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Intervention of Modern Technologies for Implication of Sustainable Agricultural Development under the Backdrop of Global Climate Crisis and Shrinking Natural Resource Base: A step Forward

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It is really becoming a challenging task for the agriculturist, scientists, environmentalist, ecologist, policy makers and associated stakeholders regarding food security for burgeoning global population under the backdrop of global climate crisis and shrinking natural resource base particularly declining land and water resources. Escalation of greenhouse gases and amplified climate system fluctuation has resulted in upsurge of extreme weather related anomalies. It is a matter of concern that Agriculture contributes approximately about 20 % of the annual increase in anthropogenic greenhouse gases by emission of carbon di-oxide, methane and nitrous oxide. The main sources of greenhouse gas in agriculture and allied sectors are flooded crop fields, faulty soil, water, nutrient management, unscientific livestock management and other related crop management strategies. As a consequence, there should be a paradigm shift in planning for concerted, judicious, prudent crop management strategies alleviating climate anomalies and fostering global agricultural research perspective and soil and climate resilient agriculture for sustainable agricultural development.

Under such a backdrop, intervention of modern technologies encompassing recent advances in soil science entailing management of soil fertility, precision nutrient management in submerged soil, mitigation strategies for arsenic contamination in agricultural production system, biochar and carbon sequestration, maintenance of Global Soil Carbon pool, site specific nutrient management, heavy metal contamination in soil and agro-ecosystem that pose potential threat addressed with recent advances in research of phytoremediation, microbial remediation, Cation interaction, soil washing and other related relevant aspect, judicious planning for conservation of soil biome ensuring preservation of bio-diversity, energetic in crop production and a healthy soil-plant system for sustainable food production not only for the present generations but also for the posterity and planning for soil and water management and conservation should be the priority sectors of research as a way forward. Advanced researches in crop biotechnology and genetic Engineering to be potentially explored for expanding the genetic pool and enabling the developed lines with improved resistance to biotic and abiotic stresses, enhanced yield potential, desired nutritional quality and enhanced resource use efficiency. Crop improvement strategies encompassing nutrient bio –fortification for alleviating nutritional deficiencies and micro-nutrient malnutrition in food chain and ensuring global food security and other related relevant aspect in modern agricultural research need to be exploited with full potential. The integration of genomics, proteomics, bioinformatics with on-going developments in genotyping technology and next-generation sequencing has the immense potential in crop improvement program under the backdrop of climate crisis and declining trend of natural resource. Implication of Next Generation sequencing technology can revolutionize crop improvement enabling the sequencing of thousands of plant genomes and offer opportunities of enhanced crop productivity, desired quality for sustainable agricultural development. Precision farming as a modern technology based intensive farming strategy with GPS, sensors., and associated modern technologies, if implemented on large scale can improve productivity, optimize resource use efficiency, mitigate climate anomaly and ensure sustainable agricultural production system. Conservation agriculture relying on minimal soil disturbance, maintenance of constant organic cover, diversified crop rotation have the potential to revolutionize global agricultural production under climate resilient system and shrinking natural resource base. There is an urgent need for implication of latest innovation in pest disease management

for plant protection deploying cutting edge molecular tools like gene editing deploying CRISPR/Cas9 that can create precise changes to increase plant disease resistance and to combat stresses faced by the crops and plant, immunity and response to diverse pest and diseases and interaction to environment and ecosystem diversity. Implications of Eco-friendly pest management encompassing judicious cultural practices, habitat manipulation maintaining structural and cultural diversity, utilization of herbivore induced plant volatile, landscape management for conservation of natural enemy and application of ecological engineering, bio-botanicals, nano-pesticides are some of the modern interventions in pest management for sustaining production. The use of Artificial Intelligence (AI), Machine learning for monitoring crop health and implication of disruptive technologies in Agriculture 4.0 like IoT, Robotics, Big Data Analytics, Drone technology may transform crop production sector towards more resilience and sustainable. It is high time for intervention of IOFT and ICT devices for revolutionize blue economy and agricultural and allied sector for sustainable development. It is an emergent need for transfer of technologies to the farming sector and farm industry and critical analysis regarding paradigm shift in economic and social perspective after Covid-19 pandemic era and its impact on agrarian economy for sustaining production.

There is an urgent need for concerted research with intervention of all available modern technologies for practical implication and novel approaches towards triggering agricultural productivity on sustainable basis, enhancing food security on the backdrop of the global climate crisis and ecological and environmental degradation.

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