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कहार

जन विज्ञान की बहुभाषाई पत्रिका

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प्रकाशक
प्रोफेसर एच.एस. श्रीवास्तव फाउण्डेशन फॉर साइंस एण्ड सीखाइटी, लखनऊ

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कहार

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त्रैमासिक 12 (1)जनवरी - मार्च , 2025

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कहार एक पारम्परिक मनुष्य वाहक के लिए प्राचीन देशज सम्बोधन है । कहार की तरह ही ये पत्रिका जानकारियों एवम् लोगों के बीच सेतु बनने की कोशिश है ।

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संपादकीय

बदलते मौसम में भोजन और पानी के भावी संकट

एक और नया वर्ष आ गया, और कलेण्डर की तिथियाँ पेड़ों के नये पत्तों की तरह फिर से नवीन होने लगी | जलवायु परिवर्तन जारी है |

बदलता मौसम तेज धूप, थोड़े समय की भीषण सर्दी, अनियमित तेज बारिश, बार-बार आते-जाते समुद्री चक्रवात और तूफान, अब सब जगह, सभी क्षेत्रों में दस्तक देते ही रहते हैं, तब भी आर्थिक विस्तारवाद से अकड़ी अनेकों सरकारें अब भी इसे महत्व नहीं दे रही हैं | कई नये-पुराने शासक खुली अर्थव्यवस्था के अति-उत्पादी सिद्धांतों के पोषक हैं | आर्थिक और अनियंत्रित आर्थिक विकास के पक्षधर दुनिया भर की सरकारें जल, जमीन और भोजन के भावी संकटों को अभी भी हमारे विकास के विमर्श में सही तरीके से और पूरी गंभीरता से शामिल नहीं कर पा रही हैं |

तकनीकी बढ़त और तेज आर्थिक विकास की बेचैनी लगातार व्यक्ति-केंद्रित और धन-केंद्रित संस्कृतियाँ विकसित करती जा रही हैं आज की यही जा रही वैश्विक संस्कृति इस मौसमी बदलाव एवं जलवायु परिवर्तन के मुख्य कारण बन रहे हैं | जिस तरह मौसम बदल रहा है, गर्मी बढ़ रही है, और पानी की खपत भी, ऐसे में, आने वाले समय में मनुष्य एवं अन्य जीवों के उपयोग लायक स्वच्छ पानी की जरूरत को पूरी करते रहना भी दुनियाभर में एक बड़ी चुनौती बनती जा रही है | प्रकृति के सभी पंच तत्वों, जीव-जगत, हमारे शरीर और मन में भी उपभोक्तावाद का प्रदूषण बढ़ रहा है, जिसका बड़ा कारण लोगों की सहूलियत और सुख बढ़ाने के लिए कारखानों में उत्पादित अप्राकृतिक वस्तुओं के निर्माण और उनके अंधाधुंध उपयोग को बढ़ावा देने की बाजार और व्यापार संस्कृति है | समुचित एवं धारणीय कचरा-प्रबंधन, आज की हमारी सबसे बड़ी तकनीकी,

सांस्कृतिक और अर्थव्यवस्था-जनित असफलताओं में से एक है | देश और दुनिया के अनेक हिस्सों में विशेषतौर पर तथाकथित विकासशील देशों में कूड़ा प्रबंधन में हमारी संवेदना, सतर्कता, तकनीकी-तंत्र, अर्थतन्त्र और शासन-प्रशासन की कार्यप्रणाली पर लगातार प्रश्न उठता रहता है |

भारत सहित कई देशों की खाद्य सुरक्षा मोटे तौर पर गांवों और किसानों की खेती-बाड़ी पर निर्भर है | एक तरफ विश्व भर में वनस्पति आधारित और विशेष रूप से जैविक एवं प्राकृतिक विधियों से उगाए गए खाद्य पदार्थों की माँग बढ़ रही है, क्योंकि ये प्राकृतिक उत्पाद स्वास्थ्य-वर्धन और पर्यावरण-प्रबंधन के लिए बेहतर माने जाते हैं, तो दूसरी ओर प्रकृति की छाँव तले पलने वाले सभी जीव, जिनमें खेतों में उगाई जाने वाली फसलें भी शामिल हैं, जलवायु परिवर्तन और वैश्विक ऊष्मीकरण के प्रभाव तथा पानी की कमी से लगातार प्रभावित होने लगे हैं, और पोषण युक्त फसलों की उत्पादकता भी निरंतर घटती जा रही है |

भारत में अब भी बड़ी संख्या में गाँव हैं | लाभप्रद नहीं होते हुए भी बेमन से ही सही गांवों की एक बड़ी आबादी अपनी आजीविका के लिए खेती-बाड़ी पर निर्भर है | खेत बँटते जा रहे हैं | घटते भी जा रहे हैं | फसलें आए दिन किसी न किसी वजह से खराब हो जाती | हरित-क्रांति का सुनहरा दौर खत्म होने के बाद, अब धीरे-धीरे खेती की फसलों की उपज घटने लगी है, और अतिरिक्त रसायनों एवं पानी की आवश्यकता एवं बढ़ती महंगाई से खेती की लागत निरंतर बढ़ती जा रही है |

सरकारें और मुख्य धारा के कृषि वैज्ञानिक अब भी हरित-क्रांति की नस्ल सुधार से बने संकर बीजों, पम्पों से खुली सिचाई, बार-बार अधिक मात्रा

में डाले जाने वाले रासायनिक खाद और न सिर्फ कीड़ों मकोड़ों बल्कि मनुष्य, पशुओं और मछलियों के लिये भी जहरीले कीटनाशकों के बहुतायत प्रयोग वाली कृषि पद्धति को प्रकृति और स्वास्थ्य के लिए नुकसानदेह मानते हुए भी, अपरिहार्य एवं देश की बढ़ती खाद्य सुरक्षा के लिए जरूरी समझते हैं | देश भर में राष्ट्रीय एवं कई राज्य सरकारों द्वारा प्राकृतिक कृषि को वैकल्पिक कृषि के रूप में बढ़ावा दिए जाने की बहुस्तरीय चर्चा के बावजूद मुख्य-धारा के पदासीन कृषि वैज्ञानिकों, कृषि प्रशासकों, कृषि प्रबंधकों एवं किसानों के बीच इसकी सफलता को लेकर भारी शंका है, और इसे एक वैकल्पिक तथा धारणीय खाद्य-उत्पादन प्रणाली के रूप में स्वीकार नहीं किया जा रहा है | श्री लंका की पिछले वर्षों की खाद्य-उत्पादन में कमी की समस्या को जैविक कृषि की देन मानकर गैर-रसायनिक कृषि को अचानक खारिज कर दिया जाता है | हालाँकि श्री लंका की तत्कालीन स्थितियों-परिस्थितियों से खाद्य सुरक्षा के संबंध को स्थापित करने वाले प्रामाणिक अध्ययन अब भी उपलब्ध नहीं हैं | सरकारी क्षेत्रों में प्राकृतिक खेती को भी मोटे तौर पर शून्य बजट की आंतरिक सूक्ष्मजीवों, देशी गाय एवं जानवरों के खाद एवं मूत्र पर आधारित जैविक खेती प्रणाली के प्रमोशन तक ही सीमित रखा गया है, जिसकी बड़े पैमाने पर सफलता, अभी सामाजिक, सांस्कृतिक एवं वैज्ञानिक पैमाने पर प्रमाणित होनी शेष है |

हमारे देश में राष्ट्रीय और राज्य स्तर के कृषि संस्थान, कृषि विश्वविद्यालय, कृषि प्रशासक एवं कृषि प्रबंधक बड़ी संख्या में इन स्थापित संस्थाओं को चलाते हैं, और वे तथा उनकी संस्थाएं अपनी उपलब्धियों से हमेशा की तरह अब भी खुश हैं, पर न तो उनकी तकनीकों

और उपलब्धियों से किसान खुश है, न ही कृषि-उद्योग। हमारे संस्थान और आर्थिक प्रबंधक महंगा बिकने वाले और विशेष रूप से विदेशों में निर्यात करने वाली फसलें उगा कर किसानों की आय और देश की विदेशी मुद्रा भंडार में योगदान बढ़ाने की बात जोर-शोर से करते हैं। काला नमक एवं बासमती चावल और मेंथा जैसी अधिक आय देने वाली फसलों का उत्पादन और निर्यात बढ़ाने को हमारे कई प्रतिष्ठित राष्ट्रीय संस्थानों ने अपनी बड़ी उपलब्धि माना है। ये फसलें बहुत अधिक पानी और कृषि रसायनों के खपत वाली फसलें हैं। जिन इलाकों में ये बहुतायत में उगायी जा रही हैं, वहाँ जमीन का पानी लगातार घटता जा रहा है, और विषैला भी होता जा रहा है।

राजधानी दिल्ली के आस-पास, स्थित हमारे हरित-क्रान्ति के पुरोधा क्षेत्र जैसे हरियाणा, पंजाब और पश्चिमी उत्तर प्रदेश और मेंथा उगाने वाले उत्तर प्रदेश के बाराबंकी जैसे जिलों में पानी की खपत और जहरीले रसायनों की बहुतायत का होना, इसके ज्वलन्त उदाहरण हैं। हमारे अधिकांश किसान अपनी उत्पादन और आमदनी में सहूलियत के लिए गन्ना और केले जैसी फसलों को उगाने को प्राथमिकता देते हैं, जिनमें पानी और कृषि-रसायनों की खपत अधिक है। दलहन, तिलहन और मोटे अनाज जो कम पानी में पैदा हो सकते हैं, तथा इनमें से अधिकांश नाइट्रोजन जैसे जरूरी तत्व हवा से जमीन में स्थिर करने में सक्षम है, उसकी पैदावार और रोग प्रबंधन की महारत में हमारा कृषि-तंत्र अब भी अधिक सफल नहीं हो पा रहा है, फलतः किसान इन फसलों का रकबा नहीं बढ़ा पा रहे हैं।

जब पूरी दुनिया में पानी और प्रदूषण का संकट बढ़ रहा है, हम कृषि उत्पादों के रूप में बहुत ही सस्ते दामों में अपना पानी, खनिज तत्व और दुर्लभ प्राकृतिक संसाधन निर्यात करने के झूठे गौरव बोध से खुश हो रहे हैं। दूसरी ओर हम पोषण,

जमीन के उपजाऊपन और जल संरक्षण के लिए जानी जाने वाली फसलों के जरूरी उत्पाद जैसे दालें और तिलहन का आयात कर रहे हैं। जलवायु परिवर्तन, वैश्विक ऊष्मीकरण और पोषणयुक्त धारणीय खाद्य सुरक्षा के लिए देश को और पूरे विश्व को आज एक नए कृषि दर्शन की आवश्यकता है, जिसे हम एक पर्यावरणीय तथा धारणीय कृषि दर्शन के रूप में नए सिरे से प्रतिष्ठित कर सकें और कृषि, सेहत, पानी और पर्यावरण प्रबंधन के सुलगते सवाल को शांत कर सकें।

भविष्य की खाद्य सुरक्षा के लिए वैज्ञानिक रूप से प्रमाणित जैविक कृषि विधियों से पोषणयुक्त भोज्य पदार्थों को देश की आंतरिक खाद्य-सुरक्षा के लिए एक आकर्षक एवं लाभकारी लघु तथा कुटीर उद्योग में बदलने के लिए सही नीतियों को निर्मित कर उन्हें सफलता पूर्वक लागू करना होगा। इसके लिए अब तक की उपलब्धि सभी तरह की जैविक कृषि विधियों को वैज्ञानिकों एवं उद्योगों को आजमाना चाहिए और उनमें व्यवहारिक रूप से सफल होने वाले तकनीकी नवाचार करना चाहिए। परंतु इसके लिए उचित नीतियों एवं अनुकूल परिस्थितियों (इकोसिस्टम) को तो शासन-प्रशासन को ही बनाना होगा, क्योंकि नीतिगत सुधारों के अधिकार एवं अधिक साधन उन्हीं के अधिकार क्षेत्र में आते हैं। इस पर राज्य एवं जिलों के स्तर पर वैज्ञानिकों, प्रशासकों जमीनी कार्यकर्ताओं, कृषि एवं पर्यावरण के विशेषज्ञों, तथा किसानों की सलाहकार एवं समन्वय समितियाँ उपयोगी हो सकती हैं। जल, जमीन, वायु, एवं खाद्य पदार्थों का जहरीला होते जाना समकालीन विकास दर्शन की एवं बड़ी चुनौती है। और यह तब तक रहेगा जब तक पर्यावरण-प्रबंधन एवं प्राथमिक सुचिता के आग्रह को विकास माना जाता रहेगा। पर्यावरण प्रबंधन, खाद्य-सुरक्षा, स्वास्थ्य प्रबंधन और प्रदूषण तकनीकी समस्या से बढ़कर एक वैचारिक और सांस्कृतिक समस्या भी है, और इस

समस्या को तकनीकी, वैचारिक एवं सांस्कृतिक तीनों स्तरों पर समझ कर इसके निदान के लिए इन सभी क्षेत्रों में हस्तक्षेप एवं नवाचार के नवीन रास्तों को ढूँढना होगा।

जल स्रोतों में पानी की उपलब्धता और भूगर्भीय जल का आपस में सीधा संबंध है। जमीन की सतह के जलस्रोतों में तभी पानी टिकेगा जब भूगर्भीय जल बचा रहेगा। बारिश, बादल, मौसम, और जल-संचयन के साथ-साथ तालाबों एवं नदियों को पुनर्जीवित करने का काम जन समूहों द्वारा अधिक सफलता पूर्वक कर पाने वाली स्वयंसेवी संस्थाओं और व्यक्तियों उचित महत्व देकर तथा उनके साथ मिलकर इन चुनौतियों को हल करने की दिशा में सरकारों को धारणीय तरीके से आगे बढ़ना चाहिए।

हमारे देश में ऐसे अनेकों उदाहरण हैं, जहां जल संरक्षण एवं नदी पुनर्जीवन में सरकारें सफल नहीं हुईं पर स्वयंसेवी संगठनों ने लोगों के साथ मिलकर इसमें अभूतपूर्व सफलता पायी है। सरकारों को सम्मान पूर्वक उनके साथ सहभागिता करनी चाहिए। विकास एक निरंतर यात्रा है, और उसकी धारणीयता उसके मानवीय और प्राकृतिक होने में ही निहित है। एक न एक दिन हमें यह समझना और स्वीकार करना होगा।

(राणा प्रताप सिंह)

राणा प्रताप

Editorial

Future food and water crisis in changing weather and changing world

Another new year has come and the dates of the calendar have started becoming new again like new leaves on trees. Climate change is continuing.

Changing weather, high sunlight intensities, short duration severe cold, irregular heavy rains, frequent sea cyclones and storms keep knocking everywhere, in all areas, yet many governments, arrogant with economic expansionism are still not giving importance to it. Many new and old rulers are the supporters of the over-productive principles of open economy.

Governments around the world, who are in favour of economic and uncontrolled economic development, are still not able to include the future crises of water, land and food in our development discussions properly and with full seriousness. The restlessness of technological advancement and rapid economic development, the global culture becoming person-centric and money-centric and it is emerging as a main reason for this seasonal change and climate change. The way the weather is changing, the heat is increasing, and so is the consumption of water, in such a situation, fulfilling the need of clean water for the use of humans and other living beings in the coming times is emerging as a

big challenge in the world. Pollution of consumerism is increasing in all the five elements of nature, the living world, our body and mind, the major reason for which is the market and business culture of promoting the manufacture and indiscriminate use of unnatural goods produced in factories to increase the convenience and ease of the people. Proper and sustainable waste management is one of our biggest technological, cultural and economic failures today. In many parts of the country and the world, especially in the so-called developing countries, questions are constantly raised on our sensitivity, alertness, technical system, economy, and the functioning of the administration in the areas of waste management.

The food security of many countries including India is largely dependent on the farming of villages and farmers. On one hand, the demand for plant-based food products, especially those grown through organic and natural methods, is increasing across the world, because these natural products are considered better for health promotion and environmental management, while on the other hand, all living beings living under the shade of nature, including crops

grown in the fields, are being increasingly affected by the effects of climate change and global warming as well as due to the water scarcity subsequently, productivity of nutritious crops is constantly decreasing.

India still has many villages. Despite not being profitable, a large population of villagers are reluctantly dependent on the agriculture for their livelihood. Fields are getting divided. They agricultural lands are also decreasing. Crops get spoiled every day due to some reason or the other.

After the golden period of Green Revolution is over, now the yield of agricultural crops has started decreasing gradually, and the cost of farming is constantly increasing due to the need for additional chemicals water which are rising the cost of cultivation too.

Governments and mainstream agricultural scientists still consider the agricultural system of green revolution based on the hybrid seeds, open irrigation through pumps, frequent application of chemical fertilizers and excessive use of pesticides, which are not only harmful to the nature and health, but also to humans, animals, and fishes, but still considered as inevitable and necessary for increasing food security of the

country. Despite multi-level discussions by the national and many state governments across the country to promote natural farming as an alternative agriculture, there is a lot of doubt about its success among mainstream agricultural scientists, agricultural administrators, agricultural managers and farmers, and it is not being accepted as an alternative and sustainable food production system.

Non-chemical agriculture is suddenly rejected by considering the problem of decline in food production of Sri Lanka in the past years as the result of organic farming. However, authentic studies establishing the relationship of food security with the contemporary and circumstances of failure of economy of Sri Lanka are still not available. In the government sector, natural farming has also been largely limited to the promotion of zero budget organic farming systems based on regeneration and spray of internal microorganisms, manure and urine of indigenous cows and animals, whose success as an alternative to chemical inputs on a large scale is yet to be proven on social, cultural, and scientific scale.

In our country, national and state level agricultural institutes, agricultural universities, agricultural administrators, and agricultural managers run a large number of established institutions,

and they and their institutions are still happy with their achievements as always, but neither the farmers nor the agro-industrial setups are happy with their techniques and achievements. Our institutions talk loudly about increasing the income of farmers and contribution to the countrys foreign exchange reserves by growing crops that are expensive and especially exported abroad. Many of our prestigious national institutions have considered increasing the production and export of high-yielding crops like Kalanamak and basmati rice and mentha as their major achievement. These crops consume a lot of water and agricultural chemicals. In the areas where it is being grown in abundance, the ground water is continuously depleting and is also becoming toxic. Our green revolution pioneer areas like Haryana, Punjab and western Uttar Pradesh, located around the capital Delhi and mentha growing districts like Barabanki in Uttar Pradesh, are facing water shortage. The abundance of pollutants and toxic chemicals are prime examples of these practices. Most of our farmers prefer to grow crops like sugarcane and banana, which consume a lot of water and agrochemicals, to increase their production and income.

Our agricultural system is still not very successful in mastering the production and disease

management of pulses, oil seeds, and coarse cereals, which can be grown in less water, and most of these are capable of fixing essential elements like nitrogen from the air into the soil. As a result, farmers are not able to increase the acreage of these crops.

When the water and pollution crisis is increasing all over the world, we are feeling happy with the false pride of exporting our water, minerals, and rare natural resources at very cheap prices in the form of agricultural products. On the other hand, we are importing essential products of crops like pulses and oilseeds, which are known for nutrition, soil fertility and water conservation. To deal with climate change, global warming and for sustainable food security, the country and the world need a new agricultural philosophy, which we can re-establish as an environmental and sustainable agricultural philosophy and can put to rest the burning questions of agriculture, health, water, and environmental management.

For future food security, the right policies will have to be formulated and successfully implemented to turn nutritious food products from scientifically proven organic farming methods into an attractive and profitable small and cottage industry for the internal food security of the country. For this, scientists and industries should try all the organ

ic farming methods available till now and make technical innovations that are practically successful in them. But for this, the government and administration will have to create appropriate policies and favourable conditions (ecosystem), because the right and more resources for policy reforms come under their jurisdiction.

For this, advisory and co-ordination committees of scientists, administrators, ground workers, agriculture and environment experts, and farmers at the state and district levels can be part of the planning committees.

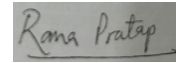
The poisoning of water, land, air, and food is another big challenge for contemporary development philosophy. And it will remain so, if the insistence on environmental management and basic cleanliness is considered as a compound of the development.

Environmental management, food safety, health management and pollution are more of ideological and cultural problems than technical problems. And to solve this problem, new ways of intervention and innovation will have to be found in all these areas by understanding it at technical, ideological, and cultural levels.

The availability of water in water sources and groundwater are directly related to each other. Water will remain in surface water sources, only when groundwater is saved. Along with rain, clouds, weather and water harvesting, the work of reviving ponds and rivers should be done more successfully by the masses and the NGOs. Those who have successfully demonstrated it as individuals or organizations should move forward in a sustainable way towards solving these challenges by giving

due importance to them. There are many examples in our country where governments have not been successful in water conservation and river rejuvenation, but NGOs and individuals have achieved unprecedented success in this by working with the people.

Governments should participate with them respectfully. Development is a continuous journey, and its sustainability lies in its being human and natural. One day we will have to understand and accept this.



(Rana Pratap Singh)

चंबल क्षेत्र की सैरनी नदी में जल संरक्षण से जैवविविधता संवर्द्धन

मंझल सारंग देवोत

सैरनी नदी क्षेत्र में पहले सहरिया जनजाति के लोग रहते थे। तब यह पूरा क्षेत्र केवल जंगली था। 90 वर्ष पहले वनाधिकार बदले और जंगल कटे तो ये लोग बेघर होकर बारां जिले के जंगलों में चले गए। आजकल सहरिया बारां क्षेत्र में रहते हैं। उनके प्रतीक भी पेड़ और जीव है। करौली-धौलपुर क्षेत्र में उनकी सांस्कृतिक धरोहर नदी और जंगल ही था, लेकिन खनन विकास ने नदी को सुखा दिया और सहरियाओं की बेघर कर दिया। सहरियाओं की इस नदी का नाम सैरनी पड़ गया। पार्वती और सैरनी में पेशागत बहुत बदलाव आया है। काल-चक्र ने इस क्षेत्र में भयंकर बदलाव किये हैं। पुराने बदलाव भी हुए होंगे, लेकिन एक शतक में तीन बड़े बदलाव इस नदी में आये।

खनन इस क्षेत्र में केवल 90 वर्षों में यह बदलाव आया है। जब खनन में बारूद उपयोग किया तो आदिवासी सहरिया इसे अपसगुन मानकर यहाँ से उजड़ना शुरू हो गए। इनके स्थान पर गुर्जर और मीणाओं ने प्रवेश कर लिया। क्योंकि गुर्जरों को एकान्त और मीणाओं को मवासा चाहिए। गुबरेण्डा और बाँसवारी के जंगल आज के नए नाम नहीं हैं, ये नाम पुराने हैं। लेकिन आजादी के बाद इन्हें संरक्षित क्षेत्र घोषित कर दिया गया। तब भी कानून से गुर्जर-मीणा डरे नहीं, इन्हीं जंगलों में डटे रहे। परिणाम यह हुआ कि, पार्वती और सैरनी नदियाँ अब इन्हीं की नदियाँ बन गई हैं। ये लोग अब पशुपालन और जंगल का आश्रय छोड़कर खेती करने लगे हैं। पहले ये वनवासी वनोत्पादन से ही अपना काम चलाते थे। आजादी के बाद खेती को बढ़ावा मिला, तो ये भी खेती करना सीखने लगे।

इस क्षेत्र की मिट्टी खेती लायक नहीं थी। इसलिए कुल 4 प्रतिशत जमीन ही खेती करने लायक बची है। शेष को खनन तथा जंगल कटान ने बिगाड़ दिया है। खेती के लिए भी जब पानी नहीं मिला तो ये लोग लाचार, बेकार, बीमार और फरार होकर घूमने वाले बागी बन गये। बागियों से इलाका डरने लगा तो खेती भी छूट गई। पानी नहीं था, सभी नदी, कुओं को खनन और वनकटान ने

सूखा दिया। परिणामस्वरूप लोग विस्थापित होकर उजड़ने लगे और गाँव खाली हो गए। कभी अच्छी वर्षा हुई तो यह वापस कुछ दिन के लिए अपने खेत पर आने लगे। यह पलायन परम्परा तो भारत में पुरानी थी, लेकिन पलायन और विस्थापन में खनन के कारण नदी सूख जाने पर भयानक बदलाव आया है।

100 वर्षों में सैरनी की आबादी दो बार विस्थापित हुई है। दोनों बार ही बिना राजा और बिना सरकार के पुर्नवास भी हो गया। पार्वती-सैरनी पुर्नवास का आधार बन गई है। पार्वती-सैरनी के पानी पर किसी ने डकैती नहीं डाली थी, न ही किसी ने उनका जल लूटा है; आज भी कोई नहीं लूट रहा। यहाँ पहले मछली पालन नहीं था, सिंघाड़े की खेती भी नई-नई फ़सल है। पहले बाजरा, तिल, सरसों, चना होते थे, अब खरीफ ज्वार, बाजरा, तिल, अरहर, उड़द, मूँग तथा रबी में गेहूँ, जौ, चना, सरसों, मटर तथा अन्य बहुत-सी सब्जियाँ उगाई जाने लगी हैं। फसल-चक्र अब वर्षा-चक्र के साथ जुड़ गया है। सदानीरा नदी ने फ़सल की सिंचाई सुनिश्चित कर दी। सुनिश्चित सिंचन के बाद भी नदी बह रही है; यही अच्छी आशा के बीज हैं।

जल, जंगल, जमीन बचाने हेतु पंचायतों का रुझान जैसा पूरे भारत में है, वैसा ही यहाँ भी है; लेकिन जल संरक्षण बारे में यहाँ के समाज का रुझान गहरा है। इन्होंने नई खेती की ज़मीन दो गुना बढ़ाई है। पहले जल नहीं था, तो एकाध फ़सल भी नहीं हो पाती थी, अब तो दोनों फसलें अच्छे से उगाई जाती हैं। जहाँ पाँच मन बाजरा भी नहीं होता था, वहाँ अब 100 से लेकर 300 मन तक बाजरा पैदा हुआ है। सैंकड़ों उदाहरण मैंने देखे और सुने हैं; जहाँ गेहूँ, सरसों, का एक भी दाना नहीं होता था, अब वहाँ 200 मन सरसों और 400 मन गेहूँ हुआ है। यह बात सभी सैरनी के बेटे-बेटियाँ बोलते हैं।

भू-गर्भ जल स्तर ऊपर आ गया और सतही जल शुद्ध-सदानीरा बनकर, बह रहा है। जल मात्रा 160 जल संरचनाओं से 96/201.6X100 =48% जल संरक्षित हुआ है। जिसने धरती का पेट भरा-नदी

बहने लगी, खेती और पशुपालन से सभी जरूरतें पूरी होने लगीं। इन दोनों नदियों में वर्षा जल उपलब्ध है। $1000000 \times 0.6 \times 0.4 = 201.6$ मिलियन लीटर है। रन ऑफ 40 प्रतिशत है। औसत वार्षिक वर्षा 616 मिली मीटर = 0.6 मी।

1990 में 841 वर्ग कि.मी. नदी क्षेत्र का 2 प्रतिशत क्षेत्र बाढ़ ग्रस्त था। अब बाढ़ क्षेत्र कम हो गया है, बिल्कुल नगण्य जैसा है। क्योंकि वर्षा-जल ताल, पाल, झाल, चैकडैम में रुककर धीरे-धीरे नीचे आता रहता है। पहले वर्षा-जल एक साथ बाढ़ की तरह बहकर नीचे आ जाता था। अब तो जहाँ भी लोग जल रोक लेते हैं, वहाँ रुक जाता है। फिर भी कुछ तो आता ही है। जिन नालों पर जरूरत के अनुसार काम नहीं हुआ है; उनका पानी तो नीचे आता है। इस क्षेत्र में सुखाड़ और बाढ़ दोनों साथ-साथ आते रहते हैं। पहले 64 प्रतिशत सुखाड़ तथा 4 प्रतिशत बाढ़ क्षेत्र था। अब बाढ़ क्षेत्र नगण्य है और सुखाड़ क्षेत्र भी घट कर 22.6 प्रतिशत ही रह गया है।

करौली जिले की अधिकृत सरकारी रिपोर्ट के अनुसार वर्ष 2011 में खेती की ज़मीन 4.80 प्रतिशत नोटीफाईड; जंगल भूमि 34.30 प्रतिशत; औद्योगिक, आवास जहाँ पर खेती नहीं कर सकते वह 9.70 प्रतिशत तथा अयोग्य अधिसूचित भूमि 8.40 प्रतिशत है।

अब सैरनी नदी में मवेशी, पक्षी, वन्यजीव और नए वन बनने लगे हैं। 1990 से 2015 तक यह क्षेत्र उजाड़ से ग्रसित था। 19वीं शताब्दी में जहाँ-जहाँ खनन का काम शुरू हुआ। कुछ लोग इसमें हुनरमन्द भी बने। यहाँ के कुछ कारीगर बेपानी होकर, पत्थरों से अपना जीवन चलाने के लिए मजबूर हुए, फिर पत्थर का काम करने वाले पेशेवर मजदूर बन गए। इनकी बोली-भाषा और खान-पान ब्रज और अवधी है। पशुओं की चोरी, मार-पीट अपहरण आदि इनके काम हो गये थे। शुरू में इनकी प्रवृत्ति सामुदायिक सहयोग की थी। बाद में बन्दूक और पत्थर के काम से एकांगी बनते गए। सामूहिक जीवन, आपराधिक जीवन में बदलने लगा। तरुण

भारत संघ ने यहाँ ग्राम सभाओं, पंच-संरपंचों तथा वैयक्तिक तथा संस्थागत कामों को भी सामुदायिक सक्रियता प्रदान की है।

अध्ययन से पता चला है कि, नाहरपुरा के जगदीश ने भी अपना जीवन लूट-पाट कर के जंगल में ही काटा, और अब भी जंगल में ही रहकर अपनी ज़मीन पर केवल खेती का काम करता है। लेकिन दोनों कामों में बहुत फ़र्क है। उसने सारे अपराध छोड़ दिए हैं। इनका जीवन चिंटी-चराई से लेकर गाय-जंगल की आस्था और धराड़ी परम्परा से भरपूर है। धराड़ी शब्द धरोहर और धारणा से बना है, इसे बहुत लोग मानते हैं। अमुक गोत्र का अमुक जन्तु और पेड़ ही उनकी जाति को धरा आधार देने वाला और उनकी धरोहर है। इसलिए वे अपनी धरा, धरोहर और नदियों की धाराओं को पूजनीय मानते हैं। कुछ लोग धराड़ी को, कुछ लोग मछली को, कुछ लोग पेड़ों को, तो कुछ लोग जीवों को ही भगवान मानते हैं। जीव का जीव ही भगवान होता है। यही इनकी मान्यता और आस्था है। सैरनी की जैव विविधता को समृद्ध बनाने में इस क्षेत्र की धराड़ी परम्परा की बहुत महत्वपूर्ण भूमिका है।

मेरे अध्ययन का क्षेत्र सैरनी नदी ही है; लेकिन नदी पुनर्जीवन से जैव विविधता का प्रभाव जानने हेतु अभी मैंने केवल इस नदी क्षेत्र के पांच गांवों का गहन अध्ययन एवम इनके गांवों में आए बदलाव से सैरनी नदी के क्षेत्र पर होने वाले प्रभावों को जानने का प्रयास है।

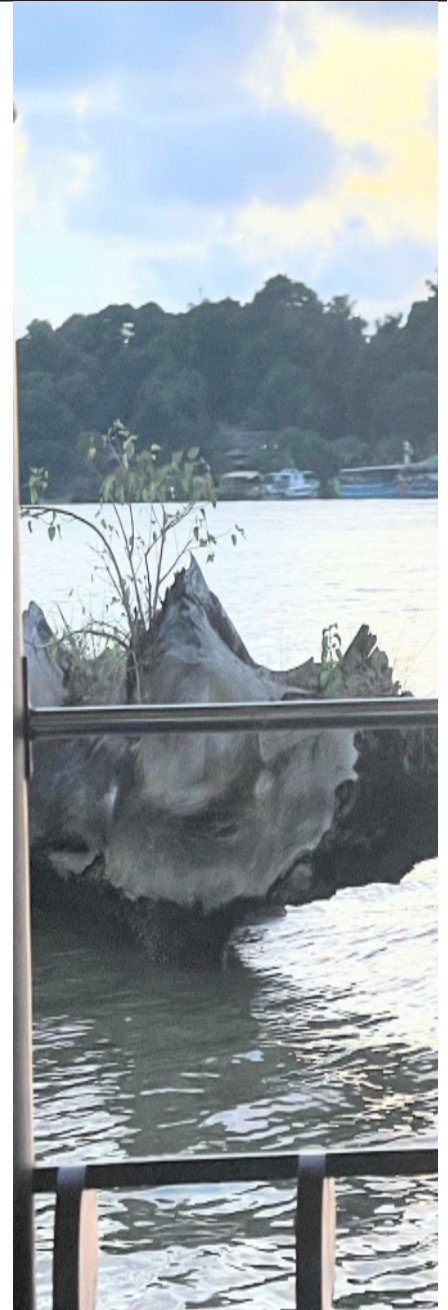
कोरीपुरा भुडखेड़ा, महाराजपुरा, केशपुरा और अरोंदा सैरनी नदी के शुरू के तीन गांवों से नदी की तीन उपधाराओं उद्गम होता है। केशपुरा गांव नदी का मध्य और अरोंदा गांव जहां नदी दूसरी धारा से मिलती है। सैरनी नदी पुनर्जीवन की जैव विविधता का संबंध जल, वायु और मिट्टी से है। यहां लाल ककरीली मिट्टी के बीच भूडखेड़ा गांव में पश्चिमी राजस्थान से चलने वाली हवा ने सफेद बालू के टीले बना दिए हैं, वर्षा जल को ये टीले सोखकर, नीचे अधो भूजल भंडार में डालते हैं। अब तरुण भारत संघ द्वारा जगह-जगह पर बनाई गई लगभग 160 जल संरचनाओं से भूजल भंडार भरकर, अधोभूजल से नदी बहने लगी है। नदी के उद्गम क्षेत्र में जब जल संरक्षण से धरती की नमी बढ़ी और मिट्टी का कटाव रुका तो मिट्टी के जैव, वनस्पति बनकर बाहर आने लगे। नदी में जहां जल था; वहां बहुत सी सैवाल, जीव जंतु ने जन्म लेना शुरू किया।

मिट्टी की नमी से खेती के साथ बहुत सी घास भी अब जन्म लेने लगी है। इस क्षेत्र के किसानों ने नदी की शुद्धता हेतु प्लास्टिक नदी में नहीं जाने दिया। जिससे नदी में बहुत विविध प्रकार की मछलियां खासकर रोहू और कतला बड़ी मात्रा में देखी जा सकती है। छोटी-छोटी विभिन्न प्रकार की नई-नई टकसाल कुछ अंतर पर स्पष्ट दिखती है। भूडखेड़ा, महाराजपुरा और कोरीपुरा गांव की जल संरचनाओं में मुझे कोकोडायल दिखाई दिया। ट्राटल और कैरेवास भी इस क्षेत्र में नदी पुनर्जन्म के साथ-साथ स्वतः दिखाई देते हैं। गौरैया चिड़िया, नीलकंठ, सरस, तीतर, बतख, मोर, तितलियां आदि भी जल संरचनाओं के पास मिलते हैं।

गाड़ी में जाते हुए कोरीपुरा, भूडखेड़ा व महाराजपुरा गांवों के रास्ते में जंगली सूअर, नील गाय, रोज, लोमड़ी, सियार, जरख, सांभर, कोबरा, बघेरा आदि जानवरों को भी मैंने जल संरचनाओं में जल पीते तथा जंगलों में दौड़ते देखा है।

पहले जिस जमीन पर किसान वर्षा के दिनों में केवल बाजरा की फसल उगाते थे; अब तो इस क्षेत्र में पूरे साल हरियाली रहने लगी है। यहां के किसान सर्दियों में गेहूं, चना, सरसों, मूली, गाजर, शलजम, बरसीम आदि कई फसले लेते हैं और खरीफ में मक्का, बाजरा, ज्वार, धान, सिंघाड़े आदि फसले तक उगते हैं। गर्मियों में सब्जियों तथा हरा चारा की फसले उगते हैं। यह अपने घरों में अनार, अमरूद, नींबू, पपीता जैसे फल पैदा करने लगे हैं। किसानों की गाय, भैंस, भेड़, बकरियों को हरा चारा खूब मिलने लगा है।

सैरनी नदी जब शुद्ध सदानीरा होकर बहने शुरू हुई, तो कुओं में भी पानी आया। वैसे ही यहां की जैव विविधता पुनर्जीवित होकर समृद्ध बननी आरंभ हुई। सैरनी नदी के अध्ययन काल में जो बदलाव मैंने देखे हैं, उनको यहां लिखा है। मेरा अध्ययन जारी है। इस बदलाव को आपके सामने प्रस्तुत करने का कारण यह कि, इस बदलाव से सीख कर आप भी प्रकृति और हमारी धरती को प्यार करना शुरू करें। जब हम प्रकृति को प्यार करते हैं; वह अपनी सृजन शक्ति से हमारे जीवन में आनंद हेतु जैव विविधता का समृद्ध रूप प्रस्तुत करती है। जैव विविधता



का हमारी शांति, समृद्धि और आनंद के साथ गहरा रिश्ता है।

इसे समझने हेतु मैंने अपने अध्ययन के लेखों की एक श्रृंखला शुरू कर रही हूं। मैंने जो अनुभव किया है सैरनी नदी के पुनर्जीवन के काम से अब सैरनी नदी में भी वर्ष भर पानी रहने लगा है। सैरनी नदी क्षेत्र में जंगली जानवारों की सहज रूप से उपस्थिति नजर आने लगी है। पार्वती अब पुनः शुद्ध सदानीरा होकर, सैरनी के जल प्रवाह से वर्ष भर बहती है। यह बात मैं सैरनी नदी के लोगों से बात करके लिख रही हूं।

आदिज्ञान ने सैरनी चंबल क्षेत्र में जैवविविधता का संवर्द्धन किया है

मंजल सारंग देवोत

यह लेख आदि ज्ञान (अर्थात् प्राचीन और पारंपरिक ज्ञान) पर आधारित है और इसका उद्देश्य इन ज्ञान प्रणालियों को पुनः पहचान और स्वीकार्यता दिलाना है, खासकर जलवायु संकट और पारिस्थितिकीय संकट के समाधान के संदर्भ में विशेष रूप से यह सुनिश्चित करने पर है कि पारंपरिक ज्ञान को आधुनिक वैज्ञानिक दृष्टिकोण से जोड़कर उसकी प्रभावशीलता और विश्वसनीयता को साबित किया जा सके। यह सिद्ध करने हेतु विकास से हुए विनाश क्षेत्र के पुनर्जीवित क्षेत्र को ही दृढ़ता ही पहला काम था। फिर इस क्षेत्र में आदिज्ञान से ही काम होना जरूरी है। चंबल के हिंसक क्षेत्र की सैरनी नदी ही इस अध्ययन हेतु उपयुक्त पाई है।

अध्ययन का उद्देश्य:

दस्तावेजीकरण: पारंपरिक ज्ञान की उपलब्धियों और योगदानों को दस्तावेज करना है, ताकि इन ज्ञान प्रणालियों की वास्तविकता और प्रभाव को वैज्ञानिक दृष्टिकोण से सिद्ध किया जा सके। दुनिया में ऐसे और अध्ययनों की बहुत जरूरत है। ये अध्ययन भारत के आदिज्ञान से वैश्विक जलवायु परिवर्तन संकट का समाधान सिद्ध करके दुनिया को पुनःविश्व गुरु बनाने का रास्ता प्रस्तुत कर देगा।

अनुसंधान और अनुवाद: अध्ययन प्राचीन ज्ञान प्रणालियों और आधुनिक विज्ञान के बीच पुल बनाने के लिए अनुसंधान है। इसे सांख्यिकी, भौगोलिक संवेदन और अन्य वैज्ञानिक भाषाओं में अनुवादित किया है ताकि इसे आधुनिक ज्ञान के रूप में आदि ज्ञान को प्रस्तुत किया जा सके। यही भारत का सर्वोपरि गुण है।

भविष्य की दिशा: यह दस्तावेज अंततः यह दर्शाता है कि पारंपरिक ज्ञान को आधुनिक विज्ञान और प्रौद्योगिकी के साथ एकीकृत करके जलवायु संकट और पारिस्थितिकीय

संकट का समाधान संभव है। इसके लिए “बहुल ज्ञान” (चसनतंस ज़दवूसमकहम) को एक नई दृष्टि के रूप में प्रस्तुत किया जा रहा है, जो समग्र, टिकाऊ और न्यायपूर्ण भविष्य की ओर मार्गदर्शन करेगा।

अध्ययन के मुख्य बिंदु:

1. प्रकृति और मानवता का संकट: अध्ययन से पता चला कि, मानव और प्रकृति के बीच का संतुलन टूट चुका है, और इस स्थिति में हमें अपनी प्राचीन ज्ञान प्रणालियों को पुनः लागू करने की आवश्यकता है जो प्रकृति के साथ सामंजस्यपूर्ण संबंध पर आधारित हैं।
2. आदि ज्ञान का जैव विविधता संवर्द्धन में महत्व: आदि ज्ञान भारतीय सभ्यता का महत्वपूर्ण हिस्सा है, जो मनुष्य और प्रकृति के बीच गहरे, समग्र संबंधों को दर्शाता है। यह ज्ञान पारिस्थितिकीय, आध्यात्मिक, सांस्कृतिक और व्यावहारिक

पहलुओं को जोड़ता है और इसमें पृथ्वी, जल, अग्नि, वायु और आकाश जैसे तत्वों का विशेष स्थान है। सैरनी नदी क्षेत्र में चोरी, डकैती, लूटपाट सभी कुछ मौजूद था लेकिन प्राकृतिक भगवान-भूमि, गगन, वायु, अग्नि, नीर के प्रति पूर्ण सम्मान शेष बचा था। इसलिए यहां परंपरागत तरीके से ही जल संरक्षण से जलवायु परिवर्तन अनुकूलन, उन्मूलन के साथ जैवविविधता का संवर्द्धन हुआ है।

3. सतत और समग्र दृष्टिकोण: आदि ज्ञान प्रकृति के साथ एकता और संतुलन की समझ पर आधारित है। यह विज्ञान और प्रौद्योगिकी के विखंडित दृष्टिकोण से अलग, समग्र दृष्टिकोण प्रदान करता है जो प्रकृति और मानव के बीच संबंधों को संरक्षित करता है। सैरनी में यही है।

4. समाज में आदिवासी और पारंपरिक ज्ञान की चुनौती: हालांकि आदि ज्ञान ने मानवता को कई लाभ दिए हैं,



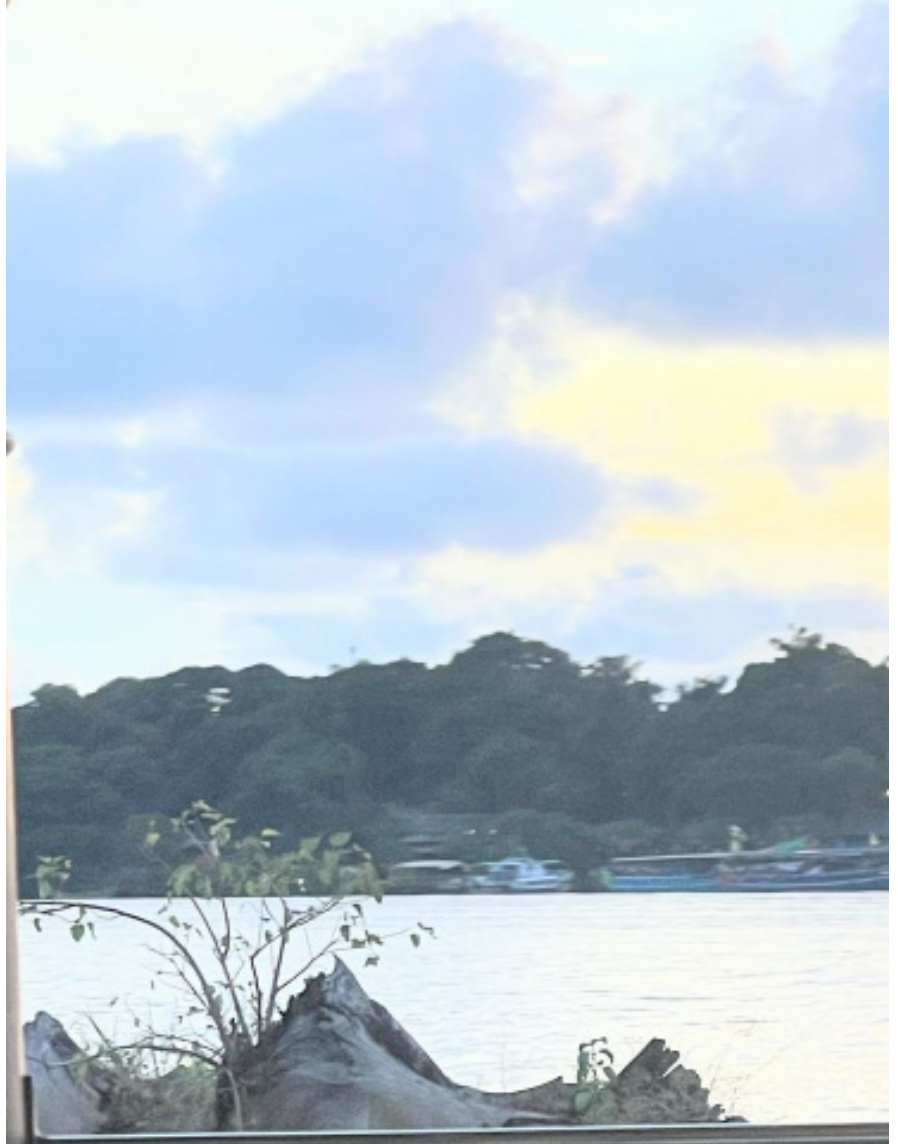
लेकिन इसे आधुनिक समाज में वैज्ञानिक या प्रौद्योगिकीय मान्यता प्राप्त नहीं है। पारंपरिक ज्ञान को अवैज्ञानिक माना जाता है, और यह सामान्यतः मुख्यधारा के ज्ञान प्रणालियों से बाहर रखा जाता है। यह अध्ययन इस चुनौति को अवसर में बदल रहा है। इस अध्ययन ने परंपारिक आदि ज्ञान को मान्यता प्रदान कर दी है।

निष्कर्ष:

आदि ज्ञान की प्रणाली, जो पृथ्वी और मानवता के बीच संतुलन और सामंजस्य की स्थापना करती है, आज के समय में जलवायु संकट से निपटने और मानवता के भविष्य को सुरक्षित रखने के लिए अत्यंत महत्वपूर्ण है। यह अध्ययन, इस ज्ञान को मुख्यधारा में पुनः लाकर, इसके योगदान को वैश्विक समाधान के रूप में स्थापित करने का कार्य करेगा।

यह अध्ययन आदिज्ञान और सैरनी नदी की जैवविविधता अध्ययन के महत्व और भूमिका पर आधारित है। पिछले पचहत्तर वर्षों में, जब आधुनिक विज्ञान और तकनीकी ज्ञान को प्राथमिकता दी गई, तब पर्यावरण के शोषण और जैवविविधता के नुकसान के बारे में गंभीर आलोचनाएँ भी उठाई गईं। विशेष रूप से सैरनी नदी का उदाहरण लिया गया है, जहाँ पारंपरिक ज्ञान ने नदी को पुनर्जीवित करने में अहम भूमिका निभाई। अध्ययन में यह संकेत किया गया है कि पारंपरिक, आदिवासी और स्थानीय ज्ञान प्रणालियाँ, जो प्रकृति और मानव के बीच एक सामंजस्यपूर्ण संबंध स्थापित करती हैं, आधुनिक विज्ञान और तकनीकी दृष्टिकोण से ज्यादा प्रभावी और टिकाऊ हो सकती हैं, विशेष रूप से जलवायु संकट और जैवविविधता संरक्षण के संदर्भ में।

सैरनी नदी क्षेत्र में इस पारंपरिक ज्ञान का उपयोग करके जल संरक्षण और



जैवविविधता को पुनः स्थापित किया गया है। इसके साथ ही, अध्ययन में यह भी बताया गया है कि पारंपरिक ज्ञान के प्रति नकारात्मक रूढ़ियाँ और वैज्ञानिक भाषा में उसकी वैधता को स्वीकार करने में आने वाली चुनौतियाँ कैसे निवारित की जा सकती हैं। इसके लिए बहुविविध ज्ञान प्रणालियों को वैज्ञानिक और आर्थिक भाषाओं में अनुवादित करने की आवश्यकता है, ताकि वे आधुनिक समाज में स्वीकार्य बन सकें।

इस अध्ययन का उद्देश्य पारंपरिक ज्ञान प्रणालियों की महत्ता को प्रमाणित करना और उन्हें मुख्यधारा में लाना है, जिससे वे जलवायु परिवर्तन, जल प्रबंधन, टिकाऊ कृषि और जैवविविधता संरक्षण

के समाधान में योगदान दे सकें। इसके लिए एक बहु-विषयक दृष्टिकोण अपनाया गया है, जिसमें शैक्षिक संस्थानों, नीति निर्माताओं और वैश्विक सहयोग को शामिल किया जाएगा। इस अध्ययन के माध्यम से पारंपरिक ज्ञान प्रणालियों को वैज्ञानिक प्रमाण और आर्थिक सफलता के साथ मुख्यधारा में स्थापित करने का प्रयास किया जाएगा।

यह अध्ययन पारंपरिक और आधुनिक ज्ञान के बीच सामंजस्य स्थापित करने और जलवायु परिवर्तन जैसे वैश्विक संकटों के समाधान के लिए स्थानीय, पारंपरिक ज्ञान को संरक्षित करने और उसका प्रचार करने के महत्व को रेखांकित करता है।

पर्यावरण में गणित : स्थायी समाधानों के लिए संख्याओं का उपयोग

आशीष कुमार और मधु प्रकाश श्रीवास्तव

गणित को अक्सर ब्रह्मांड की भाषा के रूप में प्रतिष्ठित किया जाता है, और इसका अनुप्रयोग समीकरणों और गणनाओं के दायरे से कहीं आगे तक फैला हुआ है। पर्यावरण के संदर्भ में, गणित एक दुर्जेय सहयोगी के रूप में उभरता है, जो प्राकृतिक प्रणालियों और मानवीय गतिविधियों की जटिल परस्पर क्रिया को समझने, मॉडल करने और संबोधित करने के लिए उपकरण और तकनीक प्रदान करता है। जलवायु परिवर्तन की भविष्यवाणी करने से लेकर संसाधन प्रबंधन को अनुकूलित करने तक, गणित पर्यावरणीय मुद्दों की हमारी समझ को आकार देने और स्थायी समाधान तैयार करने में महत्वपूर्ण भूमिका निभाता है।

जलवायु मॉडलिंग: भविष्य की भविष्यवाणी पर्यावरण अनुसंधान में सबसे आगे जलवायु मॉडलिंग है, जो गणितीय सिद्धांतों एवम् अनुशासन पर अत्यधिक निर्भर है। विभेदक समीकरण, सांख्यिकीय विश्लेषण और कम्प्यूटेशनल एल्गोरिदम पृथ्वी की जलवायु प्रणाली की जटिल गतिशीलता का अनुकरण करने के लिए एकत्रित होते हैं। ये मॉडल, सरल ऊर्जा संतुलन समीकरणों से लेकर परिष्कृत सामान्य परिसंचरण मॉडल तक, वैज्ञानिकों को तापमान के रुझान, वर्षा पैटर्न और चरम मौसम की घटनाओं की आवृत्ति का पूर्वानुमान लगाने में सक्षम बनाते हैं। जलवायु गतिशीलता की जटिलताओं को उजागर करके, गणित नीति निर्माताओं को पारिस्थितिक तंत्र, अर्थव्यवस्था और समाज पर जलवायु परिवर्तन के प्रभावों का अनुमान लगाने और कम करने का अधिकार देता है।

प्रदूषण नियंत्रण : प्रभाव की मात्रा निर्धारित करना

प्रदूषण के खिलाफ लड़ाई में, गणित एक शक्तिशाली हथियार के रूप में कार्य करता है, जो पर्यावरणीय गुणवत्ता का आकलन करने और चिंतन करने रणनीतियों को तैयार करने के लिए मात्रात्मक उपकरण प्रदान करता है। सांख्यिकीय तरीके से

पर्यावरणीय डेटा की जांच करते हैं, जिससे प्रदूषक सांद्रता और प्रतिकूल स्वास्थ्य परिणामों के बीच संबंध का पता चलता है। गणितीय मॉडल हवा और पानी में प्रदूषकों के फैलाव को स्पष्ट करते हैं, उत्सर्जन पर अंकुश लगाने और सार्वजनिक स्वास्थ्य की सुरक्षा के लिए नियामक प्रयासों का मार्गदर्शन करते हैं। प्रदूषण के पर्यावरणीय बोझ को मापकर, गणित स्थायी प्रथाओं और नीतिगत हस्तक्षेपों को लागू करने की तात्कालिकता को रेखांकित करता है।



चित्र न0-1, जलवायु मॉडलिंग

सतत संसाधन प्रबंधन : संतुलन अधिनियम पर्यावरणीय स्थिरता के केंद्र में सीमित संसाधनों का विवेकपूर्ण प्रबंधन है, यह कार्य गणितीय अनुकूलन तकनीकों के माध्यम से संभव बनाया गया है। रैखिक प्रोग्रामिंग, पूर्णांक प्रोग्रामिंग और गतिशील प्रोग्रामिंग एल्गोरिदम दक्षता को अधिकतम करने और पर्यावरणीय प्रभाव को कम करने के लिए जल, ऊर्जा और भूमि जैसे संसाधनों

के आवंटन की सुविधा प्रदान करते हैं। चाहे कृषि में जल संरक्षण के लिए सिंचाई कार्यक्रम को अनुकूलित करना हो या पावर ग्रिड में नवीकरणीय ऊर्जा स्रोतों के एकीकरण को व्यवस्थित करना हो, गणित प्रतिस्पर्धी मांगों को संतुलित करने और सतत विकास को आगे बढ़ाने के लिए एक व्यवस्थित दृष्टिकोण प्रदान करता है।

जैव विविधता संरक्षण: जीवन की टेपेस्ट्री का संरक्षण

गणित जैव विविधता के संरक्षण को

एक मात्रात्मक लेंस प्रदान करता है, जो प्रजातियों के वितरण और पारिस्थितिकी तंत्र की गतिशीलता के जटिल पैटर्न पर प्रकाश डालता है। विभेदक समीकरणों और स्टोकेस्टिक प्रक्रियाओं द्वारा सूचित जनसंख्या मॉडल, प्रजातियों की बातचीत और निवास स्थान की गतिशीलता की जटिलताओं को उजागर करते हैं। ये मॉडल आवास विखंडन, जलवायु परिवर्तन और जैव विविधता पर आक्रामक प्रजातियों के

परिणामों की भविष्यवाणी करके संरक्षण रणनीतियों को सूचित करते हैं। जैव विविधता के मूल्य को निर्धारित करके और इसके नुकसान के परिणामों को स्पष्ट करके, गणित पृथ्वी के जीवन की समृद्ध टेपेस्ट्री के संरक्षण की वकालत करता है।

अपशिष्ट प्रबंधन: कूड़े से खजाने तक कुशल अपशिष्ट प्रबंधन गणितीय अनुकूलन पर निर्भर करता है, जो पर्यावरणीय नुकसान को कम करने के लिए कचरे के संग्रह, पुनर्चक्रण और निपटान का मार्गदर्शन करता है।

रैखिक प्रोग्रामिंग एल्गोरिदम अपशिष्ट संग्रहण मार्गों को अनुकूलित करते हैं, जिससे ईंधन की खपत और ग्रीनहाउस गैस उत्सर्जन कम होता है। गणितीय मॉडल अपशिष्ट निपटान सुविधाओं की स्थापना, अपशिष्ट निपटान से जुड़े पर्यावरण और स्वास्थ्य जोखिमों को कम करने के संबंध में निर्णयों की जानकारी देते हैं। अपशिष्ट प्रबंधन को गणितीय समस्या में बदलकर, गणित अपशिष्ट उत्पादन और निपटान की बढ़ती चुनौतियों का समाधान करने के लिए अभिनव समाधान प्रदान करता है।

मॉडल पर्यावरणीय प्रभाव को कम करते हुए ऊर्जा उत्पादन को अधिकतम करने के लिए पवन फार्मों और सौर सरणियों के स्थान और विन्यास को अनुकूलित करते हैं। अनुकूलन एल्गोरिदम नवीकरणीय ऊर्जा स्रोतों के उतार-चढ़ाव वाले उत्पादन का प्रबंधन करते हैं, एक विश्वसनीय और लचीली बिजली आपूर्ति सुनिश्चित करते हैं। गणित की शक्ति का उपयोग करके, नवीकरणीय ऊर्जा आने वाली पीढ़ियों के लिए स्वच्छ, हरित भविष्य का वादा करती है।

पर्यावरण नीति: सूचित निर्णय लेना

गणित साक्ष्य-आधारित पर्यावरण नीति को रेखांकित करता है, नीति निर्माताओं को नीतिगत हस्तक्षेपों की लागत, लाभ और व्यापार-बंद में मात्रात्मक अंतर्दृष्टि प्रदान करता है। लागत-लाभ विश्लेषण नीति विकल्पों के आर्थिक और पर्यावरणीय प्रभावों को मापता है, सामाजिक कल्याण को अधिकतम करने वाले हस्तक्षेपों को प्राथमिकता देने में निर्णय निर्माताओं का मार्गदर्शन करता है। गणितीय मॉडल नीतिगत उपायों के दीर्घकालिक प्रभावों का

शिक्षा और जागरूकता : परिवर्तन को सशक्त बनाना

अनुसंधान और नीति में अपनी महत्वपूर्ण भूमिका से परे, गणित पर्यावरण शिक्षा और सार्वजनिक जागरूकता के लिए उत्प्रेरक के रूप में कार्य करता है। इंटरएक्टिव मॉडल, विजुअलाइजेशन और शैक्षिक उपकरण जटिल पर्यावरणीय अवधारणाओं को उजागर करते हैं, व्यक्तियों को पर्यावरणीय चुनौतियों को समझने और उनका समाधान करने के लिए सशक्त बनाते हैं।

संख्यात्मकता और आलोचनात्मक सोच कौशल को बढ़ावा देकर, गणित नागरिकों को टिकाऊ प्रथाओं की वकालत करने और पर्यावरणीय प्रबंधन में संलग्न होने के लिए ज्ञान और उपकरणों से लैस करता है। शिक्षा और जागरूकता के माध्यम से, गणित भावी पीढ़ियों के लिए ग्रह को संरक्षित करने के लिए सामूहिक प्रतिबद्धता को उत्प्रेरित करता है।

निष्कर्ष : गणित पर्यावरणीय प्रबंधन के लिए एक जबरदस्त शक्ति के रूप में उभरता है, जो हमारे ग्रह के सामने आने वाली जटिल चुनौतियों का समाधान करने के लिए विभिन्न प्रकार के उपकरण और तकनीकों की पेशकश करता है।

जलवायु मॉडलिंग से लेकर अपशिष्ट प्रबंधन तक, गणित स्थिरता की दिशा में मार्ग प्रशस्त करता है, नीति निर्माताओं, शोधकर्ताओं और नागरिकों को एक स्वस्थ, अधिक लचीले ग्रह की तलाश में मार्गदर्शन करता है।

जैसे-जैसे हम पर्यावरणीय परिवर्तन की जटिलताओं से निपटने के लिए गणित की शक्ति का उपयोग करते हैं, हम विज्ञान पर आधारित, डेटा द्वारा सूचित और गणितीय कठोरता के सिद्धांतों द्वारा निर्देशित, अधिक टिकाऊ भविष्य की ओर यात्रा शुरू करते हैं।



चित्र न0-2 जैव विविधता संरक्षण: जीवन की टेपेस्ट्री का संरक्षण

नवीकरणीय ऊर्जा: भविष्य को शक्ति प्रदान करना

टिकाऊ ऊर्जा की खोज में, गणित नवीकरणीय ऊर्जा प्रौद्योगिकियों के डिजाइन, अनुकूलन और एकीकरण में महत्वपूर्ण भूमिका निभाता है। गणितीय

अनुकरण करते हैं, जिससे नीति निर्माताओं को अनपेक्षित परिणामों का अनुमान लगाने और पर्यावरण संरक्षण के लिए रणनीतियों को परिष्कृत करने में सक्षम बनाया जाता है। कठोर विश्लेषण में नीतिगत निर्णयों को आधार बनाकर, गणित पर्यावरणीय संसाधनों के बारे में सूचित और प्रभावी शासन को बढ़ावा देता है।

“हमके जे काटेला कटहा कहाला” (पेड़ की व्यथा)-

कृष्णानन्द

रोई रोई के पेड़वा बतावे कहनियाँ।
मति मोर काटे केहू, हरी हरी टहनियाँ।।

टहनियाँ कऽ रहला से छाँह हम करीला।
पास में जे आवेला, पेट ओकर भरीला।।

पशु पक्षी कऽ लगाईला, ठेकनियाँ।
रोई रोई के पेड़वा बतावे कहनियाँ।।
हमरा नीचे सभकर बीतल बचपन,
जवनियाँ।

बगइचा में आम लूटे, लइका छेहर
पुरनियाँ।।
हमरा के काटि के तु खूबे पछितइबऽ।
घामा में जरबऽ, कबो छाँह नाहि
पइबऽ।।

हमरा बिना आँसू बहइयन कुल
परनियाँ।
रोई रोई के पेड़वा, बतावे कहनियाँ।।
हमरा कटइला से बढ़ जाई परेसनियाँ।
सांस ना पइबऽ, चल जाई जवनियाँ।।
चुप चाप खड़ा बानी बरखा बोलाइला।
बदरा के हाथ जोरि के हम मनाइला।।
खेतवा में बाली लागुल सुघर अगहनियाँ।

रोई रोई के पेड़वा बतावे, कहनियाँ।।
बूढ़ हो जाइब तऽ हम खुदे खाइब
ढमनियाँ।
खपड़ा छवाई सुघर, बन जाइब
धरनियाँ।।
हमके जे काटेला, उ कटहा कहाला।
रोई रोई जीवन भर हरदम पछताला।।
पेड़वा लगावऽ खूबे, बरसी झम झम
पनियाँ।



रोई रोई के पेड़वा, बतावे कहनियाँ।।

फल खूबे देइबऽ हमसे चलइहऽ
दुकनियाँ।।
घरवा आबाद रही, जी जइहन
परनियाँ।।

कृष्णानन्द कऽ कलमियाँ से राहत
बुझाला।
धरम कऽ बतिया से कबो नाहि
अकुताला।।

आरी कुल्हाड़ी के अब धई दऽ पटनियाँ।।
रोई रोई के पेड़वा, बतावे कहनियाँ।।
सेवा भाव मन में रखि के, गाई हरि कऽ
भजनियाँ।

बगिचवा में लकड़ी बीने, माई अउरी
बहीनियाँ।।
आखिरी समइया में काम हम आईला।
परमारथ में अपना के हरदम लगाइला।
बनऽ मत कसाई, पकड़ऽ सुघर रहनियाँ।।
रोई रोई के पेड़वा, बतावे कहनियाँ।
-कृष्णानन्द राय

क्या कसूर किया था गैलीलियो ने?

वेद प्रिय

विज्ञान का हर विद्यार्थी गैलेलियो के नाम से परिचित है। ये एक प्रसिद्ध खगोलविद थे। इन्होंने दूरदर्शी बनाया था। खगोल पिंडों का अवलोकन किया था। गति के नियमों पर काम किया था। पीसा की झुकी हुई मीनार का प्रसिद्ध प्रयोग इनके खाते में दर्ज है। ये कॉपरनिकस के सिद्धांत के समर्थक थे।

अपने अवलोकनों के द्वारा इन्होंने सूर्य केंद्रित प्रणाली को स्थायित्व दिया था। ये चर्च की नजरो में चढ़े। इन्हें सजा मिली। अपनी जिंदगी के अंतिम दिनों ये परेशान रहे। आखिरी यह मामला क्या था? यह थी उनकी एक पुस्तक जो उनके जी का जंजाल बनी।

गैलीलियो से पहले ज्ञान की दुनिया में अरस्तु का बोलबाला था। ब्रह्मांड की भू केंद्रित प्रणाली को मान्यता थी। धर्म ग्रंथों ने इस पर मोहर लगा रखी थी। कॉपरनिकस ने सूर्य केंद्रित प्रणाली की अवधारणा रख दी थी। प्रयोग होने अभी बाकी थे। ब्रूनो ने इसका बहुत प्रचार किया था इन्हें जान से हाथ धोना पड़ा था। गैलीलियो ने बात को आगे बढ़ाया। चेतावनी भी मिली। लेकिन ये संभल कर चल रहे थे। इनके दिमाग में बहुत दूर की सोच थी। चर्च भी चौकन्ना था। इनकी हर बात पर उसकी नजर थी। जब गैलीलियो की उम्र बढ़ने लगी तो इन्होंने अपने काम को अंजाम देना चाहा। इन्होंने एक पुस्तक लिखने की सोची। सन 1630 में यह पुस्तक पूरी हुई।

पुस्तक का नाम था डॉयलॉग कंसर्निंग दी टू चीफ वर्ल्ड सिस्टम्स। यह दो मुख्य प्रणालियां थी ब्रह्मांड का टॉलमी मॉडल और दूसरा था कॉपरनिकस का मॉडल। यह पुस्तक दार्शनिक बहस का एक बहुत सुंदर उदाहरण है।

गैलीलियो इन दिनों फ्लोरेंस में रहते थे। किताब को छपवाने के लिए रोम की अनुमति अनिवार्य थी। पुस्तक की पांडुलिपि रोम भेज दी गई। उत्तर में चेतावनी आई। गैलीलियो बहुत प्रतिष्ठित व्यक्ति थे राजघरानों में इनके परिचय थे। गैलीलियो ने पोप अर्बन अष्टम से मिलने का मन बनाया। ये उनके मित्र भी थे। इन्हीं की अनुमति से पुस्तक छप सकती थी।

पोप अर्बन अष्टम ने कुछ अच्छी सलाह दी। साथ में खबरदार भी किया। इस खबरदारी में दोस्ती का कम खयाल रखा गया था। तय हुआ की पुस्तक फ्लोरेंस में छपे। पुस्तक की भूमिका में टॉलमी मॉडल का समर्थन किया जाए और गैलीलियो स्वीकार करें कि यह उनके अनुमान है।

आखिर सन 1632 में यह पुस्तक छप गई। जैसे ही पुस्तक बाहर आई चर्च की निगाहों में चढ़ी। गैलेलियो ने पुस्तक के अंदर सामग्री से कोई समझौता नहीं किया था। पोप ने एक स्पेशल कमीशन गठित किया। गैलीलियो को रोम बुलाया गया। यह बात अगले वर्ष सन 1633 की थी। गैलीलियो से पहला ही प्रश्न यह किया गया, आपको पहले चेतावनी दे दी गई थी फिर आपने यह हिम्मत कैसे की? गैलेलियो ने अपने बचाव में एक पत्र पेश किया। यह पत्र पुराना लिखा हुआ था। यह एक पूर्व पोप बैलारमाइन जो उस समय जीवित नहीं थे का लिखा हुआ था। इसमें यही लिखा हुआ था की गैलेलियो को कॉपरनिकस का समर्थन करने के लिए केवल धिक्कारा जाता है सजा की कोई बात नहीं थी। रोम इससे संतुष्ट नहीं हुआ। गैलीलियो को कारावास की सजा सुनाई गई। लेकिन यह कारावास आसान शर्तों पर था। पहले उन्हें एक दूतावास में रखा गया बाद में इन्हें घर में नजरबंद की इजाजत मिल गई। अंतिम दिनों में इनकी देखभाल इनकी बेटी मारिया का लेस्टा ने की।

अब बात आती है कि इस पुस्तक में था क्या। इस पुस्तक में 3 पात्रों के बीच वार्तालाप है। यह वार्तालाप 4 दिन चलता है एक पात्र का नाम है सालवीयती। यह एक बुद्धिजीवी है। यह गैलीलियो का पक्ष रखते हैं। यह एक प्रकार से गैलीलियो ने अपना नाम बदल कर रखा है। दूसरे पात्र का नाम है सैग्रेडो। यह शहर का एक धनी व्यक्ति है। यह किसी का पक्ष नहीं लेता। यह सच्चाई जानना चाहता है। बहस में बहुत कम भाग लेता है। कभी-कभी स्पष्टता के लिए बाकी दोनों पात्रों से कुछ पूछ लेता है। यह एक वास्तविक पात्र है।

तीसरे पात्र का नाम है सिंपलीसीओ। यह एक काल्पनिक पात्र है। यह अरस्तु के मत की पक्षधरता करता है। सालवीयती और सिंपलीसीओ के बीच में दो मुख्य मुद्दों पर सवाल-जवाब चलते हैं। सैग्रेडो इन दोनों को सुनता है और समझना चाहता है। ब्रह्मांड में पिंडों की स्थिति पर सवाल होते हैं। सिंपलीसीओ टालमी और अरस्तु के उदाहरण तर्क के रूप में रखता है। इसी प्रश्न के उत्तर में साल वीटी कहता है इन पिंडों की स्थिति दूरदर्शी के द्वारा देखी जा सकती है।

गति के प्रश्नों पर सिंपलीसीओ कहता है ईश्वर की मर्जी है वह इस ब्रह्मांड को कैसे भी चलाएं। यह हमें वैसे ही दिखाई देगी जैसा वह हमें दिखाना चाहेगा। सालवीयती का कहना था कि इन्हें समझा जा सकता है।

सिंपलीसियो फिर प्रश्न करता है कि क्या पूर्व में व्यक्ति कम ज्ञानी थे। उसका इशारा अरस्तु की ओर था। सालवीयती ने फिर उत्तर दिया, उस समय लोगों के पास ऐसे साधन उपकरण या यंत्र नहीं हो सके थे। इस समय की सुविधाएं उस समय नहीं हो सकती थी। सैग्रेडो दोनों की पूरी बहस को सुनकर सालवीयती के पक्ष में जाकर खड़ा हो जाता है।

बहस यहां समाप्त हो जाती है।

गैलेलियो ने इस पुस्तक में दो तीन महत्वपूर्ण सिद्धांतों को रखने की कोशिश की है। प्रथम है, इस पृथ्वी पर हम चाहे कैसे भी कितने भी प्रयोग कर ले यह यथार्थ की सापेक्ष व्याख्या ही करेंगे।

दूसरा था, सहज ज्ञान से अनुमान लगाए गए उत्तरों की अपेक्षा प्रयोगों एवं अवलोकनों द्वारा प्राप्त किए गए उत्तर अपेक्षाकृत ज्यादा सही होते हैं।

अंत में सिंपलीसीओ को एक प्रश्न के उत्तर में - तो फिर अर्थोरेटी क्या है? सालवीयती दोनों को संबोधित करते हुए कहता है

mind, senses and observations।

High Pressure Processing in the Food Industry: A Revolutionary Approach to Food Preservation and Quality Enhancement

Shubham Gangwar

Introduction

In the ever-evolving world of food processing and preservation, advancements in technology have paved the way for innovative methods that not only extend the shelf life of food products but also maintain their nutritional value and taste. One such groundbreaking technique that has gained prominence in recent years is High

Pressure Processing (HPP). HPP has shown some potential for enhancing several food processes (e.g. extraction, freezing, thawing), as well as modifying the physico-chemical properties of functional ingredients in some foodstuffs (Tao et al., 2012).

Principles of High-Pressure Processing

High Pressure Processing, also

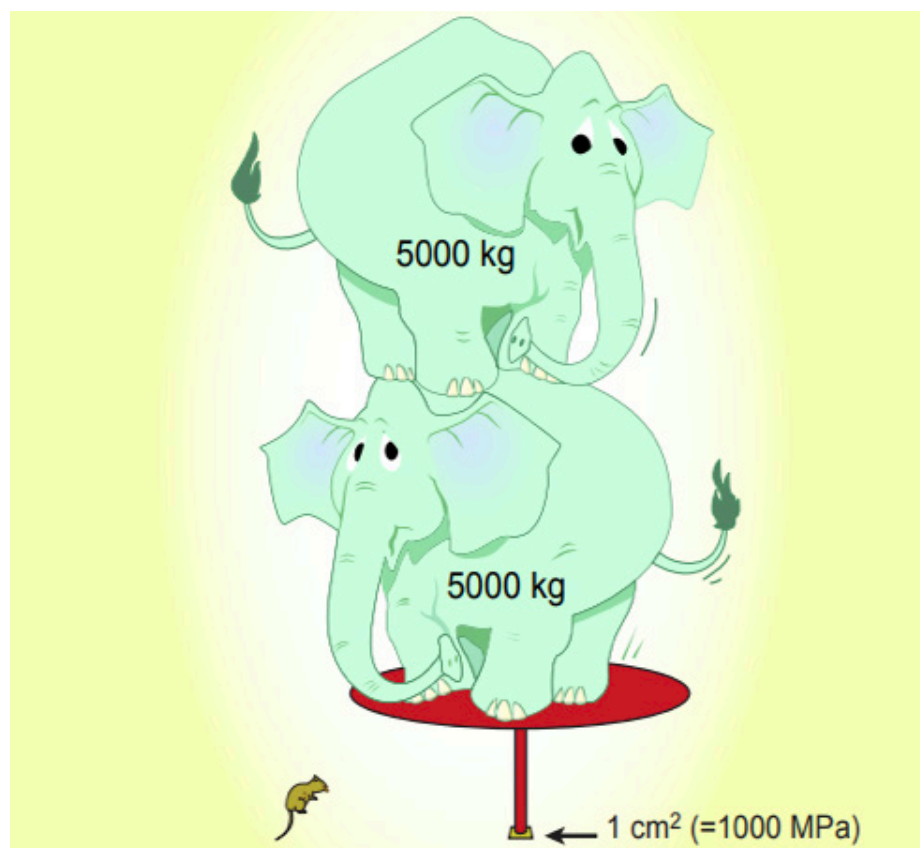
without the application of heat. The basic principle behind HPP is Pascal's law, which states that when pressure is applied to a fluid within an enclosed system, it is transmitted undiminished in all directions. According to Norton and Sun, (2008) HPP is this pressure is applied to food products that are placed inside a pressure chamber filled with water. This intense pressure effectively inactivates or destroys pathogenic microorganisms, such as bacteria, yeasts, and molds, without causing any significant thermal damage to the food.

HPP vs. Traditional Thermal Processing

High Pressure Processing stands out in comparison to traditional thermal processing methods like canning, pasteurization, and sterilization. Traditional methods involve exposing food to high temperatures, which can lead to a loss of flavor, texture, color, and nutritional value. In contrast, HPP retains the fresh taste, vibrant color, and vital nutrients of the food, making it a preferred choice for many in the food industry.

➤ Retention of Nutritional Value: HPP does not require high temperatures, which can break down vitamins, enzymes, and other heat-sensitive compounds in food. As a result, vitamins, minerals, and antioxidants are better preserved in HPP-processed foods.

➤ Preservation of Fla-



Pressure Processing (HPP). HPP is a non-thermal food preservation method that relies on high levels of hydrostatic pressure to effectively kill pathogens and microorganisms while preserving the organoleptic properties of the food. HP technol-

known as high hydrostatic pressure (HHP) or pascalization, involves subjecting food products to extremely high pressure, typically between 100 and 600 megapascals (MPa). This pressure is exerted uniformly from all directions,

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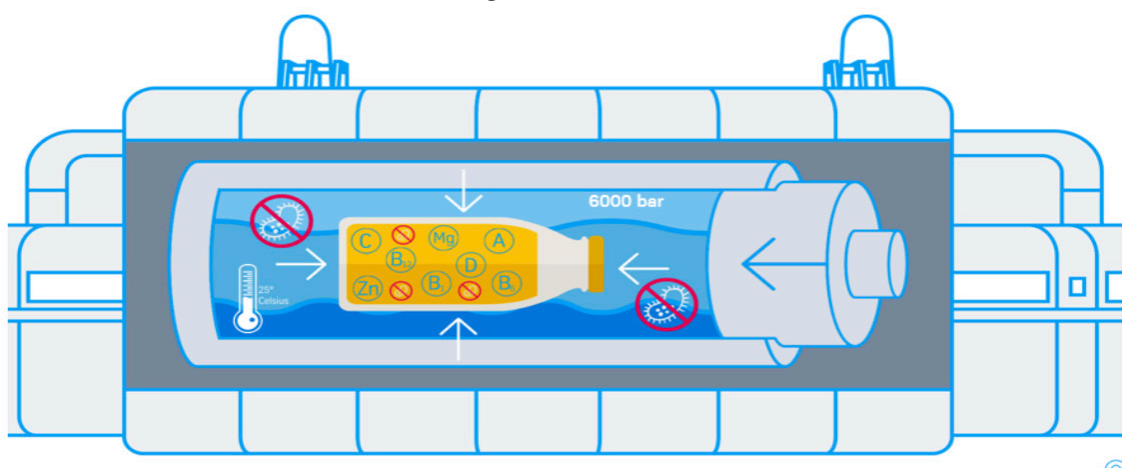
vor and Texture: HPP effectively maintains the original taste and texture of food, as it doesn't undergo the flavor-altering effects of high heat. Fruits and vegetables, for example, retain their natural crunch and juiciness.

duction and growth of microorganisms whereas a higher level of pressure leads to microbial inactivation (Bajovic et al., 2012).

Applications of High Pressure Processing

meat and seafood products, reducing the risk of foodborne pathogens while keeping the products tender and flavorful.

➤ Dairy Products: HPP is applied to dairy items such as yogurt, cheese, and milk to improve shelf



➤ Extended Shelf Life: HPP can significantly increase the shelf life of many food products by killing spoilage microorganisms and pathogens. This is particularly beneficial for fresh products like juices, guacamole, and ready-to-eat meals. Microbial inactivation by HP in food products has been extensively studied.

High Pressure Processing has found a wide range of applications across the food industry, including but not limited to:

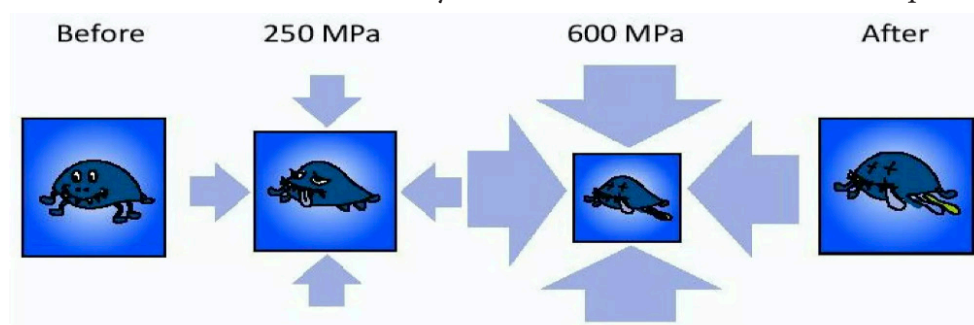
➤ Juice and Beverage Processing: HPP is extensively used to extend the shelf life of fresh juices, smoothies, and other beverages while maintaining their taste and nutritional quality.

➤ Ready-to-Eat Meals:

life and reduce the reliance on preservatives.

➤ Fruit and Vegetable Products: HPP helps maintain the freshness of sliced and diced fruits and vegetables used in salads and other dishes, with no need for chemical additives.

➤ Baby Food: HPP is a popular choice for baby food production, as it ensures the safety and nutritional quality of the products



HP can be utilized either as a cold pasteurization process or as in combination with thermal energy for pasteurization. Generally, a moderate level of pressure (10-50 MPa) decreases the rate of repro-

duction and growth of microorganisms whereas a higher level of pressure leads to microbial inactivation (Bajovic et al., 2012).

➤ Meat and Seafood: HPP is used to enhance the safety of raw

without compromising on taste or texture.

➤ Guacamole and Salsas: The guacamole and salsa industries have witnessed significant growth through HPP, as it prevents browning and extends the shelf life of

these products.

Benefits of High Pressure Processing

High Pressure Processing offers several advantages to both food producers and consumers:

➤ **Enhanced Food Safety:** HPP effectively destroys harmful microorganisms, reducing the risk of foodborne illnesses.

➤ **Clean Label:** As HPP doesn't require the use of chemical preservatives, the resulting products often have a cleaner ingredient list, which appeals to health-conscious consumers.



➤ **Reduced Food Waste:** By extending the shelf life of perishable foods, HPP helps reduce food waste, making it an environmentally friendly technology.

➤ **Improved Taste and Quality:** Consumers appreciate the taste, texture, and nutritional value of HPP-processed products, leading to increased sales and consumer satisfaction.

➤ **Convenience:** HPP allows for the production of ready-to-eat and heat-and-eat meals, catering to the demands of busy life-

styles.

Challenges and Future Prospects

First, the use of HP as a possible alternative to heat treatment highlights the need to study the pressure temperature behaviour of macromolecular food ingredients. For example, although several mechanisms have been proposed to explain protein denaturation and lipid oxidation under pressure, the detailed mechanisms have not been understood clearly (Rivalain et al., 2010; Bolumar et al., 2012). Despite its numerous benefits, High Pressure Processing does face some challenges:

➤ **Equipment Cost:** HPP equipment can be expensive, which may limit its adoption by small-scale food producers.

➤ **Limited Application:** Not all food products are suitable for HPP, as the technology may affect certain textures and characteristics.

➤ **Consumer Education:** There is a need for consumer education to raise awareness about HPP and its benefits, as some may be unfamiliar with the technology. The future of High Pressure Processing in the food industry looks

promising. Ongoing research and development efforts are focused on addressing the challenges mentioned above and expanding the range of products that can be processed using HPP. As consumer demand for fresh, minimally processed, and safe food products continues to grow, HPP is expected to play a pivotal role in meeting these demands.

Conclusion

High Pressure Processing has revolutionized the food industry by offering a safe and efficient method of food preservation that maintains the quality, flavor, and nutritional value of food products. With its wide range of applications and numerous benefits, HPP has found its place in the market, and its future prospects are bright. As technology continues to evolve, we can expect High Pressure Processing to play a crucial role in meeting the ever-increasing demand for high-quality, safe, and convenient food products.

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हरियाणवी कविता

ठाहु बेबस होन्दे देखे।
तेगे सूई टोन्दे देखे।।

टैम नहीं मुहताज किसे का
राजे मटके ढोन्दे देखे।

माँ बाप्पू बाळ्कां कै स्याह्नी
नाइ तळे नै गोन्दे देखे।

फूल बिछाए थे जिन खात्तर
वें भी काण्डे बोन्दे देखे।

बखत पड़े पै निरधन के तो
भाई श्यान लकोन्दे देखे।

दौलत की मेहरबानी तै
कमळे स्याणे होन्दे देखे।

ऐश अमीरी के लालच म्हं
साधू आप्पा खोन्दे देखे।

खुद नै जो भगवान कहैं थे
जेळ हुई तो रोन्दे देखे।

लठ बजवाकै मुल्ला पण्डित
एक जगह पै सोन्दे देखे।

बोट्टां खात्तर निरधन आगै
जबर तमाक्खू मोन्दे देखे।

बाळक घट गे बैदे बढ गे
मास्टर पूड़ी पोन्दे देखे।

ई वी एम सरकार बणावै
वोटर न्यूं जंग झोन्दे देखे।

चांदपै बुढिया चरखा कातै
बाप जुआक भलौन्दे देखे।

कोरट के म्हं गोळी चाल्ली
मुन्सिफ़ बहरे होन्दे देखे।

छान टपकदी देख हंसै तूं
हमनै लैन्टर चोन्दे देखे।

कोठी म्हं सुपन्यां के कातिल
खून्नी लत्ते धोन्दे देखे।

खड़तल नै तो अपने घर कै
गारा के भी लोन्दे देखे।

मंगतराम शास्त्री "खड़तल"

Cosmic farming as an alternative for better crop health

Prof. Arun Arya

Intensive outside influence has led to a shift in perspective amongst farmers from the tribal and other primitive communities. Earlier, farming was seen as a lifestyle, a way for sustenance for their family, community and local ecosystems. The settlements used to do farming in a place for some time and when the fertility used to reduce they changed the place and agriculture was practised in new fertile soil. This was termed jhoom cultivation. Later on villages were made and settlements practised natural farming with organic compost as growth stimulant.

But now they have been trained to view farming as a pathway for securing financial gains (cash flow). This cash crop mentality has led to large scale deforestation in eco-sensitive zones, land and soil degradation and loss of local seed diversity. We are working with the community to return to healthier agricultural and economic practices to slowly but surely build a resilient village community. The nation harvested a record 110 million tonnes of wheat during 2020-21. In rice high-yielding varieties were developed to perform well under drought or saline conditions. However, Basmati rice varieties, developed by IARI, won worldwide acclaim and popularity due to their exquisite aroma, flavour, and texture. India could earn equivalent to Rs 33,000 crore

of foreign exchange by exporting basmati rice during 2018-19. Backed by S&T interventions and improved varieties, India harvested a record 122.27 million tonnes of rice during 2020-21.

Former Vice President Shri Venkaya Naidu urged the farming community to bestow special attention on environmental protection. In this regard, he advised every farmer to accord importance to tree plantation and conservation of water. The Vice President said that at a time when science and technology are driving the progress of the world, agriculture cannot lag behind and has to adopt modern scientific practices. It is not the sole responsibility of the government to make agriculture profitable. Every stakeholder must come forward to enable the farmer to reap the benefits of modernization.

The Vice President also urged educated youth to develop an interest in agriculture and provide technical help to farmers. He also appealed to the private sector to come forward and invest in modernizing agriculture. Stressing the need for a wider debate on modernization of agriculture, he said that scientists, policymakers and media should take the lead in this matter.

Feeding the world in the 21st century is not an easy task due to several issues of uncontrolled

population growth, uneven distribution of resources, depletion of natural resources, overburdened urbanization, loss of fertile soils, etc. Vertical farming can be seen as an opportunity to mitigate food security risks. Vertical farming can provide continuous crop production and is much more efficient; one acre of vertical farming can cover the food production of 30 acres of farming on the land.

Due to the controlled environmental conditions, there is less chance of diseases and insects/pest attacks which can eliminate the chance of chemical use during farming practices. Many environmental factors such as hail, flood, drought, etc., that cause crop failure are also eliminated due to controlled environmental conditions. Moreover, vertical farming helps to reduce carbon emissions generated during agronomic practices and reduce water losses by 70% (Kulak et al. 2013). Although this cropping system can deal with food security issues, it comes with some challenges to deal with. The main challenge to deal with is the cost-benefit analysis. The land and building costs may vary from region to region but cost in urban areas does not allow vertical farming in big cities. The use of energy and operational cost to maintain and control the internal environmental conditions of a farming setup can challenge cost efficiency. A limited

number of crops can only be grown through vertical farming and also require pollination by hand during crop growth.

However, the system lacks some economic efficiencies, but in the future, to avoid food scarcity, vertical farming will become a trend and the reuse of necessary building structures will reduce the cost of the system (Naqvi et al. 2022). People are afraid of pesticide pollution and adulterants used in food and food items like different carcinogenic chemicals in form of colors etc. The practice of cosmic farming may provide an alternative and relief from harmful chemicals.

Different cultivation practices

Historical records exhibit Egyptians optimized agriculture production with simple means. Most Egyptians were descents from settlers who moved to the Nile valley in prehistoric times, with population increase coming through natural fertility. Most people lived in villages and towns in the Nile valley and delta. Dwellings were built of the mud brick and have long disappeared beneath the rising water table or beneath modern town sites, thereby obliterating evidence for settlement patterns. Nearly all the people were engaged in agriculture. Bread was made from cereals. Spices like onion garlic, black pepper were cultivated and used in diets. Different agricultural practices may be listed as:

Jhoom cultivation or shifting cultivation, Natural farming, Modern or chemical farming, Bio-dynamic farming, Rishi Kri-shi, Nateuco farming, Jaivik Kri-

shi-integration of technologies, Soil less cultivation or aquaponics, and vertical farming etc.

Problem of Pollution due to agro-chemicals

Agrochemical led farming has polluted soil, water, air and environment. It has adversely impacted farmers, society, government and human being. Pollution is major threat to humanity. Broken social fabrics and climatic disasters is routine. Seems essential to trap ancient knowledge. Reverting back to technologies prevalent in ancient time could resolve current crises of humanity. Sustainable agriculture pertains with management of natural resources for agriculture to satisfy human needs along with its conservation to hand over to coming generations. So far we have abused natural resources-showing discomfort in form of natural hazards and many more ill impacts. Natural resources are free gift to humanity, we are simply custodian. "Nurture these to assure comfortable life on planet earth and hand over to coming generation". Concept of food should be changed- Air: Water: Food. "Cosmic Farming" could be a viable option.

Cosmic Farming: An alternative Enormous amount of — cosmic, solar, lunar, planets, stars and earth energies are available. People do not respect old traditions. Ancestors respected Panch mahabhutas and these provided free energy. Energy from cosmic, planets, stars and sun are still in prime form availability for mankind. Cosmic energy is available all time, while solar in day hours. Soil microbes, plant cell, cow and soil humus have capacity to harness

cosmic and solar energy. Sun is giant power house-Infinite, non-polluting source. Soil microbes and plants are potential tools to capture cosmic and solar energy. Natural resources i.e. soil, water, air, bio diversity of flora and fauna are available as grace of Cosmos and Sun. Cosmic farming includes better soil management and increase in soil microbial population by the use of cow dung and leaf litter, use of agnihotra in agriculture farms and use of ash after agnihotra in increase in fertility. By agnihotra there is reduction in insect pests and increase in plant growth.

Farming in Rigveda

Vedas are compilations of sacred hymns or verses composed by Rishis in vedic period. Agriculture was considered as very important profession. There are 8 mantras in 4th chapter of Rigveda, 12 mantra in 10th chapter of Rigveda and 9 mantras in 3rd chapter of Atharva veda related to agriculture. Ramayana tells us that in the circumstances of famine King of Mithila Raja Janak ploughed the field and Sita ji appeared during the process. Rig Veda tells

Indra Sitam Ni grahnat Tam Pusham chachatu

Sanah payaswati duhamuttram-taram samam.

Which means God Indra plough the land, pusha God take care and irrigated fertile land produce grains for us. Few other mantras of RigVeda tell (Nene and Sadhale 2000).

O Sun! You are the purifier and protector of everything. We praise the light by which you look after this world and feed all living beings (1:50:6)

Through Yajna the mother earth worships the father- the sun. Sun and earth produce the embryo which is irrigated with water inside the earth. Earth and sun have decided to produce all kinds of crops (1:164:8)

Let sand and fire together with implements used for digging the soil accept the offerings made during the fire worship (yajna) and give us disease free (rog-mukt) food (3:22:4).

Seed treatment

It is stated in Krishi-Parashara (400 BC), "the origin of plentiful yield is the seed." Seed health includes (i) harvesting of healthy looking grains used as seed, (ii) removing visible contaminants, (iii) storing grains in safe place, (iv) viability of seeds before sowing. In northern India people used to celebrate a festival in which they carry sprouted seeds in pots over the heads in a procession which leads to a temple. This was a simple method of testing viability of seeds. Seeds were treated with cowdung, urine, milk, mustard paste and other botanicals. There are instances of treating seeds with coal ash before storage. Activated clay is also used. Pigeonpea seeds are coated with red earth before storage. The notorious pulse beetle lays eggs in mature seeds in the field. The harvested seeds contain grubs inside. The red earth coating prevents the emergence of adults from such seeds. The insect die inside the seed and thus the infestation is prevented. I have seen my grandfather using jaggery to treat Cicer or gram seeds. The soaking of seeds helped to attract and associate more Rhizobium near the developing roots thus promoting better symbiosis. Pelleting the seeds

with fungus like Trichoderma or cowdung results in the antagonistic affect and it increases the percentage germination of seeds by killing the harmful microbes.

Agnihotra or Homa farming

Homa Therapy and agnihotra helps in reduction of pollution, and is equally effective in improving agriculture, animals and human health. Agrochemicals are not needed in it at any stage of farming. It can be integrated with any organic system to get synergistic impact. If promoted is assertive way it will have many implications in human life. In agnihotra the fire is lit in Pyramidal vessel, which attract energies from cosmos and sun; Biorhythm of nature (sun rise and sunset) are followed; Resonance impact in sound is produced by Sonic energy through chanting specific mantras. Burning of organic substances, results in vaporization and generation of heat energy, and other electromagnetic waves. Agnihotra ash itself has the properties of all elements- Earth, Air, Fire, Water and Ether. Agnihotra fire nourishes the Earth-soil to plants, air to water, all of human kind, animal and plant kingdom. With RP area up to 80 ha becomes cosmic area.

Energy resonate in four corner of pyramid, travels to 4 pyramids in field and shoots up to 12 km. It is claimed that environment is clean, full of subtle energy above this.

It collects subtle energy which get deposited in ash. Impact depends upon different discipline observed. As on today homa farming has been tried in more than 70 countries. On combustion chemicals like formaldehyde, formic acid, acetic acid, ethelene oxide, propyl-

ene oxide are generated. Formaldehyde can purify atmosphere by killing harmful microorganisms. It kills pathogenic organisms in air, water and soil. Propylene oxide helps in acceleration of rains. It results in enhancement in chlorophyll content in plants thereby increasing photosynthesis. Agnihotra alters biological systems. Homa atmosphere has positive impact on plants as well as human, and animal health. Agnihotra ash contains micronutrients when sprayed it improves plant growth as micronutrients can be absorbed through stomata. The ash helps in reduction of plant sucking insects and fungal diseases.

In an experiment conducted in 2004 near India gate in New Delhi the conc. of NO₂ reduced from 56 to 29.5 and SO₂ from 11 to 1.5 ppm. After performing yagna. When yagna was performed indoors for three consecutive days there was reduction in 63%, 72%, 92% bacterial and 83%, 84% and 100% fungal population. Some effect persisted even after 7 days. In outdoor atmosphere the bacterial population reduced by 38% after yagna (Brahmavarachas 2016).

Environment and sensitivity in plants

Plant body is sensitive to environment, not only the sun light affects plant growth the storm or strong winds and cold waves affect the stomatal opening and thus reduce plant growth. The enzyme activity is changed due to temperature and pH. Patalwat (2024) reported that regular mechanical stress induces multiple physiological changes in Cajanas cajan. He found that even touching the plants daily can induce formation of jasmonic acid and this results into physiological changes. And even

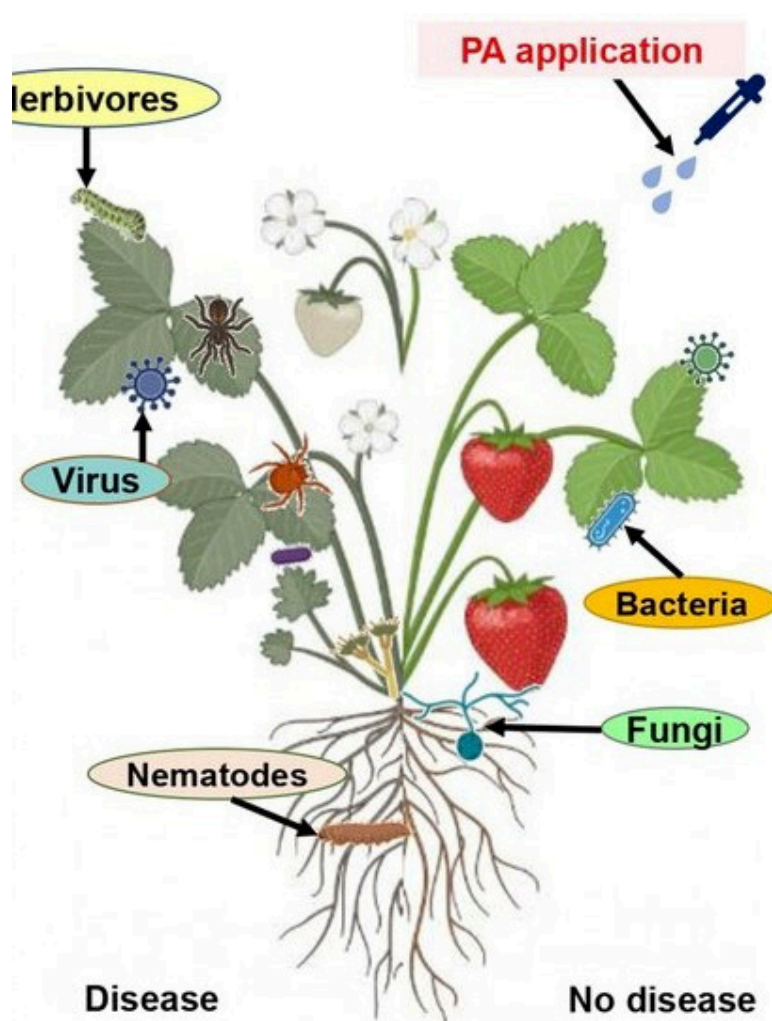
yields can be affected. Bhattacharya (2014) reported effect of music therapy on plants. Vibrations at 50Hz stimulated seed germination and root elongation in rice and cucumber (Takahashi et al. 1991). Wang et al. (2004) found that vibrations of 1400 Hz increased the IAA levels while ABA levels were decreased in callus of Chrysanthemum.

Role of Soil humus and bio-enhancer

Micronutrients and microbial fertilizers play a definite role in enhancement of plant growth and crop yield. Rhizobium a root nodule bacteria and antagonistic fungus Trichoderma can be multiplied easily and used for crop growth. Plant growth can be increased by soil microbes. The role of mycorrhizae and phosphate solubilizing bacteria are tried and found useful for plant growth. Arbuscular fungi like Glomus and Gigaspora are tried against different plants and the growth of mycorrhizae promotes root elongation and this increases crop yield.

Fig: Microbes helping in plant disease control

Soil moisture can be maintained by providing mulching in the soil. Soil moisture can be also maintained by plastic mulching. In making Miyawaki forest mulching was tried with waste paddy straw. By maintaining soil moisture there was enhancement of plant growth. Trees attained a height of three meters within two years. Addition of waste ash produced after yagna in the soil enriches it with deficient nutrients. And this further helps in more plant growth.



All production factor i.e. soil, water, cow, earthworms, bees get boost in cosmic farming. Soil fertility is improved. Environmental pollution is reduced and Climatic disasters are avoided. It improves water quality and availability. Yield is equal or better than conventional or organic systems. Technology is eco-friendly and cost effective. Such model if found suitable will lead to sustainable agriculture.

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Beneficial Role of Enzymes in Detergents

Prof. Nand Lal

Enzymes are increasingly important to detergent formulators for a wide range of tasks, including laundry, automatic dishwashing, and cleaning of industrial equipment used in the food industry. One of the driving forces behind the development of new enzymes and the modification of existing ones for detergents is to make enzymes more tolerant of other ingredients, such as builders, surfactants, and bleaching chemicals, as well as of alkaline. The trend toward lower wash temperatures, has also increased the need for additional and more efficient enzymes.

specks in both fluid and powder detergents, and once reaching with water they disintegrate quickly, by acting as a catalyst, the detergent enzymes increase the rate of the reaction among stains and aqueous solutions. In this way, laundry enzymes are suitable for stain removal. The option of laundry catalysts in cleanser items improves the efficiency and efficacy of detergents and furthermore makes the procedure all the more environmentally friendly, and accordingly, detergent makers are eager to update their items with laundry enzyme formula included. With the buyers'

ed of the starch. Utilizing cleansers in the water at high temperatures and with vivacious mixing, it is conceivable to dispel most kinds of dirt, however the expense of heating the water is high and protracted mixing or beating will decrease the shelf life of the garments and other materials. The utilization of enzymes permits lower temperatures to be utilized and shorter times of agitation are required, frequently after a primer time of soaking. All in all, enzyme cleansers dispel proteins from garments ruined due to blood, milk, sweat, grass, and so forth. Detergent en-

The most widely used enzymes in laundry detergents include:

Proteases: Break down proteins.

Lipases: Break down fats and oils.

Amylases: Breaks down starches and sugars.

Cellulases: Help remove soil from cotton fibres while promoting softness and helping brighten colours.

Pectinases and Mannanases: Used for hard-to-remove stains such as prepared foods (salad dressing, ketchup, ice creams), body lotions, fruits, and dairy products.

Laundry enzyme is one sort of biological enzymes that are as often as possible utilized in the laundry business, and furthermore it is as yet the biggest industrial enzyme application and in this manner, the laundry catalyst assumes a noteworthy job in helping both household laundry and the relative industrial business. Laundry enzymes are a subclass of chemicals, and in this way, they are likewise biological catalysts with poly-atomic structure. They typically exist as meagre blue particles or

high enthusiasm for new biosystem gradually developing, laundry enzyme detergents are turning out to be increasingly better known in the world, which reveals the achievement of laundry enzyme's application in the business. There are five classes of proteins found in laundry enzymes - proteases, amylases, lipases, cellulases, and mannanases.

Dirt comes in numerous types and incorporates proteins, starches and lipids. What's more, garments that have been starched must be liberat-

zymes must be savvy and safe to utilize. Early endeavours to utilize proteases floundered on account of makers and clients developing hypersensitivity. This was combatted by creating dust-free granulates (about 0.5 mm in breadth) in which the chemical is fused into an inner centre, containing inorganic salts (e.g., NaCl) and sugars as an additive, bound with fortifying, strands of carboxymethyl cellulose or comparative defensive colloid. This centre is covered with inactive waxy materials produced using

paraffin oil or polyethylene glycol in addition to different hydrophilic covers, which later scatter in the wash. This mix of materials both forestalls dust development and secures the proteins against harm by other parts of the detergent during storage.

Biological catalysts are utilized in shockingly modest quantities in most solutions of detergents, just 0.4 – 0.8% crude enzyme by weight (about 1% by cost). It follows that the capacity to survive the conditions of utilization is a more significant criterion than extreme affordability. Albeit one impact of including enzymes is that lower washing temperatures might be utilized with resulting savings in energy consumption, the enzymes

for hydrolysing most peptide bonds. They convert their substrates into little, promptly solvent pieces which can be expelled effectively from materials.

The biological catalysts are provided in structures appropriate for formulation by detergent producers. Domestic users know about powdered solutions, however fluid solutions for utilisation at home are progressively available. Household washing presents issues not quite the same as those of industrial washing: the household wash comprises of an extraordinary assortment of fabrics dirtied with a range of materials, and the user requires convenience and viability with less thought of the expense. Home detergents will most

chlorite fixation is deficient to hurt the catalyst. This is basically a batch procedure: medical clinic laundries may utilize nonstop clothes washers, which move less-at first filthy material from a pre-flush introductory stage, at 32°C and pH 8.5, into the principal wash at 60% and pH 11, at that point to a subsequent wash, containing hydrogen peroxide, at 71°C and pH 11, at that point to a bleaching stage and rinsing. Aside from the pre-soak stage, from which water is run to squander, the procedure works counter-currently. Chemicals are utilized in the pre-wash and in the main wash, the degrees of peroxide at this stage being inadequate to inactivate the enzymes.

The importance of enzymatic detergency is expected to continue to increase, based on the following trends:

- Reduction of washing temperatures
- More detergents without bleach (e.g., color detergents and liquid detergents)
- More compact detergent formulations
- More cost-effective enzymes

must maintain activity up to 60 °C.

Notwithstanding the granulated structures, intended for use in detergent powders, liquid solutions in water and slurries of the compound in a non-ionic surfactant are accessible for formulating in fluid 'spotting' concentrates, utilized for expelling stubborn stains. Solutions containing both Termamyl and Alcalase are made, Termamyl being adequately impervious to proteolysis to maintain their activity or enough time to fulfil its function. It ought to be noticed that all the proteolytic catalysts portrayed are reasonably vague serine endoproteases, giving favoured cleavage on the carboxyl side of hydrophobic amino corrosive buildups however equipped

likely incorporate both amylase and a protease, and an extensive warm-water soaking time will be prescribed. Industrial washing requires viability at least expense, so warmed water will be re-utilized if conceivable. Huge laundries can isolate their 'wash' into classes and in this manner limit the use of water and augment the adequacy of the detergents. A pre-wash dousing for 10-20 min at pH up to 11 and 30-40 °C is trailed by the principle wash for 10-20 min at pH 11 and 60-65 °C. The water from these stages are disposed of to the sewer. A third wash incorporates hypochlorite as a dye, which would inactivate the enzymes quickly. The water from this stage is utilized again for the pre-wash be that as it may, by at that point, the hypo-

The ongoing accessibility of appropriate lipase may build the amounts of enzymes utilized altogether. There are, may be, opportunities for catalysts, for example, glucose oxidase, lipoxygenase and glycerol oxidase as methods for producing hydrogen peroxide. Included peroxidases may help the bleaching adequacy of this peroxide.

Ongoing improvement in laundry enzymes has been the presentation of a soluble alkaline-stable fungal cellulase solution for use in laundering cotton fabrics. During use, little strands are raised from the surface of cotton thread, bringing about an adjustment in the 'feel' of the texture and, especially, in the bringing down of the brilliance of hues. Treatment with

cellulase expels the little filaments without obviously harming the significant strands and re-establishes the texture to its 'as new' condition. The cellulase additionally helps the expulsion of soil particles from the wash by hydrolysing related cellulose filaments.

As a noteworthy advantage, purchasers can unreservedly pick a bigger scope of garments with

various materials. Lower temperature clothing condition permits progressively fragile materials like fleece and silk which are very easily adversely influenced when putting into high-temperature conditions. Besides, lower temperature additionally abstains from fading pants and denim, which are generally coloured with dark hues. Along these lines, there will be less colour transfer.

Therefore, utilising enzymes in detergents has a lot of benefits like being eco-friendly, having a wider range of clothes, being cost-effective and also saving energy!

कविता

जल प्रदूषण की समस्या, बढ़ती जल संकट की चिंता।

भूजल और सतही जल, दोनों का है अहम महत्व।

भूजल जो है अंदर धरा, हमें देता ऊर्जा अमृत सारा।

सतही जल की बरसातों से, खेतों को सजाता है रंगीन नये।

लेकिन जल का यह अंतर, हो रहा है बढ़ता खतरा।

जल संरक्षण की है आवश्यकता, नहीं तो होगा पृथ्वी का विनाश।

भूजल और सतही जल का संरक्षण, है हम सबकी जिम्मेदारी।

साथ मिलकर जल संरक्षण करें, पृथ्वी को बचाने की बनाएं योजना।

जल है हमारी जीवन धारा, इसे बचाना है हमारा कर्तव्य सारा।

जल संरक्षण के महत्व को समझें, हर

कदम से पृथ्वी को सजाएं।

जल की महिमा को गाते चलें, हर कोने में जल का संरक्षण करें।

जल ही जीवन का सार है, इसे समझकर समर्पित रहें।

जल संरक्षण के लिए समर्पित हों, हर इंसान और हर क्षेत्र में।

जल को बचाने के लिए कदम उठाएं, सबको जागरूक बनाएं।

पेड़-पौधों को लगाने का काम करें, जल को सचेत बनाएं।

जल संरक्षण में हम सबका हो साथ, एक सुंदर भविष्य की दिशा में।

जल है हमारी जीवन धारा, इसे बचाना है हमारा कर्तव्य सारा।

सबको जागरूक करें, जल का संरक्षण करने के लिए।

जल संरक्षण में हम सबका हो साथ, सुनें जल की पुकार।

पृथ्वी को स्वच्छ और हरित बनाएं, जल का संरक्षण करके।

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Driving Development: The Dynamic Duo of Technology and Innovation

Dr. Preetam Singh Gour

In an era defined by the relentless pace of progress, technology and innovation have emerged as twin pillars reshaping the landscape of global development. From rural communities to bustling urban centers, the fusion of cutting-edge technology and innovative solutions is catalyzing transformative change. This article explores the multifaceted impact of this dynamic duo across various sectors, uncovering how they are propelling us into a future where development is not just a goal but a continuous, adaptive journey.

1. Connectivity as the Catalyst:

At the heart of development lies connectivity. The advent of the digital age has ushered in an unprecedented era of global interconnectedness. From 5G networks to satellite-based internet, technology is weaving a web that spans the globe. This connectivity is not just about fast internet; it's about linking minds, resources, and opportunities. In rural areas, technology is narrowing the information gap, providing farmers with real-time market data, and empowering communities with knowledge that was once out of reach.

2. Innovation in Sustainable Solutions:

In the pursuit of sustainable development, innovation takes center stage. Breakthrough technologies are offering solutions to age-old challenges. From solar-powered

irrigation systems that revolutionize agriculture to innovative waste-to-energy projects transforming urban landscapes, technology is proving to be a driving force in the quest for environmental sustainability. Innovation in materials, energy, and resource management is paving the way for a more eco-friendly and resilient future.

3. Fintech: Financial Inclusion on Fast Track:

Access to financial services has long been a bottleneck for development. Enter financial technology, or FinTech, a game-changer in the world of finance. Mobile banking, blockchain, and digital currencies are tearing down traditional barriers, offering financial services to the unbanked and underbanked. The innovation in FinTech is not only facilitating transactions but also opening doors to credit, investment, and economic empowerment for individuals and small businesses.

4. Health Tech Revolutionizing Well-being:

In the realm of healthcare, technology is proving to be a lifeline. Telemedicine is bringing medical expertise to remote corners of the world, wearable devices are enabling proactive health monitoring, and artificial intelligence is revolutionizing diagnostics and treatment plans. The health tech

revolution is not just about curing diseases; it's about preventive care, personalized medicine, and ensuring that healthcare is accessible to all, regardless of geographical constraints.

5. Education for the Digital Age:

The future of development hinges on education, and technology is reshaping the way we learn. Virtual classrooms, online resources, and interactive learning platforms are democratizing education. Artificial intelligence is tailoring educational experiences to individual needs, ensuring that no learner is left behind. The integration of technology in education is not just about preparing students for the workforce; it's about fostering critical thinking, creativity, and adaptability.

Conclusion:

In the tapestry of development, technology and innovation are the warp and weft, weaving together progress, inclusivity, and sustainability. The key lies not just in adopting the latest technologies but in fostering a culture of continuous innovation. As we navigate this evolving landscape, the challenge is not only to keep up with the pace of technological change but to harness its power for the greater good. It's a journey where every breakthrough, every innovation, is a stepping stone toward a more connected, sustainable, and equitable world.

Indian Horticulture's Evolution and Future Pathways

Rishabh, Ujjwal Shrivastava and Deepa H. Dwivedi

Abstract

Indian horticulture has evolved significantly, contributing substantially to agricultural value addition despite utilizing only 18% of agricultural land. This article explores the sector's journey, its current status in producing 347.18 million tons of diverse products, and its pivotal role in the country's Gross Value Addition (GVA). This article provides an in-depth analysis of the sector's evolution, key achievements, research focus areas, technological innovations, government initiatives, and future prospects.

Key words: Indian Horticulture, Productivity Surge, Global Stand-

33% to the agricultural value[1]. Its growth trajectory, exemplified by 38.5% productivity surge from 2004-05 to 2021-22 [2], has positioned India as a global leader. This section highlights the sector's vital role in the economy, its exponential growth, and its dominance in global fruit, vegetable, and spice production.

Current Landscape and Global Standing

Despite occupying a small land area, Indian horticulture yields a remarkable 347.18 million tons of produce, contributing 33% of the gross value to the agricultural GDP. India holds prominent posi-

sustainable crop health strategies, and understanding physiological and biochemical mechanisms. These areas aim to enhance productivity, quality, and resistance to stresses, ensuring a robust agricultural system.

Significant Research Achievements
Research institutions across India, including CIARI, CPCRI, CTCRI, IISR, NRCB, IIHR, among others, have spearheaded groundbreaking advancements. These include the development of disease-resistant crop varieties like the bacterial wilt-resistant brinjal lines, innovative pest detection using drones,



ing, Research Focus Areas, Technological Innovations

Introduction

The Indian horticulture sector has emerged as a pivotal contributor to the nation's agricultural landscape, leveraging technological advancements and research breakthroughs. This sector, utilizing only 18% of agricultural land, contributes an outsized

share globally, excelling in fruits, vegetables, and spices production. Notably, the export growth rates of fresh and processed horticultural produce stand at 14% and 16.27%, respectively.

Research Focus Areas

Key research areas in Indian horticulture encompass genetic improvement, production technologies, post-harvest management,

nutrient-efficient cassava genotypes, and the creation of products like nutraceutical banana squash. These achievements significantly contribute to sustainable farming practices and enhanced productivity.

Significant Research Achievements of different Institutes
Central Island Agricultural Re-

search Institute (CIARI):

- Registered a bacterial wilt resistant brinjal line (CARI Brinjal-1) with NBPGR, New Delhi (INGR 12015).

- Identified it as a suitable root-stock for grafting.

- Exhibits moderate drought tolerance.

Central Plantation Crops Research Institute (CPCRI):

- Developed drone-based standard operating procedures (SOP) for spraying, along with recommended spray nozzles.

- Standardized drone-based detection methods for distinguishing healthy and unhealthy palms.

- Created an acoustic device capable of identifying juvenile pests.

- Established suitable climate forecasting models for coconut cultivation. [4]

Fig.1- A bacterial wilt resistant brinjal line CARI Brinjal-1-CIARI

Fig.2-Drone-based SOP for spray developed-CPCRI

Technologies and Innovations

Cutting-edge technologies such as disease detection devices, tissue culture advancements, and value-added products derived from horticultural waste are revolutionizing the sector. These innovations reduce waste and elevate product value, ensuring sustainable practices and economic viability.

Challenges and Future

Directions:

Challenges Faced

Challenges persist in meeting the demands of a growing population amidst declining land and water resources, compounded by the impacts of climate change. Addressing these challenges requires

addressing these challenges requires a concerted effort towards conservation, sustainable practices, and innovation.

Future Thrusts and Strategies

The future trajectory of Indian horticulture hinges on effective management of genetic resources, technological advancements to meet diverse demands, waste reduction strategies, and the mainstreaming of underutilized fruits. Precision farming, digital horticulture, and the integration of AI, robotics, and biofortification stand as pivotal strategies to propel the sector towards global recognition.

Government Initiatives

Government initiatives like the Atmanirbhar Bharat Clean Plant Program (An outlay of Rs. 2,200 crore to boost availability of disease-free, quality planting material for high value horticultural crops), Gati Shakti, and others underscore a commitment to horticulture's growth. Future thrusts aim at efficient genetic resource management, technology-driven growth, waste reduction, and export promotion. (Union budget, 2023-24)

Conclusion

Indian horticulture stands at the brink of unparalleled growth and innovation. With continuous research, innovation, and government support, the sector is poised to further elevate India's global standing, ensuring food security, economic growth, and sustainable agricultural practices. In conclusion, Indian horticulture remains a cornerstone of the nation's agricultural prosperity, characterized by remarkable achievements, tech-

nological prowess, and immense potential for growth. Sustained efforts in innovation, technology adoption, and sustainable practices are pivotal to realize its potential as a global food hub.

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Plastic waste and its sustainable management through extended product responsibility (EPR)

Anuj Saxena and Sanjay Kumar Garg*, Thakur Roshan Singh

Extended Product Responsibility (EPR) is an environmental policy placing responsibility on producer for end of life management (collection, transportation, reuse, recycle or disposal) of their product. EPR is intended to incentivize producer to design recyclable and reusable sustainable product having low waste generation. EPR implementation is an effective tool for plastic waste management. Under EPR producers are incentivized to design low waste generating more sustainable products. However, EPR implementation has increased the product cost to meet out its end of life management. There is a need to complement EPR with other means like developing plastic alternatives, reduction in plastic use, improving waste management infrastructure and increasing consumer awareness to achieve circular and sustainable economy.

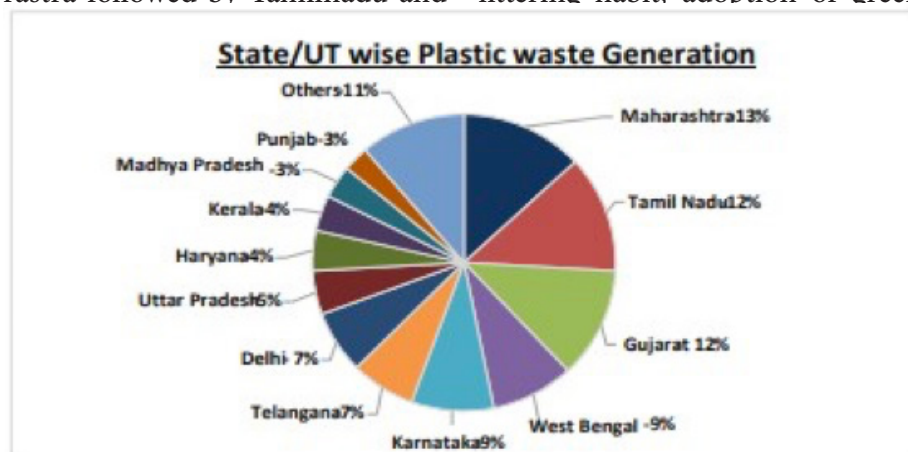
The world is awash with plastic. The massive increase in plastic production, particularly single-use disposable plastic and its widespread mismanagement has built a heap of plastic waste in our ocean, sea, waterways and even the terrestrial ecosystem. Plastic pollution damages ecosystem, poses a threat to biodiversity and ultimately affect the blue planet up to much larger extent (Barnes, 2019).

Initially, paper, wood, metals etc. were used as a packaging material. Being cheaper, plastic soon

became the first choice packaging material even for common man. The strength, flexibility and light weight of traditional oil-driven plastic have made them ideal material for a large number of applications, including packaging, medical devices, building, transportation, etc. Majority of plastic is single-use and throw-away culture has led to the accumulation of plastic waste and pollution (Narancic and Connor, 2019). Plastic waste generated by different states in 2019-20 is shown in figure 1. Maximum plastic waste was generated by Maharashtra followed by Tamilnadu and

years. There are reports detecting plastic traces even in the human blood samples (Leslie et. al., 2022).

The major concern about plastic waste is its accumulation in landfills and natural habitat, ingestion and entanglement by wild and domestic animals, waste leach out, pollution during burning etc. (Figure 3) (Thompson et. al., 2009). People and organizations have started evolving holistic approach for its eco-friendly disposal. Material reduction, EPR, increased recycling capacity, reduction in littering habit, adoption of green



Punjab (Figure 1). Per capita plastic waste generated during 2019-20 is depicted in figure 2. Goa, Delhi and Kerala generate highest per capita plastic waste while the least plastic waste generating states are Nagaland, Sikkim and Tripura (Figure 2). With the excessive use of plastic, its ill effects were soon realized on different sphere of environment. Pollution has emerged as one of the major killer in recent

chemistry based eco-friendly life style can help in dealing with the plastic pollution. India has generated 3.3 million metric tons of plastic in 2019, out of which about 40% remained untreated (Chauhan et. al., 2022). India being the fifth largest generator of plastic waste, strict implementation of EPR is necessary to reduce plastic footprint.

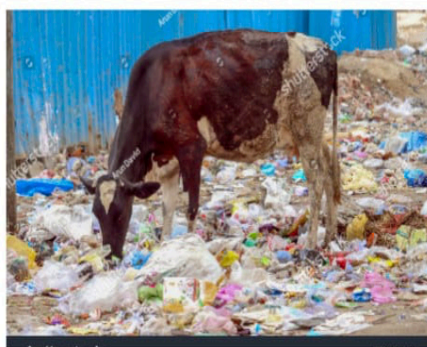
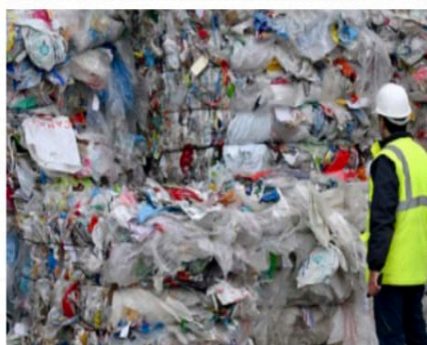
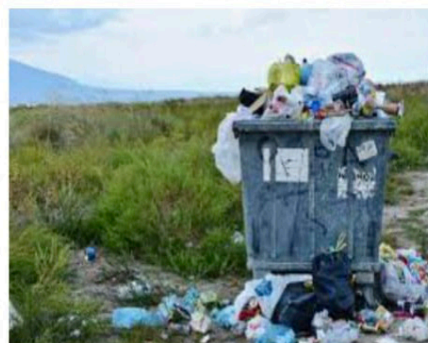
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Under EPR, the producer is responsible for safe disposal of its product after utilization through reuse, recycle or buy back. Producer is responsible for end of life management of its product(s). It requires producer to take responsibility for the entire life cycle of their products, including their disposal. This approach helps to incentivize producer to design eco-friendly easily recyclable products and to invest in recycling infrastructure. It also provides funding for the collection and recycling of plastic waste, creating employment opportunities and helping to reduce the environmental impact of plastic waste. Producer has liberty to transfer this responsibility to third party. EPR implementation increases the product cost but safeguard the environment. Due to EPR producer laid emphasis on development of eco-friendly, more sustainable long lasting product to reduce burden on disposal cost.

Extended Products Responsibility (EPR) principle were officially formulated by Lindhqvist in 1990 (Lindhqvist, 2000). Ministry of Environment, Forest and Climate Change has notified the 'Guidelines on Extended Producer's Responsibility for Plastic Packaging' in schedule II of Plastic Waste Management Rules through IV amendment on February 16, 2022. Under section 13(3) of the Plastic Waste Management Rules (2016), producers, importers and brand owners (PIBOs) have to register in CPCB/SPCB/UT EPR portal developed with intension of improving the accountability, traceability and transparency of EPR obligations. PIBOS are responsible for recycling, re-use and life disposal through processing like waste to energy, plastic to oil, road making, industrial composting etc. Plastic



man of India, Rajgopalan Vasudevan, has developed an innovative method to reuse plastic waste to construct better, more durable and cost effective roads. Green spaces are one of the efficient solutions in reducing the pollution (Haas et. al., 2021).

UN member states have endorsed an international legal binding 'End Plastic Pollution' at UN Environment Assembly held at Nairobi on March 2022. EPR has emerged as

a viable option in dealing with the plastic waste.

Importance of EPR

Encourage sustainable product design: EPR places the responsibility on producer for the end of life management of its product(s), up to their disposal. This incentivizes producer to design easily recyclable eco-friendly products to reduce waste generation and environmental foot print.

Job creation and economic opportunities: EPR can create jobs and economic opportunities in the recycling industry. This is because the collection and recycling of products require labor and can also create a market for recycled materials. Third party management of products by producers will also create jobs.

Funding waste management program: EPR often involve a fee paid by producers for fund generation to finance the collection and recycling of their products. This funding can be used to support waste management programs.

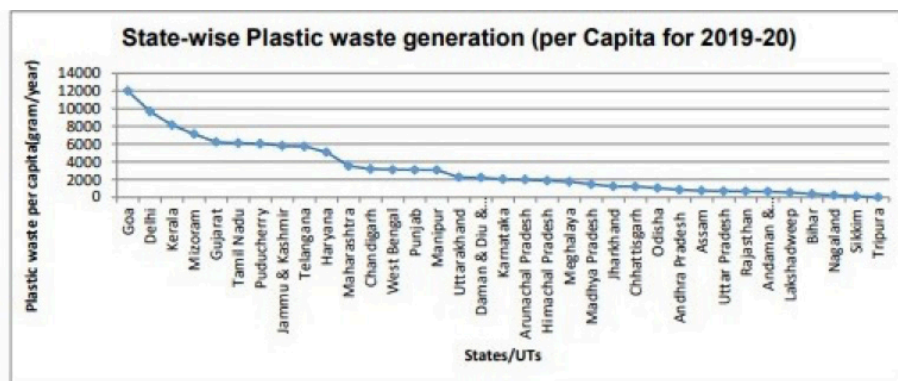
Reduction in environmental impact of products: EPR reduces the environmental impact of products, as producer is incentivized to use recyclable materials in sustainable way to reduce greenhouse gas emissions and resource conservation.

Extended product responsibility (EPR) for plastic waste management in India: India generates significant amount of plastic waste, and much of it, ends up in landfills and ocean, causing harm to the environment and human health. Extended product responsibility (EPR) has become increasingly important in India for managing the plastic waste.

Ministry of Environment, Forest and Climate Change, Government of India introduced the Plastic Waste Management Rules (2016), making it mandatory for producers to collect and recycle a certain percentage of the plastic product at the end of its life. Ministry has notified the Plastic Waste Management (Amendment) Rule 2018 to phase out non-recyclable multi layered plastic (MLP). Ministry of Environment, Forest and Climate Change announced the Plastic Waste Management (Amendment)

Rule 2022, which notified the instructions on extended producer responsibility (EPR) for plastic packaging.

The framework sets guidelines for collection and recycling of plastic waste and outlines the role and responsibilities of various stakeholders. Several states in India (e.g. Maharashtra and Tamil Nadu) have also implemented their own EPR programs for plastic waste. A concrete implementation of EPR has not visualized so far at ground level. Still we have to go a long way.



Overall, EPR is a valuable tool in managing plastic waste sustainably. It encourages producer(s) to take responsibility for their products, reduces the environmental impact of plastic waste, and creates opportunities for innovation and investment in recycling infrastructure. However, it requires cooperation from all stakeholders, including producers, consumers, and governments for visualizing any transformational change in the long run.

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Plant associated rhizospheric microorganisms mitigate abiotic stresses

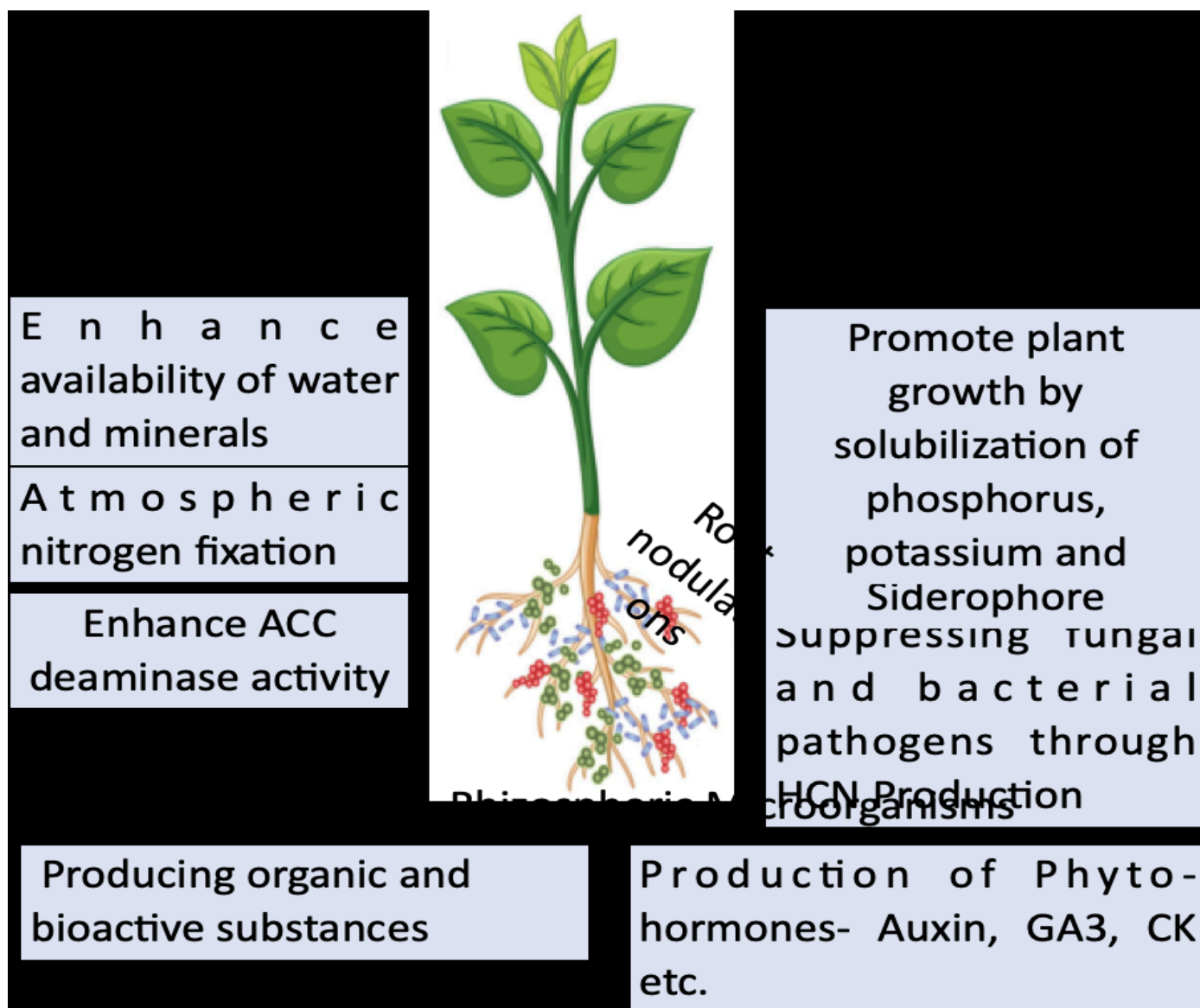
Ajay Kumar Singh¹, Padmanabh Dwivedi^{2*} and Omkar Singh³

Abstract

In the present circumstances, suddenly changing environmental factors adversely affect agricultural productivity. Plants face tremendous changes during prolonged periods of extreme environmental events such as droughts, floods,

and heavy metal stress that affect their biological systems, affecting growth and development. Plants associated beneficial microorganisms establish a mutualistic relationship with the host plant that not only contribute to the normal growth and development of

role in the maintenance of plant homeostasis during abiotic stress conditions. As we all know, the interaction between rhizospheric microorganisms and plants is critical for sustainable agriculture and ecosystems. We can achieve sustainable agricultural practice by in-



heat waves, frost damage, salinity plants but also play an important incorporating plant-microorganisms

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as a positive technological tool. The rhizospheric microorganisms associated to the host plant mitigate abiotic stress through various mechanisms such as antioxidants, phyto-hormones, bio-active compounds, detoxification of toxic substances, reducing the effect of reactive oxygen species and other free radicals. A deeper understanding of the functions of plant microorganism will be useful for abiotic stress management in plants and development of stress resistant crops.

Introduction

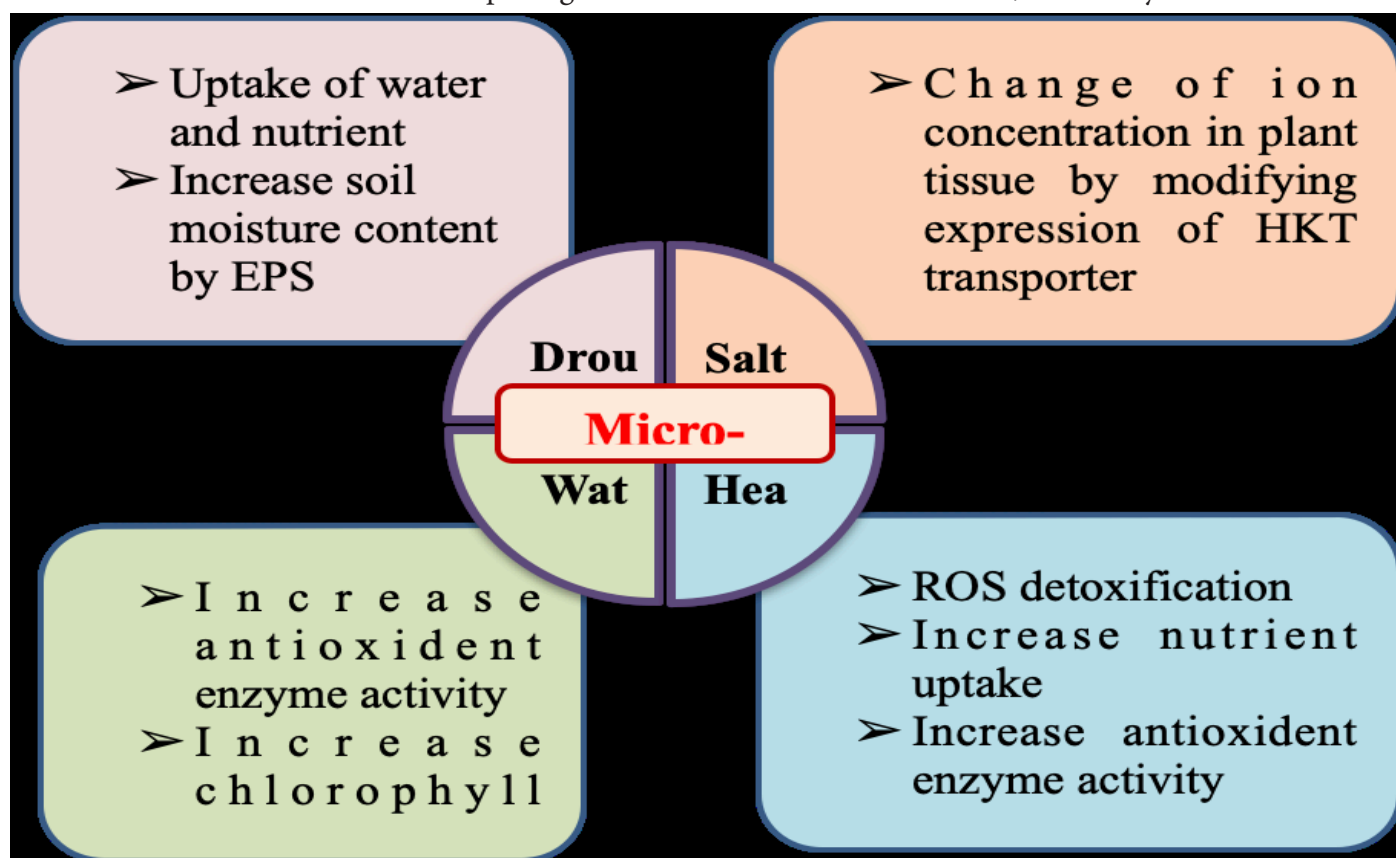
Plants adapt different strategies to survive under adverse environ-

mental conditions. The beneficial microorganisms associated with the crop plants are in a symbiotic relationship and mutually promote plant health, growth and development. It also offers various benefits to plants through fixing atmospheric nitrogen into the soil, enhanced availability of water and minerals, producing organic and bioactive substances, producing plant growth promoting phyto-hormones, detoxifying injurious chemicals substances i.e. herbicide, pesticides and other toxins, thus reducing plant diseases by suppressing fungal and bacterial pathogens - all these have been re-

the low and excess precipitation leading to drought and waterlogging stress, respectively, and salinity and alkalinity stress produced by soil parent material and indirectly through mismanagement or human intervention to cause greenhouse effect by increasing carbon dioxide concentration in the atmosphere, resulting in heat stress.

Drought stress: causes and its mitigations

Drought stress is an environmental abiotic factor that takes place by decreased rainfall, increased rate of evaporation, soil aggregation, leaching of available soil moisture, solubility and diffusion of



mental conditions and have incredible abilities to tolerate and acclimatize to abiotic stresses through gene expression mediated by stress signaling. The microorganisms present in the rhizosphere of plant play an important role to maintain plant homeostasis and support the plants during adverse

ported in several crops during unfavourable environmental conditions (Upadhyay et al., 2022). There are many types of abiotic stresses around the world due to global warming and climate change that adversely affect the plant's growth and development. These abiotic stresses are directly generated from

nutrients into the soil and microbial activities. The production of severe drought stress leads to yellowing, discoloration, leaf burning and wilting in plants, reduces the rate of photosynthesis, decreases the rate of germination, shortening the time for reproduction and changes in the composition and

amount of root exudates in plants. Plants have inherent capacity to act in response to drought stress and they try to manage the damage by complex mechanisms. Plants associated beneficial microorganisms like *Trichoderma*, *Pseudomonas*, *Bacillus amyloliquefaciens* counter and regulate the drought stress by closing stomata, decreasing the surface area of leaves and increasing the plant root growth indirectly and directly by secreting variety of chemicals substances including phyto-hormones, osmoprotectants and antioxidants to decrease the concentration of reactive oxygen species (ROS) causing free radical damage which increase plant drought tolerance, solubilizing mineral nutrient, increases ACC deaminase activity to support the plant for better growth and development (Table 1).

Salinity stress: causes and its mitigation

Salinity is considered an important environmental factor that affects crop production and agricultural sustainability in many regions worldwide as it diminishes the productivity of the affected land. Salinization can be either natural or human-induced, become visible on irrigated and non-irrigated soils, generally, in arid and semi-arid environment where evapo-transpiration exceeds precipitation or where drainage is very poor. Salinity generates osmotic stress thereby reducing nutrient availability and microbial diversity, organic matter content, organic carbon dissolved in soil, disrupts nutrient balance in plant, reduces chlorophyll content, leaf area, photosynthetic efficiency and negatively influence intracellular K^+ translocation. Salinity stress also affects various cellular enzymes participating in nitrogen metabolism and

amino acid synthesis that induced oxidative stress by accumulating reactive oxygen species, which can damage plant cells. Plant microorganisms develop several approaches to avoid salinity stress by the production of osmolites, synthesis of extracellular proteases, and activation of Na^+/H^+ antiporters. They stimulate the production of plant growth substances like auxin, cytokinin and gibberellins. Plant growth-promoting rhizobacteria (PGPBs) release ACC deaminase which decreases the concentration of ethylene by converting into ammonia (Chauhan et al., 2022). In response to abiotic stress, microorganisms produce biofilms, which protect the roots from damage. Several types of highly soluble organic substances such as sugars, sugar alcohols, amino acids and tetra-hydropyrimidines are formed by bacteria that alleviate the osmotic pressure of plant cells under salinity stress (Table1).

Table 1 Effects of various microorganisms in reducing abiotic stress and improving plant stress tolerance.

Waterlogging: causes and its mitigation

Waterlogging is also an important abiotic factor in the low-land areas, where the rainfall is very high leading to reduction of proper gas exchange between plant tissues and the atmosphere, initially leading to a state of hypoxia (low oxygen) and then leads to anoxia (complete absence of oxygen). If waterlogging remains in the soil for a long time, it causes inhibition of root respiration and reduces energy production through catabolism. Waterlogging causes wilting of leaves, chlorosis, epinasty, closing of stomata, reduced photosynthesis and changes in carbohydrate

partitioning, disruption of cell membranes, altered rate of respiration, degree of mineral uptake, growth regulator relationships and other consequences of plants under waterlogging stress. Plant associated beneficial microorganisms *Pseudomonas putida*, *Pseudomonas veronii* KJ protect the plant by production of phyto-hormones, osmoprotectants, increased activity of ACC deaminase, production of bio-films like EPS on the root surface, detoxifying the reactive oxygen species to overcome the effect of waterlogging in plants (Table1).

Heat stress: causes and its mitigation

Heat stress produced by continuous release of green house gases and trapped solar radiation in stratosphere leads to changes in various plant metabolic processes such as decrease in cell water content, cell size and plant biomass, decreasing rate of photosynthesis and respiration. Severe heat stress leads to scorching and discoloration of leaves, fruits, and other parts of the plant. It also leads to the modification of bio-molecular substances, alteration of phyto-hormone signaling, denaturation of proteins and change of fluidity and permeability of cellular membranes, increase the deposition of reactive oxygen species (ROS) resulting in membrane depolarization and induction of programmed cell death. There are several reports that rhizospheric PGPM such as *Bacillus safensis* and *Bacillus cereus* develop plant thermo-tolerance by the production of phytohormone like IAA, gibberellins, and cytokinins, nitrogen fixation, nutrient mobilization and uptake by the plants, ROS detoxification and

production of heat shock proteins (HSPs) leading to decrease plant cellular damage and enhanced plant growth

Microorganisms	Host Plant	Activity of Micro-organisms	Effect on Host Plant	References
Drought Stress				
Trichoderma and Pseudomonas	Oryza sativa L	production of antioxidant enzymes such as peroxidase glutathione peroxidase ascorbate peroxidase and glutathione	Promotes development of plants	Singh et al. (2020)
Bacillus amyloliquefaciens	Pennisetum glaucum L.	Reduced expressions of DREB-1E (drought-responsive) and ERF-1B (ethylene-responsive)	Promotes growth of the plants	Murali et al. (2021)
Salinity Stress				
Bacillus pumilus	Oryza sativa L.	IAA, ACC deaminase, P-solubilization, proline aggregation, and EPS production	Increased plant height, plant fresh, and dry weight, chlorophyll and carotenoids content	Ben Mahmoud et al. (2020)
Rhizobium massiliae	Capsicum annuum L.	IAA, ACC deaminase and siderophore production	Plant height, weight, and chlorophyll contents significantly enhanced	Hahm et al. (2017)
Waterlogging Stress				
Pseudomonas veronii KJ	Sesamum indicum L.	ACC deaminase, production of antioxidant, phytohormones,	Leaf chlorophyll fluorescence signals, concentration of chlorophyll, root and shoot length, and fresh and dry biomass	Sajid Ali et al. (2018)
Pseudomonas putida	Brassica napus	ACC deaminase, production of antioxidant, phytohormones,	Germination percentage, shoot length, plant biomass,	Farwell et al (2007)
Heat Stress Stress				
Bacillus cereus	Solanum lycopersicum L.	Raising osmolytes, antioxidant enzyme and phytohormones, producing ACC-deaminase and exopolysaccharide	Enhanced growth of plants	Mukhtar et al. (2020)
Bacillus safensis	Solanum lycopersicum L.	production of antioxidant, phytohormones,	Regulates heat stress	Mukhtar et al. (2022)

Conclusions

Rhizospheric soil microorganisms provide protection to the host plant from an abiotic stress because the metabolic ability of the microorganisms is very high and it increases the metabolic potential of the plants to obtain nutrition and develop tolerance against environmental stress. The microorganisms are dynamic and its organization aims to reduce the degree and duration of abiotic stress, thus managing ill effects of abiotic factors.

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Insect-pest challenges in Ashwagandha cultivation: identification and management strategies

Saurabh Tiwari, Amir Khan, Sonveer Singh*, Dipender Kumar, Amit Kumar Tiwari

Introduction

Ashwagandha holds significant value in Ayurvedic medicine. It is commonly referred to as Ginseng, poison Gooseberry or winter cherry. This is an evergreen shrub characterized by its elongated tuberous roots. It thrives in arid and sub-tropical region, extending from south Africa to middle east India and china. The principle states in India that produce ashwagandha include Rajasthan, Punjab, Haryana, Uttar Pradesh, Gujrat, Maharashtra and Madhya Pradesh. Ashwagandha thrives in sandy loam or light red soil with pH level ranging from 7 to 8, provided there is an effective drainage system in field. Black soil or similarly dense soil is ideal for cultivating this crop under rain fed condition. It thrives particularly well as a late rainy season crop. Region with a semitropical climate that receives between 500mm and 750mm of rainfall are conducive to its cultivation in a rain-fed manner. This plant can grow at elevations ranging from sea level up to 1500 meters above sea level.

Astonishing use of Ashwagandha

- The entire plant or various components are utilized for their medicinal benefits.
- Since ancient time and continuing to the present the roots of Ashwagandha have been employed as adoptogen, diuretic & sedative.
- It is utilized for a

range of treatments primarily serving as nerve tonic.

- Leaves are utilized for all existing inflammation and swelling in joints.
- The juice extracted from leaves is beneficial for treating conjunctivitis.
- Bark decoction is utilized for the treatment of asthma.
- Its extracts are utilized in the formulation of herbal tea, powder, tablets and syrup.
- Various components of the plant including the leaves and fruits have been utilized for their properties as a pain reliever, memory enhancer, antineoplastic agent, anti microbial agent and anti-inflammatory agent.

As a potent adoptogen, Ashwagandha strengthens the body's ability to withstand stress. It enhance the immune system's cell-mediated response thereby improving the body's defence against illness.

Major Pest of Ashwagandha: Despite having growing demand of ashwagandha in the market, its production is being hampered by a number of pests which are mentioned below:

1. Hadda/spotted beetles (*Henosepilachna vigintioctopunctata*): It belong to order coleoptera and family Coccinellidae. Their eggs are cylindrical and yellow in color, the grubs are of yellow

low color and have six longitudinal rows of spines and pupa are yellow in color with spines on posterior part and anterior portion being devoid spines and the elytra of an



adult display 14 deep red spots on each wing cover. The symptoms occur when both the adult and grub stage of insects cause damage to the plants by scraping the epidermis. Beetle infection caused the leaves to become completely skeltonized as the plant grew. Ultimately, ashwagandha plant dried up and wilted. The male & female adults survived for an average of 21-25 days and 28-32 days, respectively with 7 generations per year.

Integrated pest management

- Remove and eliminate the egg clusters, grubs, pupa and adult beetles to prevent the increase in population.
- Gently agitate the plant in early morning to dislodge grubs, pupae and adult beetles, and subsequently filled with kerosene-infused water.

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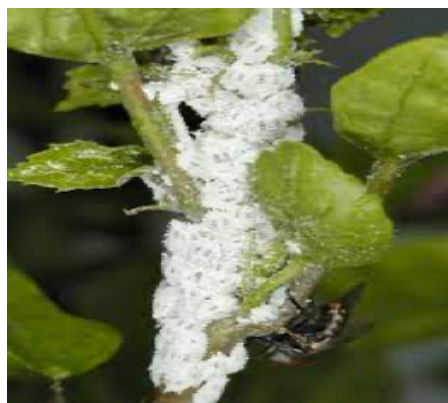
Corresponding author: sonveer.singh@cimap.res.in

- Use light traps @1/ hac to attract and kill the beetles. Bird perches @10/acre should be erected for facilitating field visits of predatory birds.

- The application of entomopathogenic microorganism, specifically *Aspergillus flavus* and *Bacillus thuringiensis*, has been suggested as a strategy for managing pest population.

- In the event of severe infestation it is recommended to apply one of the following insecticides. Neem oil at 5%, Carbaryl (0-5%) at the time of initiation of infestation and repeat after fortnight if infestation persists.

2. Phenacoccus solenopsis:



It is also known as the cotton mealybug or solenopsis mealybug, belong to the family Pseudococcidae and the order Hemiptera. The body appears yellow-grey but it is mostly concealed by the waxy secretions that envelop it, although the segmentation remains visible. A darker transverse bar is present on the dorsal surface. Additionally, there are 18 pair of extremely short, lateral wax filament. Cottony material help protect them from excessive heat and moisture loss. The presence of this mealybug infestation on Ashwagandha results in plant stunting, yellowing, distortion, and premature shedding

of leaves, while the existence of sooty mold hinders photosynthesis. Mealy bug are recognized for enticing ants with their sweet secretion (honey dew), and ants aid in the dissemination of mealybug. Integrated pest management

- Managing Mealybug frequently requires managing caretaking ants, which play a crucial role in the growth of mealybug population. In the absence of ants, mealybug reproduce at a slower rate and struggle to spread to new locations resulting in a reduced risk of severe mealybug infestation.

- It is important to clear all crop residues including ants from previously infested fields and burn them to eliminate any potential mealybug populations.

- Leaving crop residues and grass in the field can lead to mealybug infestation in the new crop.

- Effective management of infestation can be achieved through the introduction of biological control agents such as *Cryptolaemus montrouzieri* (Australian Ladybird), *Anagyrus pseudo coccis* spp. *Verticillium lacanii* and *Beauveria bassiana*.

- Under severe cause of infestation spray plants with dimethoate (0.05%) or Acephate (0.125%) could be as emerge as effective measure for pest prevention.

3. Acrosternum hilaris:



It is also known as the green stink bug, belong to the family Pentatomidae and the order Hemiptera. The typical color of green stink bug is bright green often with narrow yellow, orange or reddish edges. This bug is large, shield-shaped and has an elongated oval body, measuring between 13 and 18mm in length. The stink glands on the underside of the thorax extend more than halfway to the edge of the metaluron in both adult and nymph. Both the adult and nymph were observed to feed on the sap of the leaves, buds, and young shoots of plant, resulting in the shriveling of berries.

Its damage adversely affect seedling, inhibits the growth plants, causes leaves to wilt, and results in the appearance of superficial spots and pits. Additionally, fruit may either drop prematurely, or fail to develop entirely.

Integrated pest management

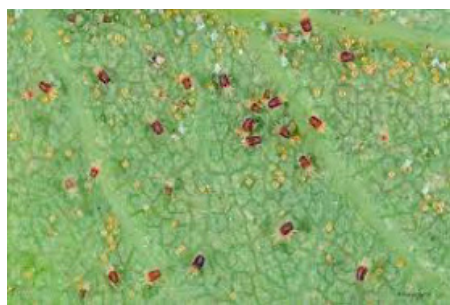
- The removal of alternative host broad leaf weeds, particularly legumes from the orchard will aid in management endeavors.

- Insecticides must be applied at the right time to eliminate immigrating adult.

- Tinchidfly (*Trichopoda pennipes*) and parasitoid wasps parasitize the stink bug species.

- The green stink bug utilizes the pheromone methyl (E,Z,Z)-2,4,6 decatrienoate in its communication process, which could potentially lure the bug away from agricultural areas.

4. *Tetranychus urticae*:



It is also known as the red spider mite and two-spotted spider mite. It is a plant feeding mite species that is commonly recognized as a pest. This mite belongs to the family Tetranychidae and the order Trombidiformes, which is barely visible without the aid of magnification. It appears as reddish, yellow or black spots on plants. Adults female typically measure around 0.4 mm in length, and mature mites occasionally produce a fine web on the upper and lower sides of leaves. *Withania somnifera* in India is most commonly affected by this pest. The insects deposits its eggs on the leaves, posing a danger to host plants as it feeds on cell contents, resulting in small pale spots or scars where the green epidermal cells have been consumed one by one. An onslaught of hundreds or thousands of mites has the potential to result in thousands of lesions, ultimately leading to a significant decrease in the photosynthetic capacity of plants. Severe infestation leads to yellowing and

stunting of plants, chlorosis on the leaves is a visible sign of damage resulting from the mites feeding activity.

Integrated pest management

- Washing the leaves during the middle of season can assist in decreasing the likelihood of spider mite population rapidly increasing.

- Biological control agents after a highly efficient alternative to pesticides such as *Phytoseiulus persimilis* has proven to be effective in controlling *T. urticae* through biological means.

- Field trials demonstrated that spider mites could be efficiently managed by applying omite (Propargite) at a rate of 1mL/liter of water and morroside

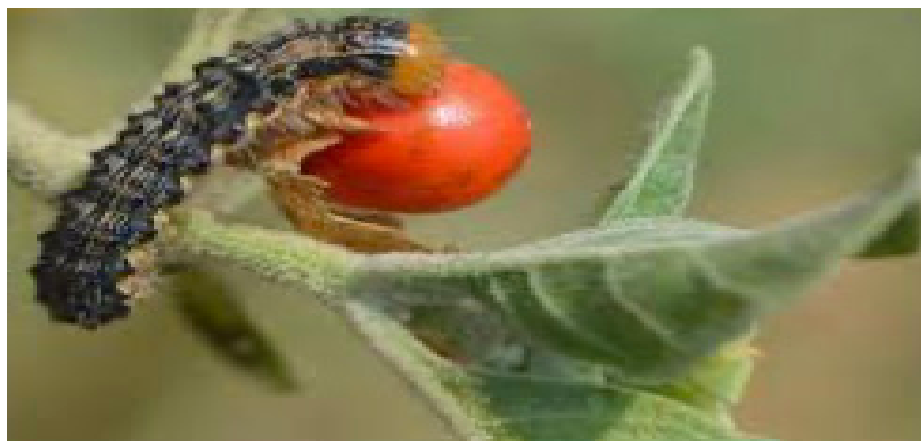
marking running along the sides of its body. The adult moth has a medium size and is brown with a V-shaped black border on the hind wing. Newly emerged larvae consume tender plant shoots. The larva penetrates the shoot and fruit at during more advanced phase.

Integrated pest management

- Spring trap crops have proven to be an effective method for managing caterpillar population.

- *Trichogramma chilonis* should be released in the field at a rate of 5cc/hac, spray application of NPV @250LE/hac and set-up pheromone trap @12/hac.

- Apply Acephate 75% sp780gm/hac or Azadirachtin

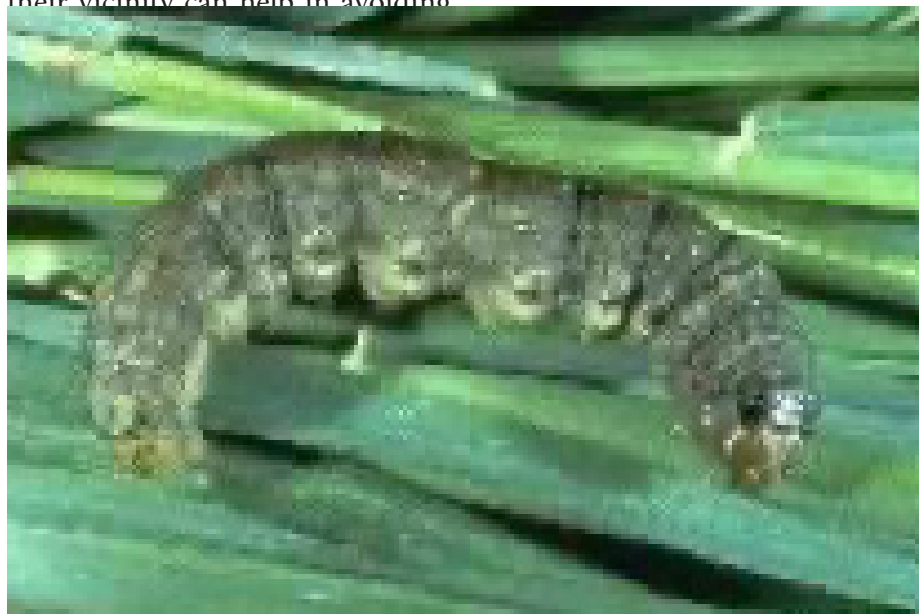


It is also known as the chickpea pod borer, shoot and fruit borer and cotton bollworm belong to Noctuidae family and Lepidoptera order. The larva display a greenish hue with light gray and dark brown

0.03% EC 500ml/hac or Chlorpyrifos 20%EC 1250ml/hac or Emamectin benzoate 5%SG 190-220gm/hac.

- Eliminating additional hosts within crop field and

their vicinity can help in avoiding



It is also known as cut worms. This cut worm belongs to the Noctuidae family and Lepidoptera order. Recently emerged larvae consume the epidermis of leaves and delicate seedling. Mature larvae emerge during the night to consume young plant by severing their stems. The larvae display a dark brown hue with a red head, while the adult shows a brown coloration with dark spots on its wings.

Integrated pest management

- Cutworms are not often targeted by diurnal predators due to their nocturnal behavior and soil dwelling nature.
- Ground beetle, soil fungi and nematodes could contribute to controlling the population of cutworms.
- Collect the caterpillar by hand and dispose of it.
- Spray neem seed kernel extract (NSKE) 5%.
- Apply synthetic pyrethroid insecticides like Deltamethrin or Cyfluthrin or bifenthrin or permethrin or Lambda – cyhalothrin are highly effective in minimizing harm caused by cutworms.

thrin or Cyfluthrin or bifenthrin or permethrin or Lambda – cyhalothrin are highly effective in minimizing harm caused by cutworms.

Conclusion: Ashwagandha has many medicinal properties. Therefore, its demand in the market is increasing day by day. But a number of pest listed above are causing severe damage to the plant which ultimately results in yield loss. That's why through effective pest management we can reduce the crop loss and meet the growing demand. Apart from this, a disease and pest free crop increases the value of products and thereby income of the farmers.

संस्कृत भाषा में विश्व का सर्वश्रेष्ठ साहित्य उपलब्ध है

Ganesh Shanker Bajpai

संस्कृत भाषा प्राचीन भाषाओं में से एक सर्वश्रेष्ठ साहित्य उपलब्ध है जो कि जीवन विद्या ददाति विनयं विनयाद याति पात्रताम्। है। भारतीय उपमहाद्वीप जिसको जम्बूद्वीप के अनेक आयामों में परिपूर्णता प्रदान करते पात्रत्वात् धनम् आप्नोति धनाद धर्मं ततः के नाम से भी जाना जाता है। संस्कृत को हुए पथ प्रदर्शन करता है। यहां के गुरुकुलों सुखम् ॥ इस उपमहाद्वीप की अति समृद्ध साहित्यिक में इस भाषा के माध्यम से ही पठन पाठन इसका अर्थ है "विद्या मानव को विनम्रता भाषा का गौरव प्राप्त है। आज की अनेक सम्पन्न होता है। संस्कृत भाषा की व्याकरण प्रदान करती हैं, विनम्रता से मनुष्य में पात्रता भारतीय भाषाओं जैसे हिंदी, बांग्ला, मराठी, को महर्षि पाणिनि ने अत्यंत प्राचीन ग्रंथ उत्पन्न होती है, पात्रता से धन और समृद्धि सिंधी आदि भाषाओं की जननी के रूप में अष्टाध्यायी के माध्यम से अनेक सूत्रों में मिलती है, समृद्धि से सही आचरण, सदाचार संस्कृत भाषा को जाना जाता है। वैदिक परिभाषित किया है। की प्राप्ति होती है और सही आचरण से कालीन प्रायः समस्त ग्रंथ व साहित्य संस्कृत "येषां न विद्या न तपो न दानं ज्ञानं न शीलं न संतोष प्राप्त होता है।" भाषा में उपलब्ध है। प्राचीन काल से लेकर गुणो न धर्मः। वर्तमान समय तक सनातन धर्म में पूजन, ते मृत्युलोके भुवि भारभूता मनुष्यरूपेण अनुष्ठान आदि संस्कृत भाषा के उपलब्ध मृगाश्चरन्ति॥" मंत्रों द्वारा ही सम्पन्न कराए जाते हैं। अर्थात्- जिस मनुष्य के पास विद्या, तप, दान, संस्कृत भाषा की लिपि को देवनागरी कहते ज्ञान, शील, गुण और धर्म का अभाव हैं, वे है। भारतीय संविधान में अनेक भाषाओं को इस पृथ्वी पर भार रूप ही है तथा मनुष्य रूप अनुसूचित किया गया है संस्कृत भाषा भी में पशु के समान जीवन व्यतीत करते हैं। उनमें से एक है। आकाश वाणी व दूरदर्शन आशय यह है कि मनुष्य में मानवता होनी पर संस्कृत भाषा में, समाचारों को प्रसारित चाहिए व मानवता ऊपर दर्शाए गुणों को किया जाता है। इस भाषा में विश्व का धारण करने से ही आती है।

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<https://testbook.com/question-answer/question--62833fac799e4a436a96800f>

Environmental and Health Impacts of Uranium Mining in Jadugoda, Jharkhand

Shubham Abhishek 1,2, Bhanu Pandey1,2*

Abstract

The uranium mines in Jadugoda and the surrounding areas of the Singhbhum thrust belt in Jharkhand State are currently active mines in India. These mines play a crucial role in providing fuel to nuclear power plants. From 1968, Uranium Corporation of India Limited (UCIL) began its uranium mining and processing operations in Jadugoda, that is predominantly inhabited by tribal communities. Radiation exposure resulting from uranium mining and processing in Jadugoda, has been a concern for the last two decades. Organizations such as 'Jharkhandi Organization against Radiation' (JOAR) were founded in Jadugoda and began to protest and accuse UCIL of neglecting public health concerns. They have discovered information about individuals experiencing physical deformities, tuberculosis, cancer, and previously unidentified illnesses occurring among the population in and around the uranium plant. These symptoms were attributed to the effects of radiation. Tailing ponds also causes a substantial release of harmful gases and nuclear radiation, resulting in the pollution of water, vegetation, soil, and ultimately, the food chain. This article provides a concise overview of the uranium mining, ore processing, and waste management operations in jadugoda.

Keywords: Uranium mines, Jadu-

goda, Radiation, exposure, Tailing ponds

1. Introduction

The Indian government has taken measures to significantly expand the nuclear power capacity from 7480 MW to 22480 MW by 2031-32 (Sharma, 2023). It is said that progress comes at a cost, the price of the expansion is in the eastern state of Jharkhand, in Jadugoda. Jadugoda, situated at 22°65'60.15" N 86°35'28.82" E, is a census town situated in the Musabani block in the Ghatshila subdivision of the East Singhbhum district in the Indian state of Jharkhand. In the native sadri language, Jadugoda means "the land of magic." It used to be a beautiful region with deep woods, little villages encircled by hills, and industrious tribal people. The inhabitants of Jadugoda are experiencing severe adverse effects because of industrial progress, facing significant challenges to their well-being and self-sufficiency (Sonowal, 2020).

The Uranium Corporation of India Limited (UCIL), which was founded in 1967 as a public sector enterprise under the administrative supervision of the Department of Atomic Energy, is responsible for carrying out indigenous uranium extraction in India. The primary goal of UCIL is to mine and process uranium ore in order to produce uranium concentrate. The extracted ore is processed at the Jadugoda Mill, where it under-

goes crushing, wet grinding, and leaching to extract uranium, which is finally precipitated and dried as yellowcake. In 1968, UCIL began operations in Jadugoda, where it mined and processed uranium ore. The ore is extracted and supplied into the Jadugoda processing facility from three underground mines: Bhatin, Narwapahar, and Jadugoda, all within a close proximity of approximately 22 km from Jadugoda. The low-grade uranium ore (0.1% U₃O₈) from all of these mines is currently processed at the Jadugoda mill. The Jadugoda Uranium Mining and Plant was constructed on terrain that was once inhabited by indigenous people. On the tribal people's agricultural fields, three tailing dams have been built. There are over a hundred thousand tons of nuclear waste stored in the tailing ponds of Jadugoda. This waste produces a significant amount of toxic gases and nuclear radiation, which has led to contamination of the water, vegetation, soil, and ultimately, the food chain. It is important to note that nuclear waste can remain radioactive and dangerous for an extremely long time. The region's ecology and human health have been significantly impacted by the uranium tailing ponds at Jadugoda. The land and water around the ponds are apparently contaminated to a level 10 to 100 times greater than normal by the radioactive waste (Nayan, 2015).

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2.0 Uranium Tailing Ponds in Jadugoda

Jadugoda has three valley dam-type tailings ponds. The first and second tailings ponds (I and II), which have surface areas of around 33 and 14 hectares, respectively, are situated next to one another in a valley that has hills on three of its sides and artificial embankments on the side that drains naturally downstream. These two containment ponds for tailings are almost full and prepared for closing. The third tailings pond (III), which is now in operation, is around 30 hectares in surface area. These tailings ponds have very low permeable bedrock and overlying soil. The tailings ponds did not enclose properly by any fencing to prevent unauthorized entry (Jha et al., 2016).

The tailings include fine-grained primary and secondary minerals in solid phases. Primary minerals include silicate minerals like quartz, feldspar, and clay as well as any residual sulfides that have resisted leaching in the mill and have remained mostly unchanged. Reagents applied during processing and neutralization cause ore species to precipitate, forming secondary minerals such as Ca sulfate and Fe oxyhydroxides. The tailings' fine fraction, which includes colloids, is mostly composed of clay, sulfate salts (such as barite (BaSO_4) and gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), and oxyhydroxides of Fe, Al, Mn, and Si. The tailings also contain significant amounts of hazardous elements such as arsenic, lead, vanadium, along with radioactive substances from the decay of uranium-238 (Radium 226, Radon 222, Thorium 230) (Tripathi et al., 2008). (Fig.1)

2.1 Ecological Effect due to Uranium Waste in Jadugoda

Improperly disposing of mill tailings without liners during the early decades of uranium mining has resulted in significant contamination of soils, surface waters, and groundwater.

The primary source of the radiation hazard from tailing ponds is ^{222}Rn and its daughter products (Panigrahi et al., 2018). Waste disposal practices in Jadugoda, such as the creation of tailing ponds, have been found to be hazardous, causing significant ecological harm and putting local communities at risk as they depend on these natural resources for their daily necessities. The region has experienced a decrease in biodiversity due to the negative impact of toxic waste on the local plants and animals. In addition, there have been significant findings of elevated radioactivity levels in the environment, which are further contributing to the deterioration of the ecosystem (Khan et al., 2002). Radioactive particles may fly airborne and settle over a large region when tailings are exposed to wind and weathering, contaminating the surrounding plants and soil (Kossoff et al., 2014). This may hinder the development of plants, lower agricultural yield, and endanger the health of people and animals if polluted dust is inhaled or consumed.

Storing waste rock after uranium mining has been found to raise the levels of heavy metals in the surrounding soil (Mandeng et al., 2019). This can result in soil contamination and the absorption of these metals by plants, causing disturbances to the local plant and animal life. Uranium tailings have a negative impact on water quality. When erosion and seepage occur

from tailings ponds, it can result in the transportation of harmful substances such as radionuclides and heavy metals into the surrounding water bodies (US National Research Council, 2011). This, in turn, has a significant impact on the delicate balance of aquatic ecosystems. These pollutants have the ability to build up in sediments and accumulate in aquatic organisms, which can then make their way into the food chain and have an impact on fish, birds, and mammals.

The failure of disposal sites can have a profound effect on the environment. There are multiple ongoing concerns that require attention. These include the release of radioactive dust from dry tailings, the erosion of tailings from the containment structure, and the discharge of effluent. There have been numerous incidents involving active and inactive tailings dams, with most of them being caused by slope instability, seepage, overtopping, and earthquakes (Strachan, 2002). For instance, an incident occurred at a uranium tailing's facility in Church Rock, New Mexico, where a dam wall was breached. This resulted in the release of a significant amount of radioactive water and contaminated sediment. The incident had a wide-reaching impact, affecting approximately 110 km of the Rio Puerco (Sonowal, 2020).

3.0 Understanding the Health Hazards of Radiation in Jadugoda

Citizens of Jadugoda are at risk of radioactivity through various channels. The mining and milling activities involving uranium generate dust and release radon gas, which miners inhale, leading to internal irradiation. Uncovered trucks transport uranium ore

on bumpy roads, resulting in the deposition of radioactive debris along the roadside. Uncovered and unlined ponds are used to dump the mine's tailings, resulting in the emission of radon gas and gamma radiation, which retain a high percentage of the original radiation (Landa, 2004). The villages located near the tailing ponds experience the most severe impact. Throughout the dry season, the villages are affected by the blowing dust from the tailings and in the monsoon

season the radioactive waste is released into the nearby creeks and rivers. This leads to additional internal radiation exposure as villagers unknowingly use the contaminated water for washing, drinking, and even fishing in the nearby ponds (Sonowal and Jojo, 2003). Uranium tailings have the potential to significantly affect the health and fertility of soil (Chen et al., 2021). Radionuclides and heavy metals have the potential to disrupt soil chemistry, which can

negatively impact the ability of the soil to sustain plant life (Chernysh et al., 2024). These changes in vegetation patterns can have a significant impact on the local wildlife, which relies on these plants for both food and habitat. When it comes to contaminated soils, there is a potential risk to human health if they are used for agriculture. This is because crops grown in these soils have the ability to accumulate harmful substances.

Table 3.1: Components of Uranium waste and associated Health Issues

	Element	Effects	Target Organ
1	Uranium	Kidney damage, birth defects, fibrosis, liver damage and nervous system	Lung, bone, stomach, brain and skin.
2	Radium	Bone and blood effects at very high levels.	Eye, breast, liver, kidney and nervous system.
3	Radon	Lung pulmonary fibrosis at very high levels.	Liver, bone, pancreas, lymph.
4	Vanadium	Birth defects and inhibition of key cellular enzymes.	Kidney, central nervous system
5	Arsenic	Causes hyper-and hypo-pigmentation and hyperkeratosis of the skin. Toxic to the nervous system, can cause jaundice (liver)	Lung, skin, liver, bladder, and kidney
6	Magnesium	Neropsychiatric disorder (similar to Parkinson's disease), liver and lung damage. Decreased male fertility.	Liver, Lung
7	Beryllium	Lung disease (berylliosis), skin hypersensitivity, immunological changes, and kidney damage.	Lung

Based on a study conducted by a team from Indian Doctors for Peace and Development (IDPD) in 2007, there has been a notable increase in the occurrences of congenital deformities among infants, higher rates of sterility, and a rise in cancer-related deaths in Jadugoda. Studies have shown a concerning decrease in life expectancy for individuals residing in close proximity to the mines. Shockingly, a staggering 68.33 percent of the population is experiencing premature mortality before reaching the age of 62. A recent study conducted by researchers from Kyoto University in Japan has uncovered alarming levels of uranium contamination in the vicinity of a tailing pond and along the stream that transports the tailing waste to the nearby Subernarekha river.

It was also discovered that there are elevated levels of radiation on the roads used for transporting uranium ore to the mill in Jadugoda (Koide, 2004).

Laxmi Das, a Jadugoda native, has lost five infants within a week of their birth and had three miscarriages. Upon learning that her ninth child, Gudia, had cerebral palsy and would need bed rest for the rest of her life. In 2012 Gudia's death, leaving her memories scarred. Many women in the eastern Indian state of Jharkhand share Laxmi's suffering in Jadugoda, a place rich in uranium. Anyone can find a relevant example by referring to the video evidence available at (<https://www.youtube.com/watch?v=b2DOfnqFNbQ&t=3s>). The issue of radiation first gained attention in Jadugoda when the Indian Federation of Trade Union

(IFTU), a labor wing of the Communist Party of India (Marxist Leninist), advocated for "radiation allowances" for workers who were exposed to radioactive rays in 1979. Despite the unsuccessful strike in 1979, it sparked a newfound awareness among educated tribal youth who had previously been indifferent to the harmful effects of radiation on the Adivasis living in Jadugoda. In 1989, a group of prominent members from the All-Jharkhand Students Union (AJSU) decided to break away from the organization and establish a new group called Jharkhand Adivasi Berojgar Visthapit Sangh (JABVS), also known as the Jharkhand Tribal Unemployed Displaced Committee. They initiated a separate movement to address the issues of displacement and unemployment in Jadugoda.

The leaders of JABVS and educated youth in Jadugoda became aware of the harmful effects and various concerns associated with uranium mining and radiation when the organization members learned about the upcoming World Uranium Hearing-4. This international event was scheduled to take place in Salzburg, Austria from September 13 to September 18, 1992. A four-member delegation participated in this Hearing and returned with valuable knowledge about the impact of radiation on health, as well as the exploitation of tribal communities through displacement and deprivation of resources. In February 14, 1998, a new organization called 'Jharkhandi Organization Against Radiation (JOAR)' was formed with the aim of addressing the public health concerns caused by radiation and the displacement of tribal people,

due to UCIL's lack of concern (Saranghi and Kundu, 2004).

Conclusion

The Uranium Corporation of India Limited plays a crucial role in supporting individuals of Jadugoda by offering employment opportunities, which in turn helps them sustain their livelihoods. If the issue of radiation is indeed a concern, individuals are faced with a difficult decision: either avoid UCIL and suffer from hunger, or accept UCIL and face the risks of radiation exposure. It is interesting to observe that individuals have often opted to face the uncertain consequences of radiation rather than granting to the certainty of hunger. Additionally, ongoing protests continue to raise two important points.

If the impact of radiation is indeed a reality, then these protests are undoubtedly genuine. However, if the impact is not proven, the persistence of these protests may be attributed to the potential for political gain, power, fame, and financial opportunities under the guise of activism and the protection of tribal and human rights. However, the indigenous communities in that area continue to bear the brunt of the situation, both in terms of physical and psychological impact. The company should prioritize meeting the demands of the people, ensuring compliance with international safety standards in handling radioactive materials, and providing appropriate medical care to those affected by radiation. It is widely acknowledged that the Uranium industry plays a crucial role in the production of nuclear energy, which is highly regarded as a reliable and low-carbon source

of energy. The stability and affordability of nuclear energy are crucial for ensuring energy security and price stability, which in turn support economic stability and growth of the country. Utilizing this sustainable energy source not only aids in combatting climate change by decreasing greenhouse gas emissions, but also safeguards the environment and lessens the economic vulnerabilities linked to climate-related catastrophes. It is important to implement sustainable practices in uranium mining and tailings storage. This requires a range of approaches that prioritize minimizing environmental impact, enhancing resource efficiency, and promoting social responsibility. Utilizing in-situ leaching, a method that dissolves uranium from the ore underground and pumps the solution to the surface, greatly minimizes surface disruption and the requirement for extensive excavation. This method, when compared to conventional mining, provides a reduced ecological impact and mitigates disturbance to natural habitats, making it a more sustainable choice for uranium extraction.

Managing uranium tailings, the leftover waste from uranium extraction, is a crucial component of sustainable mining. Proper handling and storage are crucial to prevent any potential environmental contamination, as tailings may contain low levels of radioactivity and other hazardous substances. Utilizing advanced containment techniques, such as engineered barriers and liners, effectively isolates tailings from the surrounding environment. In addition, the practice of covering tailings storage facilities with layers of soil and vegetation can effectively minimize the dispersion of radioactive

dust and prevent the infiltration of water. This is crucial in preventing the contamination of groundwater with harmful substances.

Promoting the involvement of local communities and upholding ethical mining practices are crucial aspects of achieving sustainable uranium mining. Open and honest communication, equitable compensation, and involving community members in decision-making processes are essential for fostering trust and gaining support from the local community. It is crucial for mining companies to follow rigorous environmental and social governance (ESG) standards to safeguard the well-being and livelihoods of neighboring communities. Recognizing the significance of indigenous groups and upholding their land rights is crucial for cultivating harmonious relationships and preventing potential disputes.

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Open Defecation Free: A Foundation, not a Finish Line

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The term 'sanitation' includes the upkeep of hygienic conditions by providing services like waste management and wastewater disposal. Sanitation refers to the various facets of public health that relate to ensuring the presence or accessibility of clean drinking water, and the proper handling and disposal of human waste and sewage. Based on the World Health Organisation, "sanitation refers to the provision of facilities and services that ensure the safe disposal of human urine and faeces". Sanitation refers to the technique of preventing any kind of human contact with waste, as well as the procedure of cleansing one's hands with soap and water. Sanitation infrastructure are engineered to safeguard human health by establishing a clean and sanitary environment that effectively prevents the transmission of diseases, particularly through the ingestion of faecal matter. Diarrhoea is a prominent factor contributing to malnutrition and hindered growth in children. However, the implementation of appropriate sanitation measures can help reduce its occurrence (WHO, 2014). Open defecation (OD) is linked to a multitude of adverse health effects. The immediate consequences encompass infectious gastrointestinal illnesses, which are worsened by inadequate access to clean water, sanitation, and hygiene. Additionally, stunting and long-term cognitive impairment are also reported (Mara, 2017). Achieving the eradication of open defecation by 2030 will pose a significant sanitation task. Nevertheless, the primary emphasis should be on providing aid to the most destitute individuals globally who are presently experiencing the detrimental effects of open defecation on their health. Ensuring this is our utmost concern as we work towards achieving the Sustainable Development Goals. This article centres on the problem of open defecation and the significance of sanitation in relation to both environmental and human health.

equipped with soap and water. Toilets and other sufficient sanitation facilities allow individuals to properly dispose of their waste, hence ensuring optimal health. By executing this method, the probability of acquiring diseases is diminished and the possibility of environmental contamination is averted. Unfortunately, a substantial segment of the populace lacks access to these facilities, resulting in inadequate garbage disposal. Open defecation has had a profound impact on humanity, impacting public health and the environment. The community norms, traditions, and rituals surrounding open defecation greatly influence the sanitation practices in rural areas. The variables of toilet affordability, functional lavatory availability, and access to sanitation goods and services are also critical factors. Sanitation in Rural India

Introduction

Sanitation and hygiene are crucial for the well-being, progress, and continued existence of society. Ensuring universal access to adequate sanitation remains a persistent challenge, exposing billions of individuals to the health risks associated with wastewater.

In 1990, 31% of the developing-country population, which was 4.1 billion people, practiced open defecation. In 2015, there were 1.29 billion open defecators, compared to 965 million in 1990 (WHO/UNICEF, 2015). According to the World Health Organisation (WHO), it is estimated that around 1.7 billion individuals will lack access to fundamental sanitation facilities by 2023. These facilities encompass proper means of disposing human waste and having handwashing stations at home

Despite the severe health implications linked to open defecation (OD), it is a prevalent practice, particularly in rural India where 61% of the population indulge in open defecation (WHO/UNICEF 2015). In their study, Coffey et al. (2014) presented substantial evidence supporting the inclination towards open defecation. A significant number of participants from rural India expressed their preference for this practice, finding it more pleasurable and preferred compared to using traditional toilets. Tiwaril (2016) reported

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that in rural Uttar Pradesh, India, certain households clandestinely dismantled the toilets within their Residential structures constructed under the framework of the Swachh Bharat Abhiyaan, as they opted to return to open defecation due to their familiarity with the more convenient outdoor facilities.

In recent decades, the Indian government has worked to enhance the nation's restrooms accessibility. The Central Rural Sanitation Programme, created in 1986, partnered with state governments to provide financial aid for the construction of individual family latrines throughout India. In 1999, this nationwide initiative changed its name to the Total Sanitation Campaign, and in 2014, it became the Swachh Bharat Abhiyan (SBA). In countries like India, an increasing amount of research has begun to explore the potential socioeconomic factors of latrine ownership and use. Coffey et al. (2017)

looked at one such sociocultural gap that could encourage open defecation: the highly ingrained caste system in India. According to Coffey et al. (2017), individuals are disinclined to use pit latrines because they are reluctant to empty them after they become full, which is influenced by specific societal practices and beliefs. The characteristics of housing can also influence sanitation outcomes and are considered to be social factors that determine health outcomes. The size of a family's living space is an important factor in housing, as the Government of India's recommended toilet design requires a minimum of 67 square feet of land. In 1988, the World Health Organization (WHO) published

Guidelines for Healthy Housing, in which it was mentioned how crucial it was to define residential density requirements in order to guarantee that households would have adequate space for a clean toilet and maintain hygienic conditions.

Based on the survey, families residing on fragile plots of land are less likely to have sanitary facilities due to insufficient room for constructing a toilet and managing waste disposal. Inadequate cooperation and insufficient capabilities within local government agencies tasked with enhancing sanitation coverage, village-level economic and social conditions, and a misallocation of responsibilities among the different agencies responsible for sanitation are additional factors that contribute to a discrepancy between services and their outcomes (Jain et al 2019).

Gender and sanitation are intricately interconnected. Women's health and well-being depend on having access to facilities that provide sufficient sanitation. Women have a higher level of responsibility and hardship because they do not have sufficient access to sanitation facilities. Furthermore, gender-based inequalities in sanitation access continue to exist. The relationship between gender and sanitation is intricately connected, as cultural and social standards frequently impede women from obtaining clean and private bathroom facilities. As a result, this results in unhygienic behaviours and a heightened susceptibility to water and sanitation-related diseases (Assefa et al., 2021).

Opportunities for Improving Rural Sanitation

Although there are difficulties, there exist prospects for promoting women's health and improving sanitation in rural areas. Participatory methods that engage local communities in the design and execution of sanitation initiatives have achieved positive outcomes in numerous nations. These strategies encompass promoting proper hygiene practices, constructing and upkeeping latrines, and providing education to communities regarding the significance of sanitation. The utilisation of advanced technologies such as remote sensing and mobile phones has demonstrated potential in the monitoring and evaluation of sanitation projects. Remote sensing can be used to identify areas lacking proper sanitation infrastructure, while mobile phones can aid in communicating with local residents and sharing information about hygiene and sanitation practices. Women are crucial in advocating for rural sanitation and enhancing women's health.

Due to their frequent involvement in tasks such as trash disposal, domestic cleanliness maintenance, and water collection, women have a higher likelihood of contracting water-borne infections and other health difficulties. Women's involvement in the formulation and implementation of sanitation projects may ensure that their specific needs are met and that programs are tailored to their individual requirements. Women can effectively promote proper sanitation and hygiene in their communities by serving as exemplary figures and

champions. The optimal method for ensuring and assessing sustainable access to sanitation remains uncertain, despite the existence of numerous frameworks for accomplishing this goal.

Utilising a gender-sensitive approach in sanitation projects is crucial for addressing gender inequalities in sanitation access and promoting the well-being of women. This entails incorporating women and girls into the process of designing and executing hygiene efforts, advocating for the adoption of restrooms that consider gender differences, and addressing societal and cultural obstacles that prevent women from accessing lavatory facilities. Moreover, advocating for proper menstrual hygiene practices and ensuring women have access to menstruation products can enhance their general health and well-being, while also facilitating their engagement in social and economic activities (Kaur et al., 2018).

Open Defecation Free Zones

The Swachh Bharat Mission-Grameen (SBM-G) marks a significant shift in India's approach to sanitation, building upon a legacy of ancient advancements and supported by current government initiatives. Launched in 2014 by the Honourable Prime Minister, the project aimed to achieve Open Defecation Free (ODF) status for India. This immense endeavour effectively mobilised participation across the entire nation, establishing it as the largest global movement for behavioural change. In 2019, the campaign achieved the construction of more than 100 million individual family toilets, re-

sulting in over 600,000 villages being declared open defecation free (ODF). This accomplishment was an homage to Mahatma Gandhi on the occasion of his 150th birth anniversary and aligns with the SDG Target 6.2, which is "to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations". By 2019, the Swachh Bharat Mission (SBM) of the Indian government sought to eradicate open defecation nationwide. All people were to have access to toilets, and building individual toilets would be funded to achieve this aim. A city or ward may be designated as ODF in accordance with the mission's rules if, at any time during the day, no one is discovered to be defecating outside. Before a city or ward is declared ODF, the following infrastructure and regulatory requirements must be met:

- All households with sufficient space have constructed a toilet.
- Residents of households without sufficient space have access to a community restroom located 500 meters away.
- Public restrooms are available within a kilometre of each other in all commercial areas.
- The city has implemented measures to penalise individuals who are found defecating in public (Swachh Bharat Mission sbmurban.org).

While rural areas might be faring better in being Open defecation free areas, the same cannot be said

for urban slums and other underprivileged areas in cities. Slums are part of the urban environment and can be defined by the existence of hazardous living circumstances such as overcrowding, a lack of hygiene and sanitation, insufficient drinking water, and poor construction, among others. A slum area is defined as any compact settlement with a collection of poorly built tenements, most of which are temporary in origin, congested together, with inadequate sanitary and drinking water amenities and unsanitary living conditions.

Our experience while observing slums and their sanitation facilities has led to a conclusion that most of the community toilet facilities that are set up in such areas are not maintained as they should be so that the residents around the area can use the facilities. The individuals engaged by the municipalities to supervise the regular cleaning of the washrooms only appear for work on two or three days each week. As a result, the local residents are left with the choice of either defecating in public or enduring the unpleasant odour emanating from the washrooms.

This practice has caused most of them to fall sick especially the children whose houses are closely situated around the public washrooms. This lack of sanitation is particularly hard on the women residents. Women have had to suffer from infections and diseases caused due to the state of the washrooms such as urinary tract infection (UTI) which are brought on by bacteria and germs that are present in the washrooms.

This kind of bacteria further

spreads due to insufficient cleaning, a lack of soap, and contaminated surfaces. Other diseases such as yeast infection are worsened by poor sanitation. The risk of all these diseases increases due to the contaminated toilet seats or improper cleanliness. The conditions of the bathrooms expose women to allergens and irritants, which cause skin rashes and discomfort. A major problem suffered by women is regarding disposal of their menstrual waste as they have no allocated place to dispose them.

If designated receptacles are made available in the restrooms, folks could employ them for their personal needs in these communal facilities. The absence of a predetermined timetable for sanitation cleaners leads to the buildup of menstrual blood in the lavatory, creating an unpleasant atmosphere that obstructs access for everyone. In the slums where they reside, residents lack private washrooms within their cramped living quarters, leaving them with no choice but to rely on public facilities. Many locals do not prefer to clean the washrooms themselves, as they believe it is the responsibility of the town.

A significant number of inhabitants believe that their dignity will be compromised if they take on the responsibility of cleaning these places themselves. Consequently, their difficult situation compels them to rely on adjacent sewers and the surrounding surroundings or resort to open defecation. This highlights the absence of responsibility when it comes to just establishing communal washrooms, which will never be the ultimate

solution to open defecation. What is needed is the consistent maintenance of these facilities.

Sanitation and Hygiene: Awareness at the community level Access to clean water, sanitation, and hygiene (WASH) services is crucial for fostering healthy living. Multiple strategies employing community-based approaches, such as Community-Led Total Sanitation (CLTS), have been implemented, with different levels of achievement. India's Total Sanitation Campaign, initiated in 1999, was among the first to employ community-based methodologies (Sumedh, 2018). The approach employed a blend of Information-Education-Communication initiatives, fostering a feeling of repulsion, and the implementation of latrine construction projects. In 2008, UNICEF formally adopted Community Approaches to Total Sanitation (CATS) as a framework to direct its actions in the field.

Health education is an active and self-directed process that encompasses learning and taking action. It covers a range of subjects, such as personal hygiene, sanitation in the home and surroundings, and food cleanliness. Swachh (2009) research confirms that implementing a school health education program that is tailored to the specific needs of students will surely lead to an enhancement in their comprehension and personal hygiene practices. At the community level the following are important.

(a) Education and understanding: It is imperative to foster awareness about the need of clean water, efficient hygiene practices, and proper sanitation. It is imperative to im-

plement educational campaigns that attempt to educate communities about the risks associated with poor water quality and inadequate hygiene, and the benefits of adopting healthier practices.

(b) Behaviour Modification: It is crucial to promote behaviour modification at both the individual and community levels. This includes the promotion of hand hygiene through the use of soap, the safe storage, water consumption and the adoption of appropriate waste management procedures. Behavioural interventions can be accomplished through community involvement, education, and ongoing reinforcement of desired behaviours. Organising programs focused on behaviour modification, personality enhancement, addressing social stigma, and promoting financial literacy is recommended. It is imperative for all initiatives to prioritise the inclusion of women, as there is still a need for targeted interventions to address the challenges faced by women in rural areas.

(c) Water and hygiene awareness: Ensuring the availability of pristine water, adequate sanitation facilities, and appropriate hygiene practices is crucial for supporting human health and well-being. By 2030, unless development is increased fourfold, billions of individuals would be deprived of access to these fundamental services, as stated in a UN report. The demand for water is increasing due to rapid population expansion, urbanisation, and the expanding water needs of the agricultural, industrial, and energy sectors. The exacerbation of water stress can be

attributed to prolonged mismanagement, excessive extraction of groundwater, and contamination of freshwater sources. In addition, rural locales are more vulnerable to issues related to water contamination, inadequate health conditions, and substandard hygiene practices. When considering methods to reduce water pollution or support local knowledge, it is essential to prioritise and allocate substantial resources towards promoting proper hygiene practices.

(d) The role of IEC, which stands for Information Education & Communication, is to disseminate information, educate individuals, and facilitate communication. It has a vital function in promoting awareness and disseminating information on diverse subjects, such as sanitation and hygiene. It is an essential tool that informs the public and recipients about the benefits provided by various government policies and projects. This approach is particularly beneficial when the target audience lacks education, as individuals tend to place trust in visual evidence. These visual representations are highly suitable for specific target audiences.

(e) Media: It is crucial in disseminating information and creating awareness about WASH (Water, Sanitation, and Hygiene) through advertisements and printed materials. Audio Advertisements: These may consist of radio commercials that advocate for the significance of WASH activities, the relevance of toilets and their utilisation, provide details on the Menstrual Hygiene Scheme. These advertising could be aired on local radio sta-

tions with a focus on rural areas. Video advertisements may consist of brief videos showcasing relatable characters or real-life stories that emphasise the importance of sanitation and health. These videos can be distributed on social media platforms, television, or screened in schools and community centres.

Conclusion

Promoting a healthy lifestyle can be achieved by health consciousness, knowledge of factors that might be detrimental or advantageous to one's health, motivation, and a proactive approach to safeguarding health and preventing illness. In summary, it is critical to implement awareness campaigns and provide education to students regarding the fundamental importance of hygienic practices to enhance social cleanliness. By allocating resources to the construction and upkeep of sanitation infrastructure, advocating for hygienic behaviours, and guaranteeing availability of uncontaminated water sources, we may substantially enhance general health results, diminish the impact of illnesses, and cultivate sustainable progress.

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पृथ्वीपुर पहल-२०२५



पृथ्वीपुर पहल-२०२५

पृथ्वीपुर अभ्युदय समिति का छठा वार्षिक समारोह ०९ फरवरी २०२५ को श्री श्याम मैरेज हाल, ब्लाक रोड दुदही, कुशीनगर में आयोजित हुआ। समारोह की अध्यक्षता डॉ. मथुरा राय, पूर्व निदेशक भारतीय सब्जी अनुसंधान संस्थान, वाराणसी ने की। इस

समारोह के मुख्य अतिथि डाक्टर सिराज वजीह, अध्यक्ष गोरखपुर एनवायरनमेंट एक्शन ग्रुप, गोरखपुर, विशिष्ट अतिथि सुश्री अलका त्रिपाठी, मिसेस इंडिया ग्लैमर क्वीन 2024, सुश्री अंजली अरोरा, गायिका, श्री शंभू राय, सामाजिक कार्यकर्ता और पूर्व जिला जज रजिनन्दन राय एवं अन्य

गणमान्य लोग उपस्थित रहें। समारोह के आयोजक, संचालक एवं पृथ्वीपुर अभ्युदय समिति के संस्थापक और भीमराव अंबेडकर विश्वविद्यालय के सेवनिवृत्त प्रोफेसर राणा प्रताप सिंह जी ने इस गोष्ठी का समापन किया।

— **apocryph**

क. विषय पर संयुक्त शोध कार्यक्रमों का

କି ଶୁଦ୍ଧତା ଏ ପିଲାଟି କିମ୍ବା ଜାୟା ।

मैं मिली जानदार जीव को देश के प्रधानमंत्री

कि सिल्लीपर विधानसभा नए संसद की

आत्मस्य अस्ति दर्शयितुं मे ।

पृथ्वीपुर अभ्युदय समिति का पांचवा अधिवेशन

- देशज के साथ ही वैज्ञानिकता का जुड़ाव जरूरी : डॉ० सिराज वजह
- उन्नत खेती देश की समृद्धि का आधार : प्रो मथुरा राय
- समिति ने आठ विशिष्ट लोगों को किया सम्मानित
- कार्यक्रम को संबोधित करते प्रो राणा प्रताप सिंह, सम्मानित होते विशिष्ट जन

दैनिक सुपर फास्ट टाइम
संवाददाता नन्दलाल गुप्ता दुदही
कशीनगर

कृषि की देशज व्यवस्था को वैज्ञानिक से जोड़कर उसे आर्थिक समृद्धि के साथ ही देश की समृद्धि का आधार बनाया जा सकता है। इसके लिए जागरूकता तथा शिक्षा की आवश्यकता है। उक्त बातें पृथ्वीपूर अभ्युदय समिति की ओर कृषि एवं ग्रामीण विकास की सुनीतिगत, समावेशी विकास की ग्रामीण पहल को संचाली समाजिक एवं वैज्ञानिक विकास गौरी दुदही बाजार में किसान-जुद्धोदयी वीथी के समन्वित करने हुए मुख्य अतिथि डॉ. सिराज वजीर एवं अचार्य गोरखनाथ गौरी स्नाकोर महाविद्यालय महाराष्ट्र में कही।

को आधुनिक बनाने, पड़े लिख लोगों को खेत से जुड़ने का अकार्यवादी कार्यक्रम में विधि-न क्षेत्रों में बेहतरीन कार्य करने वाले लोगों को सम्मानित किया गया। जिले में एच. निगम कुमार त्रिपाठी, सेवाभावपूर्ण अपिरासी सी. अर्जुना, को उम्मीद दूरदर्शी, सम्पत्ति एवं सहाजी जीवन-शैली के लिए संस्था के चयन "राजदेव सिंह मुन्डानी" दूरदर्शीता, प्रोफ़ेसर (डी.) शैल पाण्डेय, पूर्व प्राचार्य, दवानंद एंग्लो वैदिक डी. एं. वृत्तताकोरस गंगाविद्यालय, गोखलेपुर को विश्वास, योग्य एवं शिक्षक के क्षेत्र में उत्कृष्टतम मान्यता प्राप्त है।

संवहन के लिए संस्था के चयन "तीर्थेश देवी राणा नीरजा सम्भन, सुन्दन सिंह, भाषा मंडिता मार्के (उद्योग), दुग्ध, कुञ्जीगर को ग्रामीण शिक्षा में महत्वपूर्ण



योगदान एवं अन्य सामाजिक कर्मों में सक्रीय भागीदारी तथा नेतृत्व प्रदान करने के लिए संस्था के बाधम "विकास शिल्प कार्यक्रम" सम्मान, आसमा परबोन, निवासी घिपरा मुस्तकिल को जलकल्याण एवं स्वच्छता-शिक्षा के लिए संस्था के बाधम "पृथ्वीपुर तेजस्विका सम्मान, राजनीश तल निवासी तलवा मुस्तलीधर, को ग्रामीण सामाजिक सरोकार, नवाचार एवं समावेशी प्रवृत्ति के विश्वसनीय सभागर्भ के लिए संस्था के चतुर्थ "ग्रामीण

पत्रकारिता सम्मान, राम प्रसाद दादव,
निवासी मठही खुर्द, कटकवाव
रामकोला, (कुशीनगर) को विज्ञान
शिक्षण के लिए संस्था के प्रधान "प्रोफेसर
रवीन्द्र प्रताप राव विज्ञान सम्मान
अज्ञीम आलम, निवासी दुदही और
कुशीनगर को मुरारज. वैद्यों की
आर्थिक रूप से कमजोर बच्चों को पढ़ाई
में सहयोग एवं स्वास्थ्य प्रबंधन के लिए
संस्था के द्वितीय "सतीश डालगिया
स्मृति सम्मान दिया गया इसके साथ
ही बीस छात्र छात्राओं को शिक्षा के

क्षेत्र में पड़ने के लिये तीन तीन हजार का भारीदाती फेसलिटीस दी दिया गया। आयकक्षा आयकक्षा द्वां मयुस राय पुनं निदेशक भारतीस सखी अनुसंधान संस्था कारणसती तथा संवांलन द्वां भीमाव अंबेकर विस्थांरिंहल से संवांलन प्रती राणा प्रताप सिंह ने किया। कावृषय में अधीनस्थ पन्तर जायसखा, (पत्रकार) डेपेन प्रताप राय की भूमिक महत्वपूर्ण है। अधीनस्थ की प्रता प्रताप सिंह ने सभी अगणुको को आभार ज्ञापन किया।

वि. द्वयंगों ने लाठी टंटे गरीब परिवार पर क़ायम क़दर पीट पीट कर तोड़ा दाश डीडीर : कलपति आज करेंगी काल्य संग्रह शब्द और छंद का विमोचन



अतिथियों के हाथों सम्मान प्राप्त करते विभिन्न क्षेत्रों के लोग ।

गांव के विकास में शिक्षित किसान की भूमिका अहम : डा. सिराज

कुशीनगर (एसएनबी)। गाँवों की उपेक्षा को दूर कर विकास की ओर ले जाने के लिए शिक्षित किसान अहम भूमिका निभा सकते हैं। गाँवों में छिपी प्रतिभाओं को आगे बढ़ाना और उनका सम्मान करना आवश्यक है। इसी विचार को केंद्र में रखते हुए आज जिले के दशरी विकास खण्ड मुख्यालय पर पृथ्वीपुर अभ्युदय समिति द्वारा एक विचार गोष्ठी का आयोजन किया गया। इसी कार्यक्रम में प्रतिपक्ष की तरह पृथ्वीपुर सम्मान 2025 के तहत विभिन्न क्षेत्र की विभक्तियों को सम्मानित किया गया।

आयोजन में महात्मा गांधी स्नातकोत्तर महाविद्यालय, गोरखपुर के पूर्व प्राचार्य डा. सिराज वजीह ने बतौर मुख्य अतिथि अपने विचार रखते हुए कहा कि गांवों के विकास के लिए किसानों को केंद्र बिंदु बनाना बहुत जरूरी है। उन्होंने ग्रामीण शिक्षा और पि सुधार पर जोर देने की बात कही।

विशिष्ट अतिथि लखनऊ से आई शिक्षा विद अलका त्रिपाठी ने कहा कि मनुष्य कठिन से कठिन कार्य कर सकता है। यदि लक्ष्य निर्धारित कर परिश्रम किया जाए, तो सफलता निश्चित रूप से मिलेगी। अपने अध्यक्षीय भाषण के दौरान भारतीय सभ्यता बीज अनुसंधान संस्थान के अवकाश प्राप्त निदेशक डा. मधुरा राय ने भी गोष्ठी के विषय पर अपने विचार विस्तार से रखे।

कार्यक्रम के आयोजक, पृथ्वीपुर अभ्युदय समिति के संयोजक व लखनऊ के डा. भीमराव अंबेडकर विश्वविद्यालय के वरिष्ठ आचार्य श्री. राणा प्रताप सिंह ने संवत्न के उद्देश्यों की चर्चा की। समिति के कार्य और उद्देश्यों की चर्चा करते हुए कहा कि ग्रामीण क्षेत्र में निम्न वर्गों को पढ़ाई कराने के लिए आजीवन सहयोग और किसानों को उनके लिए उपयोगी जानकारी देने के उद्देश्य से

पृथ्वीपुर सम्मान 2025 के तहत
विभिन्न विभक्तियों का हआ सम्मान

यह कार्यक्रम प्रतिवर्ष आयोजित किया जा रहा है। श्री सिंह ने बताया कि इसमें प्रतिवर्ष विभिन्न क्षेत्रों में उत्कृष्ट कार्य करने वाले लोगों का सम्मान भी किया जा रहा है। संगोष्ठी को पूर्व न्यायाधीश राजेन्द्र राय, बिहार सरकार के पूर्व अधिकारी शंभू राय, प्रमतिशेल किसान हरीयोविन्द मिश्र, आठोआप्री योजना पार्यवर्क्य कर रही अनिता राय, राधेश्याम शुक्ला, प्रहलाद केशरी सहित कई अन्य ने भी संजोचित किया वही देवरिया से आई अंजली अरोड़ा खुशुध ने अपने स्वरचित गजल सनाकर श्रोताओं को तालियां बटोरी।

आयोजन के दौरान पृथ्वीपुर सम्मान 2025 के क्रम में विभिन्न क्षेत्रों में उत्कृष्ट योगदान देने वाले व्यक्तियों को

सम्मानित किया गया। इसमें सेवानिवृत्त अधिशासी अभियंता ई विनय कुमार विपाठी को राजदेव सिंह स्मृति दूरदर्शिता सम्मान, डीएवी कालेज गोरखपुर की प्राचार्य प्रो. शैल पाण्डेय को मौलश्री देवी गंगा गौरवी सम्मान, स्थानीय क्षेत्र के मटिया माफ़ी के

सुरेंद्र सिंह को विक्रम सिंह कर्मठता सम्मान, तमकुहीराज तहसील क्षेत्र के पिंपरा मुस्तकिल गोंय की रहने वाली सामाजिक कार्यकर्त्री आसमा परवीन को पृथ्वीवर तेजस्विता सम्मान, राष्ट्रीय सहारा समाचार पत्र के तमकुहीराज तहसील क्षेत्र के प्रभारी रजनीश राय को ग्रामीण पत्रकारिता सम्मान, जिले के मठही खुर्द, कठवरवा निवासी आर प्रसाद यादव को प्रो रविंद्र प्रताप राव विज्ञान सम्मान और समाजिक क्षेत्र में अनूठे तरीके से कार्य करने वाले दुदही नगर पंचायत अध्यक्ष के पुत्र अजीम आलम को स्तरीश डालसिया स्मृति सम्मान अतिथियों ने देकर सम्मानित किया। इसी क्रम में क्षेत्र और जिले से चयनित किए प्रतिभाशाली निर्यन विद्यार्थियों को उनको उपलब्धियों के लिए सम्मानित किया गया और साथ ही उनके बैंक खातों में सहयोग राशि भेजी गई। कार्यक्रम के दौरान काफी संख्या में शिक्षाविद, गणमान्य लोग और स्कूली बच्चे, उनके अभिभावक और शिक्षक मौजूद रहे।



BACHPAN CREATIONS

Showreel

Image Marketing & Research

Video & Print Content Development

Survey Research

Film Making Workshop

Film Production

About us:-

Bachpan Creations is an online and offline forum to support and strengthen the creative aspects of the children by providing them theoretical and technical skills. Apart from supporting children Bachpan Creations also provides video, audio, print content on different social and political issues. The firm is in the business of consultancy as well and provides service for image marketing and research which includes political communication and advertising campaigns.

Summer Trainings Camps
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