to the biosphere by combustion engine emissions involved in current food transportation

ii. Design of the ecological farm is initially constrained by the same limitations as conventional farming:

### Principles of Ecological Farming (FIMDA)

- Food production should be ecological in both origin and destiny
- Integration of species that maintain ecosystem services whilst providing a selection of alternative products
- Minimise food miles, packaging, energy consumption and waste
- Define a new ecosystem to suit human needs using lessons from existing ecosystems from around the world
- Apply the value of a knowledge-base (advanced data base) about soil microorganisms so that discoveries of the ecological benefits of having various kinds of microorganisms encouraged in productive systems can be assessed and optimised

| Disclaimer: Views expressed in this article are personal views of the author and in no way reflect the views of BASAI |

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Mr Vipin Saini is a regulatory affairs specialist, educationalist, environmentalist, toxicologist, data analyst, writer and publisher with a combined experience of more than 25 years in the field of biosciences and related regulatory aspects. He is CEO, Biological Agri Solutions Association of India (BASAI) and Founder Trustee of Sunrakshan Foundation. He is actively involved in taking forward the recommendations of the Doubling of Farmer’s Income Report issued by DAC&FW.
After the lockdown in India began on March 25, virtual governance system through digitalised workflow and video conferencing has been adopted by the government and private sector. The government has done it through its national effective and efficient internet grid system. The government exempted agricultural operations from harvesting to movement of produce to mandis, but situation at the ground level did not ease out. It may lead to supply shock due to logistic challenges of agricultural produce from farmers to retailers.

More than 130 million farmers - 85 per cent being small and marginal farmers – are involved in farming activities in India. Farmers are under distress due to breakdown in their downstream and upstream agricultural value systems. The agri-input and agri-output eco systems have progressively collapsed. Rural India has been helplessly staring at this larger and looming shock. Farmers are looking for buyers for their produce. Agricultural labourers are not available for harvesting.

Farming is one of oldest economic activities in the country, providing more employment opportunity than any other sector. India has delineated its geographical area into 15 agro-climatic regions and more than 127 agro-climatic zones. These have different farming practices evolved over centuries with changes in weather and climatic conditions, technological innovations and socio-cultural practices. Rural India requires “e-Governance in Farming System” as a Citizen Charter to overcome rural distress to a greater extent.

1. Digitalised Agriculture: Digital Technology and Innovation in Need for digitalised Agricultural Value System for empowering Indian farmers

Prof. M. Moni is Professor Emeritus & Chairman, Centre for Agricultural Informatics and e-Governance Research Studies (CARIS), Shobhit Institute of Engineering & Technology, Meerut (A NAAC Accredited Deemed to-be University). He is Chairman, ICFA Working Group on ICT in Food and Agriculture and former DG, National Informatics Centre, New Delhi. Prof. M. Moni has been associated, since his retirement on superannuation from the Central Government in May 2013, with NGOs viz., AHIMSA (www.ahimsaact.com) Chennai, ICCo (www.iccoindia.org) New Delhi and HPMI (www.hpmi.org.in) Noida, to establish Digitalised Agricultural Value Systems (Input Value Chain, Production Value Chain, Domestic Marketing Value Chain and Export Value Chain) for agricultural commodities in the country.
Agriculture: Digital India, Make in India, Skill India and StartUps India Programmes for Transformational Reforms in Agricultural Sector (SMART Irrigated Farming, SMART Rainfed Farming and SMART Tribal Farming);

2. Digitalised Agro-Met Advisories & Agricultural Risk Management Solution;

3. Digitalized Agricultural Resources Information System and Micro-Level Planning for achieving SMART VILLAGE & SMART FARMING;

4. Digitalized Value Chain for about 400 agricultural Commodities;

5. Digitalised Access to Inputs, Technology, Knowledge, Skill, Agricultural Finance, Credit, Marketing and Agribusiness Management, to Farmers;


7. Digitalized Farm Health Management for reduction of Farmers’ Losses.

In view of its importance to achieve the objectives of Doubling Farmers’ Income by 2022 Mission, as the Chief Advisor (IT) I had suggested on August 16, 2018, to the Department of Agriculture, Cooperation and Farmers Welfare that it is essential to undertake creation of National Farmers Database. I suggested that this should be built on the principles of Aadhaar Database Platform and GSTN Database Platform on about 13 Crores farmers and associated their agricultural resource assets. This could be taken up as a Mission Mode Project involving 2.25 lakhs Common Services Centres (CSCs) of Digital India Initiative. There can be many challenges for establishing this economically important National Database (Master Data Repository). It may need a Special Purpose Vehicle (SPV) for implementation in mission mode. The Proposed National Database on Farmers shall facilitate “Transactions Databases on Virtual Platforms” as described below:

1. Farmer to notify progress of sowing crop wise on virtual platform through phone;
2. Buyer to notify the demand on virtual platform;
3. Farmer to notify likely arrivals and volume of each commodity;
4. Concurrent dissemination of information on likely demand and present level of supply while sowing is progressing;
5. Dissemination of likely gap/excess of commodity to all the stakeholders/farmers;
6. demand position to be taken a season in advance from the buyers with a maximum rate at which willing to buy;
7. Aggregators to place supply position a season in advance with minimum expected rate;
8. price forecasts to be made based on the on-line information of sowing and demand position.

The DFI-2022 Mission Mode Programme Digitalized Value Chain for about 400 agricultural Commodities may facilitate formation of more than 6500 Agri StartUps (one per block) or even about 2.25 Lakh Agri StartUps (one per each Gram Panchayat). This can ease out supply-side lock in logistics of the agricultural value system. Digital Technologies – Block Chain, IOT, Artificial Intelligence (ML & DL), BigData Analytics, GIS, Smart Phone, Internet, Cloud Computing and Language computing – are vital. These facilitate the farming community and empower it progressively through the newly evolving Agricultural Informatics discipline. BharatNet can be viewed as the Digital Network for Farmers (DNF) and their agricultural value chains.

It is the high time that we understand and answer the question “How well do we know our farmers?” (Page no 50, www.egovonline.net, September 2011). The COVID-19 lockdown crisis provides us both opportunities and challenges. Let us operationalise DFI-2022 Mission Mode Programmes on digitalisation of agriculture for empowering our farming community, by establishing Agriculture 4.0. Farmwise Database and Farmerwise Database are the two basic assets on which Agriculture 4.0 shall operate to minimise the crisis that can be created by a COVID-19 like situation in the future. Development of SMART Farmer, Smart Farming and SMART Village in an agricultural eco system shall lead to a National Open Digital Eco System (NODE) of the country. It is high time that Rural India have Agricultural Polytechnics, Agricultural ITIs, and Agricultural Schools established.

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

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

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

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