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National Conference

on

Air, Water and Soil

**J.C. Bose University of Science and
Technology, YMCA, Faridabad**

September 23-24, 2022



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संदेश

मुझे यह जानकर हार्दिक प्रसन्नता हुई है कि भारत सेवा प्रतिष्ठान द्वारा स्वच्छ भूमि तथा वायु के महत्व के विषय में " National Conference on Air Water Soil" का आयोजन किया जा रहा है।

प्रकृति ने सबके लिए जल, भूमि और वायु जैसे संसाधन दिए हैं, लेकिन ये अक्षय नहीं हैं और न ही ये फिर से बनाए जा सकते हैं। जल, भूमि और वायु का आदर करना हमारी संस्कृति और संस्कारों का हिस्सा रहा है। अतः जल, भूमि और वायु जैसे प्राकृतिक संसाधनों को स्वच्छ और स्वस्थ रखें, उनका संरक्षण करें।

भारत सेवा प्रतिष्ठान जैसी संस्थाएं जल, भूमि और वायु की स्वच्छता विषय पर जन जागृति का अभियान चला रही हैं। आपके द्वारा आयोजित की जा रही इस विचार गोष्ठी की सफलता की कामना करता हूं।

शुभकामनाओं सहित,

आपका,

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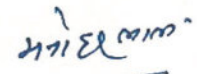
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संदेश

मुझे यह जानकर अत्यंत प्रसन्नता हुई कि भारत सेवा प्रतिष्ठान पर्यावरण संरक्षण विषय पर (ECO-22, राष्ट्रीय कांफ्रेंस : जल-वायु व भूमि, 23-24 सितम्बर, 2022) जे सी बोस विज्ञान एवं प्रौद्योगिकी विश्वविद्यालय, फरीदाबाद में दो दिवसीय कांफ्रेंस का आयोजन कर रहा है। यह आयोजन वर्तमान समय में बहुत महत्वपूर्ण है क्योंकि आज पूरे विश्व में पर्यावरण असंतुलन की स्थिति चिंताजनक है और इसके कारण प्रकृति में असंतुलन बढ़ रहा है। ऋतु चक्रों में भी अंतर आ रहा है।

मुझे विश्वास है कि यह कांफ्रेंस सभी सहभागियों, विशेषकर देश की भावी पीढ़ी में पर्यावरण संरक्षण के प्रति जागरूकता पैदा करने का कार्य भली भाँति करेगी।

मैं इन दो दिवसीय राष्ट्रीय कांफ्रेंस ECO-22 के सफल आयोजन एवं स्मारिका के प्रकाशन के लिए शुभकामनायें देता हूँ।


(मनोहर लाल)

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दिनांक : 12 सितम्बर, 2022

श्री श्रीकृष्ण सिंहल जी,

आपका आमंत्रण-पत्र प्राप्त हुआ, जिसमें आपने बढ़ते प्रदूषण व बदलते परिवेश पर विचार-विमर्श हेतु आयोजित राष्ट्रीय कान्फ्रेंस में शामिल होने का अनुरोध किया है, इसके लिए बहुत-बहुत धन्यवाद।

आपसे इस संबंध में वार्ता भी हुई थी और मैंने इस कार्यक्रम को अपनी अनुसूची में शामिल भी किया था, पर अतिआवश्यक शासकीय कार्यक्रमों की व्यस्तता की वजह से मेरा उक्त कार्यक्रम में शामिल हो पाना संभव नहीं हो पायेगा।

कार्यक्रम की सफलता हेतु मेरी हार्दिक शुभकामनाएं।

सादर,

आपका,

(भूपेन्द्र यादव)

श्री श्रीकृष्ण सिंहल,
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Tel. : 011-23043507*

सन्देश

मुझे यह जानकार अत्यंत प्रसन्नता हुई की भारत सेवा प्रतिष्ठान पर्यावरण संरक्षण विषय पर (ECO-22 , राष्ट्रीय कांफ्रेंस: जल- वायु व भूमि , 23-24 सितम्बर 2022) जे सी बोस विज्ञान एवं प्रोद्योगिकी विश्वविद्यालय फरीदाबाद में दो दिवसीय कांफ्रेंस का आयोजन कर रहा है। यह आयोजन वर्तमान के समय में बहुत महत्वपूर्ण है क्योंकि आज पूरे विश्व में पर्यावरण असंतुलन की स्थिति चिंताजनक है। और इसके कारण प्रकृति में असंतुलन बढ़ रहा है। ऋतु चक्रों पर भी अंतर आ रहा है। यह कांफ्रेंस सभी सहभागियों विशेषकर देश की भावी पीढ़ी में पर्यावरण संरक्षण के प्रति जागरूकता पैदा करने का कार्य भलीभाँति करेगी ऐसा मेरा विश्वास है।

मैं इन दो दिवसीय राष्ट्रीय कांफ्रेंस ECO-22 के सफल आयोजन एवं स्मारिका के प्रकाशन के लिए शुभकामनाएँ देता हूँ।

आदर्श कुमार गोयल
(आदर्श कुमार गोयल)

*Residence : 7A, Motilal Nehru Marg, New Delhi-110 011
Phone : 011-2379 2255, 2301 6245*

कृष्ण पाल गुर्जर
KRISHAN PAL GURJAR



75
आज़ादी का
अमृत महोत्सव


केंद्रीय राज्य मंत्री,
भारी उद्योग और विद्युत मंत्रालय
भारत सरकार, नई दिल्ली
UNION MINISTER OF STATE FOR
HEAVY INDUSTRIES AND POWER
GOVERNMENT OF INDIA, NEW DELHI



सन्देश

मुझे यह जानकार अत्यंत प्रसन्नता हुई की भारत सेवा प्रतिष्ठान पर्यावरण संरक्षण विषय पर (ECO-22 , राष्ट्रीय कांफ्रेंस: जल- वायु व भूमि , 23-24 सितम्बर 2022) जे सी बोस विज्ञान एवं प्रौद्योगिकी विश्वविद्यालय फरीदाबाद में दो दिवसीय कांफ्रेंस का आयोजन कर रहा है। यह आयोजन वर्तमान के समय में बहुत महत्वपूर्ण है क्योंकि आज पूरे विश्व में पर्यावरण असंतुलन की स्थिति चिंताजनक है। और इसके कारण प्रकृति में असंतुलन बढ़ रहा है। ऋतु चक्रों पर भी अंतर आ रहा है। यह कांफ्रेंस सभी सहभागियों विशेषकर देश की भावी पीढ़ी में पर्यावरण संरक्षण के प्रति जागरूकता पैदा करने का कार्य भलीभाँति करेगी ऐसा मेरा विश्वास है।

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(कृष्ण पाल गुर्जर)

36, उद्योग भवन, नई दिल्ली-110011 • फोन : 23062676/78, 23061593, फ़ैक्स : 23060584
36, Udyog Bhawan, New Delhi-110011 • Phone : 23062676/78, 23061593, Fax : 23060584



दिनांक-18.09.2022

शुभकामना संदेश

मुझे यह जानकर बड़ी खुशी हुई कि, भारत सेवा प्रतिष्ठान पर्यावरण संरक्षण विषय पर(ECO-22, राष्ट्रीय कांफ्रेंस: जल-वायु व भूमि, 23-24 सितंबर 2022) जे सी बोस विज्ञान एवं प्रौद्योगिकी विश्वविद्यालय फरीदाबाद में दो दिवसीय कांफ्रेंस का आयोजन कर रहा है। यह आयोजन आज के समय में बहुत महत्वपूर्ण है क्योंकि आज पूरे विश्व में पर्यावरण असंतुलन से बाढ़-सुखाड़ बढ़ रहा है। यह पूरी दुनिया के लिए चिंताजनक है। ऋतु चक्रों पर भी अंतर आ रहा है। आशा करता हूँ कि, यह कांफ्रेंस सभी सहभागियों विशेषकर देश की भावी पीढ़ी में पर्यावरण संरक्षण के प्रति जागरूकता पैदा करने का कार्य भलीभाँति करेगी।

मैं, इन दो दिवसीय राष्ट्रीय कांफ्रेंस ECO-22 के सफल आयोजन एवं स्मारिका के प्रकाशन हेतु शुभकामनाएँ देता हूँ। भावी पीढ़ी इससे प्रेरणा लेकर पंचमहाभूतों (भगवान) के प्रति आस्थावान बनकर संरक्षण में जुटेगी।

जलपुरुष राजेन्द्र सिंह
अध्यक्ष, तरुण भारत संघ

नरेश पाल गंगवार, आई.ए.एस.
Naresh Pal Gangwar, IAS



अपर सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
ADDITIONAL SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST
AND CLIMATE CHANGE

D.O. No: Z-21011/5/2022-CPW
Dated: 12th September, 2022

Dear Shri Singhal ji,

1. Kindly refer to your letter dated 30.05.2022 regarding organising of ECO-2022- "National Conference on Air-Water-Soil" in association with JC Bose University of Science & Technology, YMCA, Faridabad and Green India Foundation Trust (GIFT) on 23-24 September, 2022.
2. On behalf of the Ministry of Environment, Forest & Climate Change I extend my greetings for success of the programme.
3. I would also like to convey you that a National Conference of State/UT Ministers of Environment, Forest and Climate Change is scheduled to be held on 23-24 September, 2022. For that reason, Hon'ble Minister for Environment, Forest & Climate Change would not be able to attend the ECO-2022.
4. The inconvenience is deeply regretted.

Best wishes,

Yours Sincerely

(Naresh Pal Gangwar)
12/9/2022.

Shri Krishan Singhal,
Chairman- Bharat Seva Pratisthan
98, Sector-29, Faridabad-121 003



पृथ्वी विंग, पांचवा तल, कमरा नं. 505, इंदिरा पर्यावरण भवन, जोर बाग रोड,
नई दिल्ली-110003, फोन: (011) 20819247, ई-मेल: asnpg.mefcc@gov.in
Prithvi Wing, 5th Floor, Room No. 505, Indira Paryavaran Bhawan, Jor Bagh Road,
New Delhi-110003, Tel.: (011) 20819247, E-mail: asnpg.mefcc@gov.in





J.C. Bose University of Science and Technology, YMCA, Faridabad (Haryana)

Sector-6, Faridabad-121006 (HARYANA)

(A State Govt. University established vide State Legislative Act No. 21 of 2009)

Website : www.jcboseust.ac.in

Prof. S K TOMAR, FNASc
VICE CHANCELLOR

Phone : 0129-2310102
E-mail : vc@jcboseust.ac.in

Ref. No.: VCS/2022/Ext.C-3/62

Date: 14.09.2022

MESSAGE

It is a matter of great pleasure that Bharat Seva Prathisthan in association with J.C. Bose University is organizing a two- days National Conference on "Air, Water and Soil" between Sept. 23 and Sept.24, 2022.

Growing pressure on natural resources due to population growth, economic expansion, urbanization, Industrialization and other challenges has major impact on our social, economic, and environmental well-being. Creeping effects of climate change are likely to aggravate the position by causing higher frequency & magnitude of extreme weather events. This conference would bring together the leading researchers, academicians, environmental activist, experts and scholars working with holistic approach to discuss on water, air and soil for environmental issues and innovative solutions to protect rights of equities.

I would like to congratulate Bharat Seva Prathisthan and J.C. Bose University for organizing this conference. I am sure that the participants will also explore great ancient Bhartiya traditions as a solution for current environmental issues.

I trust that this would also motivate the participants to find out new areas of research and help them in utilizing the natural resources with utmost care.

I welcome all the participating delegates and extend my best wishes for the grand success of this event and publication of the Souvenir.


(Sushil Kumar Tomar)



जगदीश चौधरी

अध्यक्ष, ग्रीन इंडिया फाउंडेशन ट्रस्ट
सदस्य, विश्व जल परिषद

सृजन प्रकृति का स्वभाव है, सनातनता इसकी वृत्ति। अनन्त काल से नित्य विस्मयकारी नूतन सृजन मनुष्य को एक नए मंथन की ओर ले जाता है। सृजनकार अपने सृजन के पालन पोषण, जीवन की सततता को बनाए रखने हेतु आवश्यक अवयवों की व्यवस्था भी करता है। प्रकृति ने भी पंचमहाभूतों के रूप में ऐसी समुचित व्यवस्था की है।

प्रकृति के पंचमहाभूत अपने आप में चमत्कार हैं। इनमें जल तत्व श्रेष्ठतम भूमिका में है जो अन्य सभी तत्वों को गूँथ कर प्राणमय करता है। जीवन की उत्पत्ति हेतु जल ही सूत्र व माध्यम के रूप में सामने आया। जीवन के सृजनहार के रूप में सभी जीवों के भरण-पोषण की कल्पना जल के बिना संभव नहीं है। जीवन की उत्पत्ति और क्षय जल पर निर्भर है।

जल से सम्पूर्ण जीवजगत के जीवन की सहजता है परन्तु मनुष्य के “लालच व अधिक” की प्रकृति ने जल के शोषण व अतिक्रमण की ओर उसे धकेला है। मनुष्य जन्म श्रमिक के रूप में है। मनुष्य श्रम कर सम्मान प्राप्त करता है। प्रकृति ने उसे ऐसा ही बनाया है। परन्तु आज मनुष्य बिना श्रम सम्मान चाहता है। शायद ऐसे ही लोगों को

“बेशर्म” कहते हैं और बेशर्म स्थिति का यह नतीजा है कि उसने जल संरचनाएँ जैसे तालाब, पोखर, झील आदि बनाना तो बंद कर ही दिया और मशीनों से इसका शोषण शुरू किया जो आज के जल संकट का मुख्य कारण है।

भारत में जनसंख्या, परिवहन, उद्योग व रसायन निर्माण बहुत तेजी से बढ़े हैं और उसी अनुपात में पर्यावरणीय क्षरण भी बढ़ा है। 1947 में जहां 50 से कम जिलों में सूखा था, वहीं आज भूजल दोहन बढ़ने और कुप्रबन्धन से 300 से अधिक जिले पानी की कमी से जूझ रहे हैं। डार्क जोन वाले शहरों की संख्या बढ़ती जा रही है। अनेक स्थानों पर भूजल पीने योग्य नहीं बचा है। यमुना के किनारे बसे दिल्ली शहर को 100 कि.मी. दूर गंगा जी से पानी लाकर पिलाया जा रहा है। नदियाँ, नहरें, तालाब प्रदूषित हैं, खत्म होने के कगार पर हैं।

मनुष्य की यह सोच व व्यवहार कि वह जल का मालिक है, उसकी अज्ञानता का पहला संकेत है। क्योंकि जल ने मनुष्य को बनाया है न कि मनुष्य ने जल को। दूसरा उसका बिना श्रम का व्यवहार, जिसमें जल संग्रह की प्रवृत्ति खत्म होना और जल शोषण का व्यवहार बढ़ना उसको रसातल की ओर ले जा रहा है जिससे मानवीय पलायन, संघर्ष व हिंसा बढ़ी है। तीसरा जल के प्रति सम्मान के संस्कार की कमी ने उसका रूखापन बढ़ाया है। उसकी आँखों का पानी सूख गया है और ऐसी स्थिति में उसका व्यवहार अमानवीय हुआ है जिससे जल संकट और गहराया है। चौथा जल के बाजारीकरण के चलन ने लोगों के लाचक को और बढ़ाया व जल के शोषण की प्रवृत्ति को पोषित किया। पाँचवा मनुष्य ने अपनी सभ्यता और जल संस्कृति से दूरी

बना ली जिसके परिणामस्वरूप उसकी जल व जल विज्ञान से दूरी बढ़ी। छठा राज और समाज दोनों ने अपनी जिम्मेदारियों को नहीं निभाया। दोनों ने ही अंग्रेजों द्वारा दिए गए व्यापारिक संस्कारों को ही बढ़ाया जिसमें हर तत्व, रिश्ते, संबंध व व्यवहार में अपने व्यापार ही खोजा और सिर्फ शोषण की वृत्ति को ही पोषित किया। आज की ये परिस्थितियाँ हमें गंभीर जल संकट की ओर ले गई हैं और यदि अभी भी हम नहीं चेते तो यह संकट अभी और बढ़ेगा और फिर शायद हम उस स्थिति की ओर न लौट सकें जहाँ से सभी सामान्य किया जा सके।

सरकार द्वारा लगातार सकारात्मक प्रयास के उपरान्त भी अनेक शहरों की वायु में विष धुला हुआ है। दिल्ली, कानपुर, फरीदाबाद जैसे शहरों में यह प्राणवायु न होकर जहरीली हो गई है, जो हजारों जीवन प्रतिवर्ष लील रही है। 2021 के विश्व के सर्वाधिक वायु प्रदूषित शहरों में फरीदाबाद और कानपुर पहले व दूसरे स्थान पर रहे जोकि एक गंभीर चिंतन का विषय है।

घरेलू उपयोग की प्लास्टिक, उद्योगों के रसायन, किसानों के द्वारा कृषि में रासायनिक खादों के बढ़ते प्रयोग व नदियों के मैला ढोने वाली मालगाड़ी में बदलने के कारण मृदा मृतप्राय हो रही है। मिट्टी में रहने वाली जैव विविधता ध्वस्त हो गई है। पेड़ कटने, नदियों के बर्बाद होने से अनेकों अप्राकृतिक आपदाओं का हम सामना कर रहे हैं।

सरकार द्वारा शुरू किए गए स्वच्छता अभियान से देश में एक अच्छा संदेश गया है। जन जागरूकता एवं सहयोग भी दिखा परन्तु हमने गौरया, चील, लकड़बग्घा जैसे अनेक प्राकृतिक सफाई कर्मचारी खो दिए।

आज हमारे व्यवहार ने हमें उस स्थान पर खड़ा कर दिया है जहां हम अपने पालनहार के पालनहार की भूमिका में हैं। और यह भूमिका तभी संभव है जब हम सेवक के रूप में स्वयं को पुनर्स्थापित करें। सेवक जैसे विवेकी व श्रद्धावान बनें। जीवन को श्रमपूर्ण बनायें। अपरिग्रह व न्यूनतम आवश्यकताओं से जीवन चलायें। जितना बोएं, संग्रह करें, उतना काटें। सभी का हिस्सा सबको दें। दूसरों से लेने की बजाय देने की प्रवृत्ति, जो कि हमें सर्वश्रेष्ठ जीव बनाती है, को पोषित करें। हमारे यही व्यवहार का परिवर्तन इस जगत के परिवर्तन का सूत्र है।

लेने वाले से देने वाले की भूमिका में आना मनुष्य को श्रेष्ठता, अपनी क्षमताओं के साथ न्याय व शिक्षित होने का प्रमाण है, जिसे आज हम भूल रहे हैं। इसलिए जीव जगत के हर एक घटक को, प्रकृति के हर रूप को जब तक हम लेने की बजाय देना नहीं सीखेंगे तब तक हम इन संकटों से उबर न सकेंगे और जिस दिन हमारे व्यवहार में ये परिवर्तन होगा, वह पुनः विश्वगुरु के रूप में पुनर्स्थापित करेगा और हमें श्रेष्ठतम प्राणी कहलाने का अधिकार भी दिलाएगा। उस दिन प्रकृति के सभी पंचमहाभूत, जिन्होंने हमें जीवन दिया, हम पर गर्व कर सकेंगे और जब प्रकृति आर्शीवाद देती है फिर कुछ बचता नहीं, इसी को परमात्मा का साक्षात्कार कहते हैं और भारतवर्ष के लोगों में अभी ऐसे संस्कार के बीज बाकी हैं जिन्हें पुनः अंकुरित होना है।

अब समय है कि हम फिर से खड़े हों और अपनी बिगड़ी हुई जल, वायु और भूमि के पुनः जीवनदायिनी स्वरूप को प्रतिस्थापित करें। भारत सेवा प्रतिष्ठान के प्रबंधक श्रीकृष्ण सिंहल ने इस संबंध में ग्रीन इंडिया फाउंडेशन ट्रस्ट (गिफ्ट) के साथ मिलकर ECO-2022 दो दिवसीय कांफ्रेंस

करने का विचार रखा जिसे सभी ने तत्काल सहमति दी। जे.सी.बोस. तकनीकी व विज्ञान विश्वविद्यालय को साथ लेकर तीनों ने सांझे रूप से इसके क्रियान्वयन हेतु तैयारी की है। इसका उद्देश्य वर्तमान भारत, विशेषतः दिल्ली व हरियाणा, के वायु, जल व भूमि की समझ विकसित कर उसकी समस्यायें व संबंधित सुझाव प्राप्त करना जिससे इसको संबंधित सरकारों को भेज इस दिशा में कार्यवाही का आग्रह किया जा सके। इस हेतु देश के श्रेष्ठ चिंतक, शिक्षाविद्, कार्यकर्ता अधिकारियों एवं शोधकर्ताओं को इस कांफ्रेंस में आमन्त्रित किया गया है।

ग्रीन इंडिया फाउंडेशन ट्रस्ट (गिफ्ट) की उत्पत्ति प्रकृति की समझ व सेवा बढ़ाने तथा इसकी सनातनता को बनाए रखने हेतु ही हुई है। जल, भूमि व वायु संबंधी गतिविधियाँ सदैव इसकी प्राथमिकता रही हैं। हरियाणा, दिल्ली, उत्तर प्रदेश, राजस्थान व बिहार में पर्यावरण संबंधी कार्य व आयोजन इस दिशा में संतुष्टि देते हैं। षेखा झील अलीगढ़ के सृजनहार सुबोध नन्दन शर्मा, जलपुरुष डॉ. राजेन्द्र सिंह, प्रो. जी.डी. अग्रवाल, प्राख्यात पर्यावरणविद् लेखक एवं वरिष्ठ पत्रकार ज्ञानेन्द्र रावत जी आदि का समयानुसार सहयोग व मार्गदर्शन उपलब्ध रहा है।

इसकी मासिक पत्रिका 'मानस पर्व' के माध्यम से देशभर के पर्यावरण व शिक्षाविदों को एक मंच प्रदान कर उनके अनुभवों को देशभर में सांझा करने का काम आसान हुआ है। देश के महत्व की गंगा व यमुना तथा हरियाणा के महत्व की बड़खल के पुनर्जीवन हेतु गिफ्ट परिवार पूरी ऊर्जा व क्षमता से लगा है और मानस पर्व में विशेष स्थान निर्धारित किया है।

भारत सेवा प्रतिष्ठान के प्रबंधन श्रीकृष्ण सिंहल के अनुभवी समन्वयन, अध्यक्ष दीपक

अग्रवाल की ऊर्जा, जे.सी.बोस. विश्वविद्यालय के कुलपति नरेश तौमर के सहयोग व प्रो. अरविन्द गुप्ता की शैक्षणिक परिपक्वता तथा गिफ्ट इंडिया के ज्ञानेन्द्र रावत के लेखन व विश्लेषण की समझ इस स्मारिका के आधार में हैं। सभी को साधुवाद व कांफ्रेंस के सफल आयोजन हेतु शुभकामनायें।

शुभ हो!

जगदीश चौधरी

चेयरमेन की कलम से...



श्रीकृष्ण सिंहल

भारत सेवा प्रतिष्ठान, फरीदाबाद

भारत सेवा प्रतिष्ठान (सर्व इण्डिया) एक रजि. ट्रस्ट है जोकि निःस्वार्थ कार्य करने वाले सेवक लोगों का संगठन है। यह मानवता, लोक सेवा और राष्ट्र सेवार्थ कार्य करता है। इसकी स्थापना फरीदाबाद के कुछ साथियों द्वारा मिलकर की गई। सभी साथियों के प्रयास व समाज के बंधुओं की सहभागिता से ट्रस्ट ने कम समय में सेवा कार्यों में पहचान बनाई है। हम अनेक स्थायी व अस्थायी समाज सेवा के कार्य लगातार किये जा रहे हैं। इस माध्यम से भगवान् हमें लगातार सेवा के कार्य करने के अवसर प्रदान कर रहे हैं। इन सेवा कार्यों में वृद्धाश्रम सेवा के अन्तर्गत आश्रम को लगातार राशन आदि के माध्यम से सहयोग करना, निराश्रित व गरीब बच्चों की शिक्षा-शुल्क आदि का प्रबंध कराना, फरीदाबाद शहर के विभिन्न क्षेत्रों में लगातार मेडिकल कैम्प लगाकर लोगों की चिकित्सा जाँच कराना, गरीब व जरूरतमंद लोगों के लिए एम्बुलेंस का परिचालन कराना। समाज में जागरूकता लाने व संस्कार प्रदान करने के लिये प्रत्येक वर्ष दो-तीन संस्कारक्षम कार्यक्रमों का आयोजन करना इत्यादि।

आज देश और दुनिया का परिवेश बदल रहा है। पर्यावरण असंतुलन भी प्रत्यक्ष दिखाई दे रहा है। मौसम चक्र बदल रहे हैं। कब कौन सी ऋतु है कहना मुश्किल है। बसंत ऋतु में भी सर्दी कम होती दिखाई नहीं देती। कभी अत्यधिक गर्मी व कभी

अत्यधिक सर्दी और बेमौसम बरसात होना आम बात हो गयी है। कहीं अधिक सूखा व कहीं अधिक वर्षा, अत्यधिक वर्षा कम समय में होने के कारण अनेकों स्थानों पर बाढ़ की स्थिति का निर्माण होना आज सामान्य सी बात दिखायी देती है। आज सुनने में बार-बार आता है कि ग्लेशियर पिघल रहे हैं, नदियाँ सूख रही हैं, जल प्रवाह कम हो रहा है। वर्तमान में यूरोप में भीषण गर्मी का दौर है। अमेजोन जैसे जंगलों में आग लगी हुई है। अमेरिका में भी वर्षा न होने के कारण जंगलों में आग लग जाती है और लाखों लोगों को घर खाली करा कर कभी स्कूलों व कभी स्टेडियमों में शरण दी जाती है। लेकिन इसके विपरीत कभी-कभी सर्दियों में इतनी बर्फ गिरती है कि लोगों का जीवन अस्त-व्यस्त हो जाता है, हजारों विमान तो उड़ ही नहीं पाते।

आज विश्व में पीने के पानी की स्थिति भीषण होती जा रही है। कितने शहरों में पानी का अभाव व प्राकृतिक स्रोतों का सूख जाना आम बात है। दक्षिणी अफ्रीका व भारत के कितने ही शहरों में पानी की कमी है। भारत विश्व के उन 17 देशों में शामिल है जो बहुत गंभीर जल संकट का सामना कर रहे हैं और आशंका है कि वे पानी खत्म होने की स्थितियों के करीब हैं। वैश्विक पर्यावरणीय प्रणालियों पर प्रदूषण के कारण पड़ने वाले दुष्प्रभावों के कारण संक्रमण की स्थिति उत्पन्न हो गयी है जिसके आगे चलकर और भी भयावह हो जाने के खतरे आसन्न हैं। नदियों, झीलों तथा अन्य जल स्रोतों को कम करके तथा उन्हें प्रदूषित करके हम उन प्रणालियों को नष्ट कर रहे हैं जिनसे हमें मीठा पानी प्राप्त होता है। जल की

अनिवार्यता और अपरिहार्यता मनुष्य समेत सृष्टि के हर जीव के लिए है। पानी पर ही हमारा अस्तित्व है, अतः यह समस्या सम्पूर्ण विश्व की है, ऐसी हमारी मान्यता है।

आप घर के बाहर कदम रखेंगे और महसूस करेंगे कि हवा किस कदर प्रदूषित हो चुकी है। धुएँ के बादलों को बसों, स्कूटरों, कारों, कारखानों की चिमनियों से निकलता हुआ देख सहेँ। कारों की गति रोड पर किस कदर प्रदूषण को बढ़ा रही है। दिल्ली व उत्तर भारत के अनेक क्षेत्रों में कितना घना कोहरा हो जाता है। वायु प्रदूषण के कारण मानव स्वास्थ्य खराब होता चला जा रहा है। इसके कारण आँखों में जलन, छाती में जकड़न, खाँसी और गले के रोग का बढ़ना एक आम बात है। अस्थमा (फेफड़ों के रोग) अचानक सेहत खराब होने की वजह हैं वायु का प्रदूषित होना। एक आकलन के अनुसार आज वायु प्रदूषण के कारण हम सबकी आयु पांच वर्ष कम हो गई है।

शहरीकरण, औद्योगिककरण एवं जनसंख्या वृद्धि के कारण इनके अनुपयोगी पदार्थों ने मृदा को प्रदूषित कर दिया है। इनके कारण मृदा की उपजाऊ शक्ति कम होती जा रही है तथा उसमें रहने वाले जीव-जंतुओं पर इसका प्रतिकूल प्रभाव पड़ रहा है। विभिन्न प्रकार के उर्वरक एवं



कीटनाशक दवाइयां मृदा को प्रदूषित कर रहे हैं। भूमि प्रदूषण दिनों-दिन भयंकर रूप धारण करता जा रहा है। यदि समय पर भूमि प्रदूषण पर रोक नहीं लगाई गई तो यह विकराल रूप धारण कर लेगा और फिर इससे छुटकारा पाना असंभव हो जाएगा। पंजाब में अत्याधिक पेस्टीसाइड व कैमिकल खादों के उपयोग से गम्भीर व असाध्य रोग पैदा हो रहे हैं।

इसके लिये कौन जिम्मेदार है? आगे क्या होगा? एक दिन भूमि से पेयजल समाप्त हो जायेंगे? भूमि से हरियाली खत्म हो जाएगी? वायु प्रदूषित हो जायेगी जिससे साँस लेने में कठिनाई होगी। भूमि क्यों प्रदूषित हो रही है? क्यों पैदा होता है पर्यावरण असंतुलन? वैज्ञानिक इसको कह देते हैं मौसम में बदलाव (Climate change) इसका कारण है। आज का तथाकथित विकास व हमारी अपेक्षा से अधिक धन कमाने की लालसा ने इसमें अहम भूमिका निभायी है। आज हम सभी अपना दायित्व नहीं पहचान रहे हैं। सामान्य व्यक्ति से लेकर पढ़ा लिखा व्यक्ति यहाँ तक कि व्यवसाय व उद्योग चलाने वाले बंधु अपना दायित्व निर्वाह करने में मानव ही नहीं संपूर्ण जीव-जगत और प्रकृति की अनदेखी कर रहे हैं।

हम जो साँस लेते हैं, पानी पीते हैं और भोजन खाते हैं, क्या वो उचित मापदण्ड व गुणवत्ता का है। शायद नहीं। हमें सोचने पर मजबूर होना पड़ेगा कि आज वायु की गुणवत्ता कैसी होनी चाहिये? हमें विचार करना ही होगा कि जल का संरक्षण कैसे करें व उसे प्रदूषित होने से कैसे बचा सकते हैं? हमारी भूमि जो हमें जीवन देती है। हमारी क्षुधा शांत करती है। उसका संरक्षण कैसे करें?

सरकार ने वायु, जल व भूमि प्रदूषण को न्यूनतम करने के लिये बहुत से कानून बनाये हैं। कानून होते हुए भी प्रदूषण क्यों है? सरकार को अपनी मशीनरी को सक्रिय

करना होगा। प्रदूषण फैलाने वाले संयंत्रों को बंद कराना व उन पर कड़ी कार्यवाही करना इत्यादि। इसके साथ सामान्य जनता को भी अपना दायित्व समझना होगा और प्रकृति को दूषित करने वाले साधनों के प्रति अपना दायित्व समझना होगा। अनेकों स्थान पर जन-जागरण के कार्यक्रम किये जा रहे हैं। प्रति वर्ष सामाजिक संस्थाएँ पहल करती हैं और लाखों पेड़ भी लगाए जाते हैं। इस की गति व अनुपात बढ़ाना होगा। हमें कम से कम 10 करोड़ पेड़ प्रति वर्ष लगाने होंगे। हमारे यहाँ आज प्रति व्यक्ति पेड़ लगभग 28 हैं। यह आँकड़ा हमें 100 करोड़ तक जल्दी ही पहुँचाना होगा। स्थान-स्थान पर वायु की गुणवत्ता को जानने के लिये संयंत्र लगाने होंगे। जनता को जागरूक होना ही होगा। वायु प्रदूषण की गुणवत्ता 50 से अधिक ना जाने पाए, यह प्रयत्न सभी को मिलकर करना होगा। स्कूलों के पाठ्यक्रम में पर्यावरण सुरक्षा का पाठ पढ़ाना ही होगा। नदियों को प्रदूषित होने से रोकना होगा। आज कितने प्रयत्न के बाद भी माँ गंगा को साफ नहीं कर पायें हैं। भूमि की गुणवत्ता बचाये रखने के लिये कैमिकल, उर्वरक व कीटनाशक दवाओं के उपयोग पर नियंत्रण करना होगा। पानी के दुरुपयोग को रोकने के लिये सही फसलों का चयन व किसानों को भी सचेत व जागृत करना होगा।

हम पर्यावरण के क्षेत्र में काम करने वाले सभी पर्यावरणविद् एवं सक्रिय कार्यकर्ताओं का अभिनन्दन करते हैं जो इस क्षेत्र में अपना जीवन समर्पित कर आम जन को जागरूक कर रहे हैं—अमृता देवी बिश्नोई, पर्यावरणविद् सुन्दरलाल बहुगुणा, गोविन्द सिंह रावत, चण्डी प्रसाद भट्ट तथा श्रीमती गौरादेवी इत्यादि के नाम प्रमुख हैं। भारतीय समाज प्रकृति प्रेमी समाज है जोकि प्रकृति के विभिन्न आयामों को भगवान का स्वरूप मानकर इसकी पूजा व संरक्षण करता है।

हमारी यह कान्क्रेंस जन जागरण के लिये व नीति निर्धारको से भी निवेदन के



लिये है, कि किसी भी कारण से वायु, पानी व मिट्टी प्रदूषित ना होने पाए, इस क्षेत्र में कारगर उपाय किए जाएं। प्रदूषित करने वालों के खिलाफ सख्त कार्यवाही के लिए आग्रह भी है, साथ ही सामान्य जनो, कृषक, उद्योगपति विशेषकर वाहन उत्पादन करने वाले व भारी उद्योग आदि चलाने वाले उद्योगपति बंधुओं से आग्रह है कि सरकार द्वारा निर्धारित मानकों का कड़ाई से पालन करें व इसे अपना नैतिक कर्तव्य मानें। क्योंकि यह भी देशभक्ति का एक स्वरूप है। सभी सामान्य जन अपने वाहनों की ठीक से मँटीनेंस कराएं व सड़क के नियमों का पालन करें, लेन में चलें, रेड लाइट ना पार करें, स्पीड का ध्यान रखें व सजग रहें। इससे भी प्रदूषण की समस्या कम होगी। इसके साथ नई पीढ़ी को भी जागरूक करना होगा। विद्यालयों व उच्च विद्यालयों में पर्यावरण विषय को अनिवार्यता प्रदान की जाए।

पर्यावरण की सुरक्षा आज की बड़ी समस्या है। इसे सुलझाना हम सबकी जिम्मेदारी है। हमें इसे प्राथमिकता प्रदान करनी चाहिए तथा पर्यावरण की सुरक्षा में सहयोग देना चाहिए।

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From the Desk of Organising Secretary...



Dr. Arvind Gupta,

Professor, J C Bose University of Science and Technology, Faridabad

Environmental pollution is not a new fact, although it remains the world's greatest problem facing by humanity, causes of morbidity and mortality. Environmental pollution is unnecessary discarding of mass or energy into mother earth's natural resources just like air, water and soil. It damages the atmosphere and its ecological health to negatively impact the living beings and their life in terms of quantitatively and qualitatively.

The rising trends in population growth and the consequent effects on air quality are evident in the Indian scenario. As per WHO estimates, 10 out of the 20 most populated cities across the world are in India. The most of Indian cities exceeded the WHO threshold by an alarming 500%. The various sources of air pollution are classified into seven major sectors, which include transportation, industries, agriculture, power, waste treatment, biomass burning, residential, construction, and demolition waste.

India is expected to pay the highest price for the impacts of the climate crisis because of global industrialisation and its devil

effects. Other than extreme weather events such as flash floods and widespread wildfires, the country often experiences long heat waves and droughts that dry up its natural water sources and compromise crops. The agriculture sector, which employs over 60% of the population is often hit hard by these erratic droughts, impacting food stability. India is already among the world's most water-stressed countries. The water policy of the country is very much 'irrigation-centric' and more than 85% of India's fresh water is used in agriculture. This has led to the crisis in many states, including Punjab, Haryana, and western Uttar Pradesh. The indiscriminate use of water for irrigation, coupled with the absence of conservation efforts put India in a water crisis country.

Quality of human health is often linked with soil quality but soil is the dumping ground of most of the waste products from domestic, human, animal, industrial and agricultural. The problem of soil pollution is compounded by the use of agrochemicals, such as pesticides, fungicides, bactericides, insecticides, biocides, fertilizers and also the soil is polluted by deadly pathogenic organisms. In spite of great difficulty in its remediation in comparison with polluted air and water, soil pollution as a threat to human life is by and large ignored at national level in India due to lack of comprehensive information on the subject.

All the components of environmental pollutions are in alarming range in India with comparison to rest of the



word although in our ancient Vedic civilisation, Nature is a manifestation of the Divine. As per the Vedic civilisation, the constituents of Nature are Air (Vayue), Fire (Agni) Water (Jala), Soil (Prathvi) and Universe (Akash) and are called as Panch Mahabhutas or elements. The Shruti (Vedas, Upanishads) and Smruti (Ramayana, Mahabharata) tell us that the animals and plants are sacred just like humans, our fellow creatures, including plants have consciousness, therefore all aspects of Nature are to be respected. This understanding, care and acceptance towards the environment is common to all Indic religious and spiritual systems such as Hinduism, Buddhism and Jainism. Hinduism is inherently an ecological religion because it always had a deep understanding of ecology and the relationship between man and Nature.

The Vedic hymns are filled with many simple and universal messages, such as:

"One should not destroy the trees."

– Rig Veda Samhita VI-48-17

माकाकम्बीरमुद्वृहोवनस्पतिमशस्तीर्विहिनीनशः ।

मोतसूरोअहएवाचनग्रीवाआदघतेवेः ॥

Uproot not, Pūṣan, the forest lord with its progeny of crows; utterly destroy those who are my revilers; let not the adversary ensnare me, as (fowlers) set snares for birds.”

Similarly

1. Plants are mothers and Goddesses. (Rig Veda Samhita X-97-4)
2. Trees are homes and residence. (Rig Veda Samhita X-97-5)
3. Sacred grass has to be protected from Human Abuse. (Rig Veda Samhita VII-75-8)
4. Plants and waters are treasures for generations. (Rig Veda Samhita VII-70-4)
5. We solicit all supporting Earth on which trees, lords of forests, stand reliable. (Atharva Veda 12:1:27)

Even today, India is blessed with a rich biodiversity, because of the spiritual connectedness that Indians have with Nature. Mostly historic Hindu temple is associated with a tree and every tree is associated with a deity and also a motivational story. Today, the sthalavriksham is considered the single genetic resource for the conservation of species diversity. Unlike the west, where trees are merely natural objects, India is filled with magnificent sacred trees: Peepal, Neem, Bel, Banyan, Asoka, Amla, Arjuna. Most deities have their favourite tree such as, for Shiva, his favourites are Rudraksh and Bel, for Vishnu it is Peepal and Tulsi and also ritual is complete

without the leaf of a Bilva, or Neem or Tulsi. The use of these leaves reminds us of our connection with the Earth and the unity of Man and Nature.

There is also Vrikshayurveda—an ancient Sanskrit text on the science of plants and trees. Written by Acharya Surapala, around the 10th century, this is a complete manuscript for the management of plants and trees. Ancient Indian knew and understood the role of ecology, trees and forest in making life on this earth possible. Animals are also vahanas or vehicles of the Gods and Goddesses and are equally worshipped as their riders. According to the Atharva Veda, the earth was created for the enjoyment of not only human beings, but also birds, animals and all other creatures. This reverence of animals and protection of forest allowed India to be a land of great faunal and floral diversity.

Today's environmental crisis demands a sincere response. The world is grappling to find

solutions to multiple crises of the environment. Global conventions on biodiversity and climate change are signed by more than 190 countries, earth summits keeps taking place, activism by international environmental NGOs is at its peak. But, it is very difficult that the ecology would be saved by this Western approach, which is characterized by activism and relies solely on present science and the scientific community thoughts only. For ecology to be truly saved and revived, we have to return to the meanings and practices that infuse sacredness and worship towards Nature as in ancient Indian traditions, re-awaken our relationship with Nature and not in view religion and ecology as separate. For Bhartiya point of view, the environment is not only protected because of the selfish urgency to save biodiversity and hence to save human future, but it is a righteous duty that all humans are obliged to perform.

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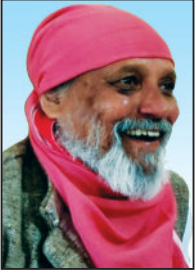
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इस हिमालय से कोई गंगा निकलनी चाहिए



डा. अनिल प्रकाश जोशी
प्रख्यात पर्यावरणविद् एवं
पद्म विभूषण से सम्मानित

दुनिया की सभी पर्वत श्रृंखलाओं में हिमालय सबसे युवा है और इसके पीछे इसके निर्माण की अवधि है। दुनिया में अन्य पर्वत श्रृंखलाएं ज्वालामुखियों की देन रहीं। इनमें अल्पाइन और एंड्रेस विशेष तौर पर शामिल हैं, लेकिन हिमालय का जन्म समुद्र के गर्भ से दो बड़ी प्लेट्स के टकराने के कारण हुआ। यह मात्र 50 करोड़ वर्ष पुराना है और अभी भी पांच मिलीमीटर प्रतिवर्ष की दर से बढ़ रहा है।

युवा होने के बावजूद दुनिया की 10 प्रमुख चोटियों की गिनती में हिमालय सर्वोच्च है जहां माउंट एवरेस्ट भी स्थित है। हिमालय का अपना स्थान इसलिए भी अदभुत है क्योंकि दुनिया की पूरी पारिस्थितिकी का नियंत्रण करने वाले अंटार्कटिका और आर्कटिक ध्रुवों की तर्ज में हिमालय को तीसरे ध्रुव के रूप में जाना जाता है। इसको ऐसी संज्ञा देने के पीछे इसका एशिया का वाटर टावर होने के अलावा, दो अरब लोगों से इसका सीधा जुड़ाव है। यह एशिया के एक बहुत बड़े भूतंत्र की पारिस्थितिकी को नियंत्रित करता है।

जीवन का आधार स्तंभ

इसको हिंदू कुश हिमालय भी कहा जाता है। कुश का मतलब है जहां से खुशियां

नदियां सूख रही हैं वहीं पिघलते हिमखंड इसे कमजोर बना रहे हैं।

भारत के मुकुट के रूप में सुशोभित हिमालय देश का सीमा प्रहरी तो रहा ही है, इसकी अलौकिकता ने भी इसे दुनिया में अलग स्थान दिया है। यह हमारी लापरवाही का नतीजा है कि अब इसको सींचने वाली नदियां सूख रही हैं, वहीं पिघलते हिमखंड इसे कमजोर बना रहे हैं। दरअसल हमने हिमालय को समझने में पहाड़ जैसी चूक की है और यह हमारी नीतियों में भी स्पष्ट दिखाई देती है।

चलती हैं। अपने देश में हवा, मिट्टी, जंगल, पानी के सारे सवाल कहीं न कहीं हिमालय से ही जुड़े हैं। शुरुआत में जब हिमालय अपने को साध रहा था तो कैलाश मानसरोवर से पूर्व की तरफ ब्रह्मपुत्र ने और पश्चिम की तरफ सिंधु ने नदियों के जाल बनाकर हिमालय को सींचा। यह भी स्पष्ट है कि यह नदियां ही थीं, जहां से सभ्यताएं और संस्कृति पनपी।

हिमालय के आर्थिक उपकार देश के ज्यादातर राज्यों में दिखाई देते हैं। उत्तर प्रदेश, पश्चिम बंगाल, बिहार, पंजाब, हरियाणा, दिल्ली जैसे राज्यों की खेती-बाड़ी की जीवनरेखा हिमालय की नदियां हैं। हिमालय मात्र आर्थिकी और पारिस्थितिकी का ही केंद्र नहीं, बल्कि साधु-संतों ने इसको अध्यात्म का केंद्र भी माना। तपस्वी

भूमि हिमालय देश को अध्यात्म के प्रति भी आकर्षित करता रहा। शांति का प्रतीक हिमालय ही वेद अरण्य संस्कृति का जनक भी रहा है।

अंतरिक्ष से आई है खतरनाक खबर

एक हालिया खबर बहुत भयभीत करने वाली है कि दुनिया के वे क्षेत्र जो अपनी शीत प्रवृत्ति के लिए जाने जाते थे, वे भी बढ़ती गर्मी से त्राहि-त्राहि कर रहे हैं। खासतौर से यूरोप बढ़ते तापक्रम से व्यथित है। पुर्तगाल में 47 डिग्री सेंटीग्रेड और पूरे यूरोप में औसतन 41 डिग्री सेंटीग्रेड तापक्रम दुखद घटनाओं को जन्म दे रहा है। इसके



कारण यहां कई लोग जीवन खो चुके हैं। साथ ही आग की बढ़ती घटनाएं जिस तरह से फ्रांस व स्पेन के वनों को लील रही हैं, वो भी तापक्रम बढ़ने का दूसरा परिणाम है।

नासा की एक रपट भी इसी ओर ध्यान आकर्षित करती है कि यूरोप, अफ्रीका व पश्चिम एशिया, (जो अंतरिक्ष से शीत संकेत देते दिखते थे) वहां का तापक्रम सभी सीमाओं को तोड़ चुका है। इस अप्रत्याशित तापक्रम वृद्धि ने कई संकट खड़े कर दिए हैं। आने

वाले समय में यह तापक्रम जंगलों को लील लेगा और नदियों को सुखा देगा।

तो डोल जाएगा जनजीवन

दरअसल, हिमालय से मात्र जनजीवन ही नहीं जुड़ा, बल्कि देश की अस्मिता भी जुड़ी है। हिमालय की महिमा कुछ इस तरह भी है कि यह मात्र स्थानीय लोगों की आवश्यकताओं की ही भरपाई नहीं करता बल्कि देश का एक बड़ा भूभाग इसी की कृपा से पनपा है। मोटे रूप में देश के सात मैदानी राज्यों की खेती-बाड़ी, प्रकृति-पर्यावरण हिमालय की देन है। इनमें देश की राजधानी से लेकर उत्तर प्रदेश, बिहार, बंगाल जैसे राज्य आते हैं।

हिमालय की गंगा, यमुना, ब्रह्मपुत्र, सतलुज, झेलम जैसी नदियों ने इस देश का भूगोल तय किया, साथ में वह संपन्नता का आधार भी बनी हैं। इतना ही नहीं, हिमालय में होने वाली कोई भी हलचल दुनिया के 18 देशों और दो अरब लोगों को सीधा प्रभावित करती है।

पिछले कुछ समय से हिमालय में यूरोप की तरह ही पर्यावरणीय छेड़छाड़ के दुष्परिणाम दिखने शुरू हो चुके हैं। यहां निरंतर होने वाली आपदाएं इसका सबसे बड़ा प्रमाण हैं। अंतरराष्ट्रीय स्तर पर आईपीसीसी की रिपोर्ट भी बताती है कि आने वाले समय में दुनिया में हीट वेब्स इंडेक्स के बढ़ने के कारण सबसे बड़ा और प्रतिकूल प्रभाव हिमालय पर ही पड़ेगा।

इन परिणामों की एक वजह यह भी है कि हिमालय के हालात बिखरते चले जा रहे हैं। यह हमारे लिए एक बड़ी चुनौती है। इससे एक तरफ जहां जनजीवन संकट में पड़ेगा, वहीं दूसरी तरफ हिमालय के संसाधनों पर बड़ी चोट पहुंचेगी। यह भी स्पष्ट है कि देश की बड़ी हिमनदियां गंगा, यमुना, ब्रह्मपुत्र, सतलुज, झेलम जो पूरे हिमालय को तर करती हैं, वे सब कहीं न कहीं संकट से घिर जाएंगी क्योंकि उनका

आधार हिमखंडों के हालात पर निर्भर है जो अब तेजी से पिघल रहे हैं। अंतरराष्ट्रीय स्तर पर किए गए शोध ने यह खुलासा किया है कि वर्ष 2000 के बाद इन हिमखंडों की पिघलने की दर दोगुणी हो चुकी है।

दोतरफा नुकसान से कांप रहा हिमालय

बढ़ती गर्मी के कारण हिमालय के हिमखंड अब झीलों में परिवर्तित हो रहे हैं, वहीं दूसरी तरफ एक अध्ययन के अनुसार, इन पिघलते हिमखंडों के कारण मीथेन गैस का उत्सर्जन भी हो रहा है। मतलब एक साथ दो तरह की पारिस्थितिकी मार हम सब पर पड़ने वाली है।

हिमखंडों के पिघलने से जहां हम पानी का फिक्स डिपॉजिट खो देंगे, वहीं समुद्र के व्यवहार बदल जाएंगे और उससे जुड़े छोटे-मोटे शहर भविष्य में डूब जाएंगे। दूसरी तरफ कार्बन डाइआक्साइड से चार गुना घातक मीथेन जैसी गैस से वायु में बढ़ते घनत्व के कारण तापक्रम में वृद्धि निश्चित है।

इस परिवर्तन के पीछे बड़ा कारण ग्लोबल वार्मिंग रहा है। यह भी स्पष्ट है कि दुनिया में बढ़ती तपन के कारण क्लाइमेट चेंज जैसे बड़े दुष्परिणाम सामने आए हैं। इस बदलाव का पहला असर हिमालय में ही झलकता है। यही कारण है कि लगातार कुछ समय से हिमालय कई तरह की मुसीबतों से घिरा है। गर्मियों में जहां इसके वनों को आग लीलती है, वहीं मानसून में अतिवृष्टि यहां जीवन को छिन्न-भिन्न कर देती है। हर वर्ष की ये घटनाएं हिमालय के विकास को पीछे धकेल देती हैं।

विशिष्ट पहल से बचेगी विरासत

ऐसे में हिमालय के प्रति एक नई नीति की पहल होनी चाहिए। मात्र राज्यों में हिमालय को बांटकर हम आज तक कोई संरक्षण भी नहीं कर सके। सच तो यह है कि पिछले

100 साल में हिमालय में होने वाले बदलाव हमारे संज्ञान में ही नहीं हैं और न ही उसका कोई लेखा-जोखा हमारे पास है।

अगर ऐसा कोई अध्ययन होता तो शायद हम सतर्क हो पाते और आने वाली समस्या से हिमालय की सुरक्षा पर व्यावहारिक कदम उठाते। हिमालय को राज्य का दर्जा दिया जाना मात्र इसका समाधान नहीं, बल्कि हिमालय की नीतियां और ढांचा कुछ अलग होने की आवश्यकता है। इसकी पारिस्थितिकी को समझते हुए यहां के विकास के ढांचे के प्रति गंभीरता दिखाना सबसे बड़ी आवश्यकता है। इन सबके बावजूद हिमालय हमारे साथ है और किसी न किसी रूप में अनवरत सेवा में जुटा है।

अभी भी हिमालय देश-दुनिया की सेवा में उस निम्न स्तर पर नहीं पहुंचा जिसे हम दूर नहीं कर सकते हैं, लेकिन यह भी अस्वीकार नहीं कर सकते कि हिमालय आज वैसा स्थिर नहीं है, जैसा अपने जन्म के समय में था। यह सारे देश की विरासत है। इसलिए महत्वपूर्ण हो जाता है कि राष्ट्रीय स्तर पर हिमालय के लिए अलग से सोच पनपे। तब शायद हम हिमालय के प्रति उन नीतियों को स्थान दे पाएंगे, जिनसे संरक्षण जुड़ा है।

इसके लिए हम हिमालय के सामाजिक, राजनीतिक, आर्थिक दृष्टिकोण पर चिंतन करते हुए हिमालय के संरक्षण के प्रति चिंता करें। इसी सोच के चलते व इस के महत्व और संरक्षण पर चर्चा के लिए हिमालय दिवस की कल्पना की गई थी। तबसे लगातार हर वर्ष हिमालय को लेकर चिंतन की यह श्रृंखला देशभर को संदेश देने का एक ऐसा प्रयत्न रहा है जिसमें सबकी भागीदारी आवश्यक है। हिमालय को नमन करने का मतलब प्रभु व प्रकृति के प्रति आदर प्रकट करने जैसा ही होगा!

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जल संकट का परम्परागत समाधान



जलपुरुष राजेन्द्र सिंह
अध्यक्ष, तरुण भारत संघ

किंसी भी देश की प्रगति या अवनति में वहाँ की जल सम्पदा का काफी महत्व होता है। जल की उपलब्धि या प्रभाव के कारण ही बहुत सी सभ्यतायें एवं संस्कृतियाँ बनती और बिगडती हैं। इसलिए हमारे देश की सांस्कृतिक चेतना में जल का काफी ऊँचा स्थान रहा है। वर्षा का जल को उसी स्थान पर रोक लेते थे। हमारे पूर्वज जानते थे कि तालाबों से जंगल व जमीन का पोषण होता है। भूमि के कटाव एवं नदियों के तल में मिट्टी के जमाव को रोकने में भी तालाब मददगार होते हैं। जल के प्रति एक विशेष प्रकार की चेतना और उपयोग करने की समझ उनकी थी। इस चेतना के कारण ही गाँव के संगठन की सृजना-बुझ से गाँव के सारे पानी को विधिवत उपयोग में लाने के लिए तालाब बनाये जाते थे। इन तालाबों से अकाल के समय भी पानी मिल जाता था। इनकी देख-भाल, रख-रखाव, मरम्मत आदि के कामों से गाँव के संगठन को मजबूत बनाने में मदद मिलती थी।

गांवाई दस्तूर

जैसा कि गाँवों की व्यवस्था से संबंधित अन्य बातों में होता था, उसी तरह तालाब के निर्माण व रख-रखाव के लिए भी गाँववासी अपनी ग्राम सभा में सर्वसम्मति से कुछ कानून बनाते थे। ये कानून 'गांवाई दस्तूर'

कहलाते थे। ये दस्तूर 'गांवाई बही' में लिखे जाते थे, या मौखिक परम्परा के जरिये पीढ़ी दर पीढ़ी चले जाते थे। गाँव में आने वाले बाहरी व्यक्ति को भी इन गांवाई दस्तूर का पालन करना पड़ता था। ये गांवाई दस्तूर चूंकि सामान्य बुद्धि के अनुसार कायम होते थे। इसलिए करीब-करीब हर गाँव में एक से ही होते थे। अतः सामान्य तौर से तो लोग इससे परिचित ही होते थे, नहीं तो भी बाहर से आने वाला व्यक्ति सहज ही उन्हें समझ लेता था।

अलवर जिले के इस क्षेत्र में तालाब संबंधी कुछ पुराने गांवाई दस्तूरों से ज्ञान हुआ है कि तालाब की 'आगोर' में कोई जूता लेकर प्रवेश नहीं करता था। शौचादि के हाथ अलग से पानी लेकर आगोर के बाहर धोये जाते थे। आगोर में किसी गाँव सभा की अनुमति के बिना मिट्टी खोदना मना होता था। आगोर से नहीं बल्कि तालाब के जल ग्रहण क्षेत्र (Catchment Area) तक में शौचादि के लिए जाना मना था। किसी प्रकार गंदगी फैलाने वाले को तालाब की सफाई करके प्रायश्चित्त करने का सुझाव दिया जाता था। प्रायश्चित्त के लिए तालाब की पाल पर पेड़ लगाने तथा बड़ा तक

उसकी देख-भाल करने की परम्परा थी। तालाब के जल-ग्रहण क्षेत्र से भूमि कटकर नहीं आये और तालाब में जमा नहीं हो, इसकी व्यवस्था तालाब बनाते समय ही कर दी जाती थी, जिससे लम्बे समय तक तालाब उथले नहीं हो पाते थे। जब तालाब की मरम्मत करने की आवश्यकता होती थी, तो पूरा गाँव मिल-बैठकर, तय करके यह काम करता था। तालाब से निकलने वाली मिट्टी खेतों में डालने या कुम्हारों के काम में आती थी।

तालाब को गाँव की सार्वजनिक सम्पत्ति माना जाता था। गाँव के लोग जब किसी दूसरे गाँव को जाते थे, तो सबसे पहले तालाब को अपने गाँव की सम्पत्ति में गिनाया जाता था। जिस गाँव का जैसा तालाब होता था, वैसा ही उस गाँव को माना जाता था। गाँव का तालाब अच्छा है, तो उस गाँव को समृद्ध, संगठित, शक्तिशाली माना जाता था। गाँव के महत्वपूर्ण निर्णय लिए जाते थे।

तथा-कथित शिक्षित लोगों की समझ

यह परम्परा 1890 तक तो बराबर चली। इसके बाद अंग्रेजों का ध्यान हमारे गांवाई संगठनों, स्वैच्छिक संस्थाओं तथा लोगों



के अभिक्रम को खत्म करने की तरफ गया। उन्होंने पूरी सक्रियता से इन सब सहज चलने वाली गांवाई व्यवस्थाओं को खत्म करने की योजना विभिन्न प्रकार से बनाई—कहीं नहरी सिंचाई योजना तो कहीं बड़े बांध आदि के स्वप्न दिखाकर, तो कहीं हमारी उच्च सांस्कृतिक धरोहर, तालाब के जल की निंदा करके और कहीं हमारे देश की शिक्षापद्धति को प्रदूषित करके हमारे ही देशवासी तथा—कथित शिक्षित कहे जाने वाले लोगों द्वारा हमारी संस्कृति की बुराई कराके, नष्ट कराने के प्रयासों के बाद भी समृद्ध तालाबों की सम्पन्न परम्परा चालू रही। इन तालाबों से सिंचाई भी होती थी। इस तरह तालाब गांव की विकेन्द्रित अर्थव्यवस्था का हमारे ये तालाब जीते—जागते उदाहरण थे। राजस्थान के जिन क्षेत्रों में केवल दो—चार सेन्टीमीटर वर्षा होती थी, उनमें भी इन तालाबों के सहारे लोग व पशु जीवित रहते थे। जोधपुर, बाड़मेर, जैसलमेर के महा मरुस्थल क्षेत्र कम वर्षा के बावजूद आज की अपेक्षा ज्यादा विकसित थे। पानी कम होते हुए भी इस क्षेत्र की पुरानी हवेलियां, महल, बड़े-बड़े बाजार, अन्तर्राष्ट्रीय व्यापार केन्द्र यहां की तालाब व्यवस्था के कारण ही सम्पन्न हुए थे और उसकी उपयोगिता के प्रमाण थे।

1890 तक अंग्रेजी शिक्षा का प्रभाव देश में बढ़ गया था और अंग्रेजों का षडयंत्र सफल होने लगा था। सबसे पहले अंग्रेजी शिक्षा का प्रभाव हमारे यहां के राजाओं, सामन्तों, जागीरदारों आदि पर पड़ा। जो पहले अकाल के समय तालाबों के निर्माण पर अधिक ध्यान देते थे, ये अब अपनी राजधानी के शहरों की चार दीवारी बनाने आदि कामों को महत्व देने लगे। इनके पूर्वजों ने जो तालाब बनाये थे वे बिन, देख-रेख के टूटने लगे, और जो एक बार टूट गया उसका पुनःनिर्माण नहीं हुआ। इनको समय ने और मिट्टी की गाद ने

बूर दिया। इस प्रकार पुराने तालाब खत्म होते गये।

हमारे देश में यह कहावत प्रचलित है कि “जैसा राजा, वैसी प्रजा”। यह कहावत चरितार्थ हुई और ग्रामवासियों में भी तालाबों के प्रति उदासीनता बढ़ती गई इसी प्रकार गांवों के तालाब नष्ट हुए और अंग्रेजों की नीति गांवों में भी अपना रंग दिखाने लगी। ग्रामसमाज के टूट जाने के कारण तालाबों का निर्माण, रख-रखाव और मरम्मत बंद हो गये। गांव के तालाबों के साथ-साथ गांव के संगठन भी बिखरने लगे।

पश्चिमी सभ्यता में जल व मिट्टी का स्थान

स्वतंत्रता की लड़ाई में केवल बापू ने अपनी बातचीत और भाषणों में अवश्य ही गांव के तालाब को प्रतिष्ठित किया था, लेकिन अन्य लोगों का इस तरफ कोई विशेष ध्यान केन्द्रित नहीं हुआ। अंग्रेजी शिक्षा और अंग्रेजियत में पले हमारे दूसरे नेता हमारी समाज व्यवस्था की खूबी को समझ नहीं पाये, बल्कि उसे हीन मानकर उसकी निंदा करते रहे। उस समय बापू ने चर्खे के साथ-साथ गांव के तालाब—चारागाह के रख-रखाव को भी रचनात्मक कार्यक्रमों से जोड़ा होता तो अच्छा होता, हालांकि उनको खुद को तो इन सब बातों का ध्यान था। आजादी मिलने के समय ही बापू ने तत्कालीन प्रधानमंत्री जवाहर लाल नेहरू का ध्यान ग्राम-व्यवस्था को पुनर्जीवित करने की ओर दिलाया था, लेकिन नेहरू पश्चिमी सभ्यता से प्रभावित थे। उनकी प्राथमिकता भाखड़ा जैसे बांध बनाने की थी देशी-विदेशी, निहित-स्वार्थी तत्वों ने इसका खूब फायदा उठाया। इन बड़ी-बड़ी सिंचाई योजनाओं से तालाबों पर सबसे अधिक प्रहार हुआ।

बड़े बांध बनाने पर भारत सरकार 2018 तक अरबों-करोड़ों रुपये खर्च कर चुकी है। इन योजनाओं से दो करोड़ हैक्टर

जमीन सिंचित होने का सरकारी दावा था। वास्तव में कितनी जमीन की सिंचाई ये योजनायें कर रही है। यह कहा नहीं जा सकता, क्योंकि जिस प्रकार इनके आंकड़े इक्ठे किये जाते हैं, उसके कारण सारी बात शंकास्पद है। इस अर्से में 246 बड़ी योजनायें शुरू की गई थी, उनमें सिर्फ 65 योजनायें अभी तक पूरी हुई हैं। इन बड़ी योजनाओं में अब जो घाटे की धारा बह रही है वह चौंकाने वाली है। एक वर्ष में हजारों करोड़ का घाटा कहां से, कैसे पूरा होगा? यह बात निश्चित ही जागरूक व्यक्ति को चिन्तित करती रहती है। लेकिन इन योजनाओं से बड़े-बड़े ठेकेदारों को मुनाफा, इन्जीनियरों को घूस और नौकरी तथा नेताओं को लूट में हिस्सा मिलने के साथ वाह-वाही जो हासिल होती है, और गांवों के पानी से बड़े उद्योगपतियों को सस्ती बिजली मिलती है। बड़े देशों की और बड़े कारखानों की बड़ी मशीनें, सीमेन्ट आदि की बिक्री करना, नहर बनाना, जिसमें गांव की सड़के भी सीमेन्ट से बनने लगी। मंत्री अपने उद्योगों की सामग्री अपने मंत्रालय के कामों से उपयोग करते हैं। गरीबों की जमीन जाये—इस तरह सारा लाभ चंद बड़े घरानों को मिलता है। यही सब हमारे नीति-निर्धारकों की “विकास” की परिभाषा है। आज बस विकास का लालची नारा हमें सुनाया जा रहा है। हम विकास में फंस गये हैं। यह विकास विस्थापन, विकृति और विनाश ही होता है तालाबों से यह सब नहीं होता है। इससे शांति, सदभावना और स्थायी समृद्धि होती है।

बड़े बांधों के निर्माण का असली उद्देश्य

बड़े बांधों से “सिंचाई” का बहाना तो सिर्फ लोगों की आंखों में धूल झोंकने के लिये थ। अगर सही तथ्य सामने आते जाये तो वास्तव में बड़े बांधों के कारण कुल-मिलाकर सिंचाई पहले की अपेक्षा कम

ही हुई है क्योंकि इन बांधों से नदियों के प्रवाह रुक जाने के कारण इन प्रवाहों के दोनों ओर की लाखों एकड़ जमीन और उसमें स्थित कुएं सूख गये हैं तथा भूगर्भ जल का स्तर पिछले दस-बीस बरसों में पचास से एक सौ फीट तक नीचे चला गया है। इन बड़े बांधों का असली उद्देश्य तो किसान की स्वावलम्बी व्यवस्था को तोड़कर उसे केन्द्रित करने और बड़े-बड़े घरानों या बहुराष्ट्रीय कम्पनियों को लाभ पहुंचाने का था। गांव-गांव में सिंचाई की जो परम्परागत स्वावलम्बी व्यवस्था थी उसे समाप्त करके किसान का भाग्य इन लोगों के हाथों में सौंप दिया गया।

इन सीधे-सादे लेकिन असरकारक तालाबों की अब भी उपेक्षा करने की भूल की जा रही है। 1950 में भारत के कुल सिंचित क्षेत्र की 17 प्रतिशत सिंचाई तालाबों से की जाती थी। ये तालाब सिंचाई के साथ-साथ भू-गर्भ के जलस्तर को भी बनाये रखते थे, इस बात के ठोस प्रमाण उपलब्ध है। 1950 से पहले तो हमारे तालाब ही सिंचाई के प्रभावी साधन थे। सूदूर भूतकाल में तो 8 प्रतिशत से अधिक सिंचाई तालाबों से ही होती थी। तालाबों में पाये गये शिला-लेख इसके जीते-जागते प्रमाण हैं। ये तालाब हिन्दुस्तान के हर कोने में पाये जाते रहे हैं। सबसे अधिक सुमन्द्रतटीय जिलों में तथा पूर्वी उत्तर प्रदेश, बिहार और राजस्थान में तालाबों से होने वाली सिंचाई का क्षेत्रफल 1890 तक निरन्तर बढ़ता रहा था। इस स्वावलम्बी सिंचाई योजना को अंग्रेजों ने जानबूझकर खत्म करने का जो षडयंत्र रचा था, उसे स्वतंत्र भारत के योजनाकारों ने बरकरार रखा है और वर्तमान, जनविरोधी, ग्राम-गुलामी की सिंचाई योजना को तेजी से लागू किया है।

गत वर्षों के भयंकर अकाल ने एक बार फिर तालाबों की याद दिलाई है। इस पर जगह-जगह कुछ लोगों ने अध्ययन

किये हैं। इन अध्ययन-कर्ताओं में श्री वान ओप्पन तथा सुब्बाराव का मानना है कि, तालाबों से सिंचित जमीन असिंचित भूमि की अपेक्षा तीन गुनी अधिक उपज देती है। सूखे इलाकों में खास तौर से तालाब की सिंचाई काफी लाभदायक सिद्ध हुई है। इसी प्रकार अब देश के कोने-कोने में तालाबों के महत्व को समझने वाले अनेकों स्वैच्छिक समूह प्रकाश में आये हैं जो इस ओर काफी चिन्तित हैं, और कुछ न कुछ कर रहे हैं। ये राजस्थान, महाराष्ट्र व कर्नाटक में अब पुनः तालाब निर्माण का कार्य कर रही है।

छोटे तालाबों का प्रत्यक्ष अनुभव

कुल मिलाकर हमने गत वर्षों में छोटे-बड़े लगभग ग्यारह हजार से ऊपर तालाब जोहड़, छोटे बांध राजस्थान में बनाये या मरम्मत कराये हैं। इनमें कुल दस करोड़ रुपया लगा है, लेकिन इनके लाभ देखे जायें तो हमें स्वयं को आश्चर्य होता है। उदाहरण के लिए, वर्ष 1986 में गोपालपुरा गांव के सिंचाई के तथा पीने के पानी वाले कुएं सूख गये थे। गांव के जवान लोग मजदूरी के लिए दिल्ली तथा अहमदाबाद चले गये थे। जमीन में कुछ पैदा नहीं हो रहा था, तभी इस गांव में तालाब के निर्माण का कार्य जारी किया गया और सन् 1987 के जून तक गोपालपुरा गांव में तीन बड़े तालाब बनाये। गांव वाले इन्हें बांध कहते हैं तथा एक छोटा तालाब बनकर तैयार हो चुके थे। इनके निर्माण कार्य में दस हजार रुपये की कीमत का गेहूं दिया गया। जुलाई 1987 में इस क्षेत्र के अन्दर कुल 13 सेंटीमीटर वर्षा हुई यह सारी वर्षा एक साथ ही 48 घंटे के अंदर हो चुकी थी। इनके पानी से जमीन "रिचार्ज" यानी पुनः सजल हो गई, और गांव के आस-पास के 20 कुओं में जलस्तर ऊपर आ गया। बेकार-बंजड़ जमीन पर 100 एकड़ खेती होने लगी।

वर्षा का पानी जो तालाबों में इकट्ठा हुआ था, वह अपने साथ जंगल व पहाड़ियों

से पत्ते, गोबर आदि भी बहाकर ले आया था, जो तालाबों की तली में बैठ गया। बड़े तालाब खेतों की जमीन पर बने हुए थे। इसलिए नवम्बर तक पहुंचते-पहुंचते तालाबों का पानी तो नीचे की जमीन की सिंचाई करने के काम में ले लिया गया और तालाब के पेटे की जमीन में गेहूं की फसल बो दी। एक फसल में केवल इन तालाबों की जमीन से ही 300 (तीन सौ क्विंटल अनाज पैदा हुआ जिसकी कीमत बाजार भाव से करीब पौने लाख होती है। इसके अलावा तालाब में पूरे वर्ष पानी भरा रहा। इसे पशुओं के पीने के पानी के लिए बनाया गया था। इस प्रकार गांव के पशुओं को पूरे वर्ष पीने का पानी सहज उपलब्ध होता रहा। गांव का पीने का पानी वाला कुआं जो सूख गया था वह अब पानी भरा रहता है। कुओं का जल स्तर अब 90 फीट नीचे से उठकर 20 फीट तक पहुंच गया है।

तालाबों के चारो तरफ हरी घास उगने लगी है। पेड़ हरे-भरे होकर तेजी से बढ़ने लगे हैं। तालाबों का पानी जंगली पशुओं तथा पक्षियों को अपनी तरफ आकर्षित करता है, जिसमें एक उजड़े हुए गांव का वातावरण सुहावना बन गया है। पक्षियों द्वारा फसल को नुकसान पहुंचाने वाले कीड़े खाये जाने तथा पक्षियों की बीट से जमीन के पानी के उपयोग की व्यवस्था फिर से सामुदायिक भावना और परस्पर सहयोग का वातावरण बन रहा था। पीने का पानी लाने के लिए पहले दूर जाना पड़ता था, जिसमें गांव की महिलाओं की बहुत सी समय शक्ति नष्ट होती थी। यह परेशानी अब खत्म हुई है। इसी तरह हर वर्ष गांव से मजदूरी करने लोगों को बाहर जाना पड़ता था, पर अब इन्हें गांव में ही काफी काम मिलने लगा है। नीमी जैसे कई गांव जिनमें पहले मजदूरी करने जयपुर जाते थे। अब ये जयपुर के शेटों को रोजगार देने वाले बन गये हैं। शेटों के ट्रक इन गांवों

की सब्जियां शहरों में ढोने का काम करते हैं। इस प्रकार इन तालाबों के कारण अनेक लाभ हुए हैं।

यह क्षेत्र पहाड़ की तलहटी में और ढालू होने के कारण तजे वर्षा के पानी जमीन को काटकर बहा ले जाता था। जमीन का उपजाऊपन वर्षा के पानी के साथ बाहर चला जाता था, इसलिए जमीन में नमी की कमी रहती थी, तथा फसल का बीज ही क्या घास तक नहीं उगती थी। वहां वर्षा कम होती है, और जो होती है, वह भी एक साथ और तेज होती है, फिर पूरा साल सूखा पड़ता रहता है। इसलिए इस क्षेत्र में तालाब अत्यन्त आवश्यक एवं खास तौर से उपयोगी है। तालाबों से अब भूमि का कटाव भी रूक गया है।

इसी प्रकार किशोरी गांव में एक "चैकडैम" बना है, जिसे बड़ा तालाब कह सकते हैं। यह भी जुलाई 1987 में पूरा तैयार हो चुका था। इसके निर्माण में कुल लागत पचास हजार रुपये) आई, जिसमें आधी लागत ग्राम के श्रमदान से जुटाई गई इस तालाब के भराव क्षेत्र में ही 250 विक्टल अनाज पैदा हुआ। यह तालाब एक ऐसी तेज धारा को रोकता है, जिसने गत वर्षों में सौ एकड़ से अधिक भूमि को बंजर (खेती के अयोग्य) बना दिया था। जमीन में बड़े-बड़े नाले व खड्डे हो गये थे। वह जमीन स्वतः ही समतल होने लगी है। अब वह खेती योग्य हो गई है। कहा जा सकता है कि इस तालाब ने पूरी एक सौ एकड़ जमीन खेती के योग्य बना दी है। कुओं का जलस्तर ऊपर आ गया है। इस तालाब में रूकने वाला पानी जो पहले नीचे जाता जिस सैकड़ों एकड़ भूमि को बिगाड़ता था, वह बिगाड़ा भी अब रूक गया है। तालाबों से एक लाख की लागत से एक हैक्टर भूमि पर सुक्षक खेती हो सकती है। बड़े बांध द्वारा सम्भव नहीं है। यह खर्च भी गरीबों को नहीं मिलता। बड़ी कम्पनियां

ही इस धन को डकारती हैं। किसानों और सिंचाई का सारा पैसा किसानों का बजट बड़ी कम्पनियां खाती हैं।

चम्बल का प्रत्यक्ष अनुभव

चम्बल के गांवों में जो साथी बन्दूक लेकर फिरते थे। अब इन्होंने बन्दूक छोड़कर फावड़े से तालाब बनाने शुरू किये, तो इनके काम से करौली जिले की सपोटरा तहसील के गांवों के जीवन में सुख समृद्धि शांति आ गई डकैत कहलाने वाले भाई सज्जन-किसान और देवता बन गये। अब इनकी महेश्वरा नदी शुद्ध-सदानीरा बनकर बहने लगी। खिजुरा गांव बहुतों को दूध-अनाज देने वाला बना गया है। इन्होंने हजारों को अपने गांव में बुलाकर कुंभ किया। बेपानी से पानीदार बन गये। अब तक 10853 वर्ग किमी क्षेत्रफल में बारह सौ गांवों ने अपने हाथों से ग्यारह हजार से ज्यादा तालाब बनाकर राजस्थान में छोटी-छोटी नदी अरवरी, सरसा, रूपारेल, भगाणी, जहाजवाली, साबी, सैरनी, महेश्वरा व महाराष्ट्र में महाकाली व अग्रणी नदियां पुनर्जीवित हो गई अब भूजल का स्तर ऊपर आकर नदियों को सदानीरा बना रहा है। बढ़ते ताप और बिगड़ते मौसम के मिजाज को भी तालाबों की नमी हरियाली बटाकर ठीक करती है। वातावरण के कार्बन को पेड़ अपने पत्तों, तनों और जड़ों में जमाकर लेते हैं। अतः तालाब जैसा छोटा स्थानीय काम वैश्विक समस्या बिगड़ते मौसम के मिजाज और धधकते ब्रहामाण्ड को सन्तुलित करने का उपचार है।

आर्थिक लाभ के साथ-साथ आनन्दानुभूति

हमने अब तक जो 13800 तालाब बनाये हैं, उनके अनुभव पर से हम पूरे अधिकार के साथ कह सकते हैं कि किसी भी तालाब के निर्माण में जितनी रकम खर्च होती है, उसकी पूर्ति, यदि सामान्य वर्षा हो जाये, तो एक

वर्ष में हो जाती है। हम आंकड़ों की भाषा नहीं जानते, लेकिन इस काम में लगे श्रम से अधिक आर्थिक लाभ के साथ-साथ गांव की एकता का सुखी आनन्दमय वातावरण तथा बे-सहारा पशु-पक्षियों को तालाब पर किलोलें करते देखकर मन बाग-बाग हो जाता है। इस आनन्दानुभूति के कारण आगे से और हजारों से लाखों तालाबों के निर्माण की शक्ति हममें आ गई है। अमेरिका के साथी पैट्रिक मेकौली ने हमारे तालाबों का अध्ययन करके लिखा है। तालाब में हजार लीटर पानी पकड़ने में तीन रुपये खर्च हुआ है। बड़े बांधों में इस पानी को पकड़कर उपयोगकर्ता तक पहुंचाने में तीन सौ से अधिक खर्च होता है। अतः तालाबों में पानी पकड़कर उपयोग करना ही सबसे सस्ता और स्थाई सनातन उपाय है।

तालाब व्यवस्था आज के अभिजात वर्ग की आंख में किरकरी!

इस भौतिक और भावनात्मक लाभ के साथ-साथ इस काम ने आज की शोषणकारी और विकृत व्यवस्था का गंगा चित्र भी सामने ला दिया है। दरअसल राजनेताओं को गांववासियों की बन रही शक्ति पता नहीं क्यों नहीं सुहाती है? प्राशासनिक अधिकारियों तथा तकनीकी लोगों को तो गांव-वासियों की शक्ति और परम्परागत स्वावलम्बन की पद्धति अखरती ही रही है। जब ये तालाब बनने आरम्भ हुए थे, तो एक बार राजस्थान सरकार के सिंचाई विभाग के अधीक्षक अभियन्ता से इन्हें अवैध कहकर तोड़ने का नोटिस दिया था। जिलाधीश ने भी इस बात की पैरवी की थी। इन्हें तोड़ने के लिए राज्य-सचिवालय में काफी सरगर्मी रही, पर गांव वालों के डटे रहने के कारण फिर जांच हुई और छः माह बाद विकास आयुक्त का पत्र आया कि यह अच्छा कार्य है, इसमें सरकार को सहयोग करना चाहिए। उपमुख्यमंत्री, सिंचाई ने कहा राजेन्द्र सिंह ने राजस्थान सरकार का पानी रोका है।

यह हमारी जेल में रहेगा। मुझे जेल तो नहीं भेज सके।

देखने और समझने में आया है कि जब सरकार को मजबूरी हो जाती है, तो जिस काम को पहले बुरा, अहितकर, यहां तक की कभी-कभी 'देशद्रोही' बतलाया गया हो वह भी उपयोगी बन जाता है। ठीक यही इस तालाब-प्रकरण में हुआ। जब मुख्यमंत्री को यह बात मालूम हुई कि तालाब लोगों ने मिलकर बनाये है और तालाब तोड़े गये तो तालाब टूटने से पहले वहां के लोग मरने को तैयार हैं, तो ये 'अवैध' तालाब वैध होने के साथ-साथ बहुत अच्छे हो गये। इस अच्छे कार्य में सरकार का सहयोग प्राप्त करने की सलाह भी हमें साथ में मिली। संयुक्त राष्ट्रसंघ जिन जोहड़ों को नारु रोग का जनक मानकर जोहड़ों को पूरा करने की सलाह दे चुका था। उन्हें ही जोहड़ नाम से 'बेस्ट प्रकटिस' कहना शुरू किया है। सवाल यह उठता है, कि आज हर अच्छे रचनात्मक काम के लिए पहले संघर्ष क्यों करना पड़ता है। अच्छा करने हेतु हमेशा शिक्षण, रचना, संगठन और सत्याग्रह करना पड़ता है।

क्या हम आशा करें?

बड़े बांध और नहरों से होने वाली सिंचाई का खर्च चालीस हजार से एक लाख रुपये प्रति हैक्टेयर पहुंच गया है। इसके अलावा तवा, नर्मदा, भांखडा आदि से निकलने



वाली नहरों का दुष्परिणाम भी लोगों ने देख लिया है। इसे समझकर जगह-जगह इन बांधों का विरोध भी हो रहा है। विरोध करने वाले छोटे बांध या सिंचाई के तालाबों की बात भी सुझा रहे हैं। आशा है जब हमारे योजनाकार ही इस बात को मान जायेंगे और तालाब बनाने को अच्छा काम कहेंगे, तथा जो पैसा अभी बड़े बांधों पर खर्च हो रहा है उससे बहुत कम खर्च में तालाबों के जरिए उतना ही काम करने की संस्तुति करेंगे। लेकिन वह दिन तभी आयेगा जबकि हम सरकार की कोई मजबूरी बनेंगे। अब हमें बड़े बांधों पर रोक लगाने के लिए सरकार की मजबूरी ही खोजनी पड़ेगी। तभी तालाबों को भी संरक्षण मिलेगा। महाराष्ट्र के मुख्यमंत्री ने बड़े बांधों का काम रोककर जलयुक्त शिवार शुरू किया है। लेकिन इसमें भी ठेकेदार पहुंचकर बिगाड़ कर रहे हैं। अन्यथा यह सर्वोत्तम योजना थी। अभी सरकार पुनः अच्छी कोशिश शुरू कर रही है। यहां की सरकार ने जल साक्षरता आरम्भ करके जलयुद्ध को शांति में बदलने का प्रयास है।

तेन व्यक्तेन भुज्जीथा:

'यह सारी सृष्टि मेरे लिए बनी है, मैं जितना और जिस प्रकार चाहूं उसके उपयोग का मेरा अधिकार है'—यह गलत धारणा ही आज की कई आर्थिक समस्याओं की जड़ में है। वास्तव में सृष्टि मनुष्य के लिए नहीं है, सृष्टि का अपना स्वतंत्र प्रयोजन है। मनुष्य उसका एक अंग है, अतः सृष्टि का आदर करके जीना है। कुल मिलाकर सारी सृष्टि एक है, उसके विभिन्न अंश परस्पर संबंधित ही नहीं परस्पर अवलम्बित है। सृष्टि 'मेरे लिये' नहीं है। वास्तव में

वह 'किसी के लिये' नहीं है। सब मिलकर सबके लिए है। इसलिए मनुष्य को प्रकृति से उतना ही लेना चाहिए जितना उसकी जीवन-धारणा के लिए आवश्यक हो। और 'जो लिया जाये वह भी सेवा करके, त्याग करके, बदले में अपनी ओर से कुछ न कुछ करके अर्थात् यज्ञ करके भारत में प्रकृति को यज्ञ द्वारा देकर ही लने की परम्परा थी। यह उपनिषद में निम्नवत कहा गया है—

**ईषावास्थ्यमिदम् सर्वम् यत्किञ्च जगत्यां जगत्।
तेन व्यक्तेन भुज्जीथाः मागुधः कस्यस्विद्धनम्॥**

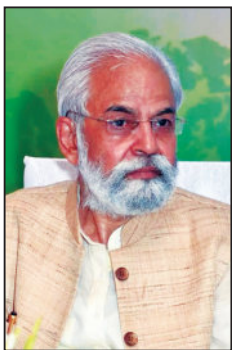
जितना हम अपने जीवन में जल उपयोग करे उतना ही हम अपने श्रम से पसीना बहाकर, तालाब बनाकर, प्रकृति के कार्य में सहयोग दें। जितना लें उतना ही, वैसा ही प्रकृति को तालाब बनाकर हम लौटाते हैं। इसलिए तालाबों की परंपरा समयसिद्ध और आज भी खरी है। जहाँ समाज लगता है, तालाब बनाकर अपने को पानीदार बना लेता है। तालाब तोड़ने वालों का सामना करके भी अपने तालाब बचा लेता है।

हमारे तालाब दुनिया के सबसे बड़े बांध हैं। आज से बने बड़े बांधों से हजारों-लाखों बेघर होते हैं। हजारों तालाब बेघरों को घर-बार, पेड़-पौधे, रोटी-पानी देकर आबाद बनाते हैं। बाढ़-सुखाड़ रोकते हैं। मौसम का मिजाज सुधारते हैं। ब्रहामण्ड का ताप सन्तुलित बनाते हैं।

भारत का किसान जब तक खेती को संस्कृति मानकर जल व मिट्टी का संरक्षण करता रहा तभी तक उसकी स्थायी समृद्धि बिना धरती को बिगाड़े बनी रही। तभी तक भारत का किसान दुनिया को सिखाने वाला प्राकृतिक उत्पादनकर्ता था। आज किसान को अपने उस मूल ज्ञान की तरफ पुनः देखने व उसी दिशा में काम करने की जरूरत है।

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कैसे सुधरेगी जलवायु परिवर्तन से बंजर होती जमीन



ज्ञानेन्द्र रावत

वरिष्ठ पत्रकार, लेखक एवं पर्यावरणविद्
अध्यक्ष, राष्ट्रीय पर्यावरण सुरक्षा समिति

अब यह स्पष्ट है कि जलवायु परिवर्तन समूची दुनिया के लिए सबसे बड़ा खतरा बन चुका है। जलवायु परिवर्तन से जहां समुद्र का जलस्तर बढ़ने से कई द्वीपों और दुनिया के तटीय महानगरों के डूबने का खतरा पैदा हो गया है, वहीं सूखे, जमी मिट्टी के ढीली होने के चलते तेजी से बिखरने, मिट्टी में कार्बन सोखने की क्षमता कम होते जाने, खारापन बढ़ने, बेमौसम बारिश के कारण बाढ़ आने, कम समय में ज्यादा बारिश आने और शुष्क भूमि पर निर्भर लोगों के लिए भोजन का संकट बढ़ने का भीषण संकट पैदा हो गया है। सबसे बड़ा संकट तो जमीन के दिनोंदिन बंजर होने का है। यदि सदी के अंत तक तापमान में दो डिग्री की बढ़ोतरी हुई तो 115.2 करोड़ लोगों के लिए जल, जमीन और भोजन का संकट पैदा हो जायेगा। इस बारे में संयुक्त राष्ट्र महासचिव एंतोनियो गुतारेस का कहना एकदम सही है कि ग्रीन हाउस गैसों के उत्सर्जन में कटौती के लक्ष्य अब भी पहुंच से बाहर हैं। यही कारण है कि जलवायु आपदा टालने में विश्व पिछड़ रहा है। उनका मानना है कि समय की मांग है कि समूचा विश्व समुदाय सरकारों पर

दबाव बनाये कि वह समझ सकें कि इस दिशा में हम पिछड़ रहे हैं और हमें तेजी से आगे बढ़ने की जरूरत है। यदि वैश्विक प्रयास तापमान को डेढ़ डिग्री तक सीमित करने में कामयाब रहे तो भी 96.1 करोड़ लोगों के लिए यह खतरा बरकरार रहेगा। फिलहाल विज्ञान कह रहा है कि ग्रीनहाउस गैसों के उत्सर्जन में कटौती की दिशा में यदि समय रहते प्रयास किए गए तो इन लक्ष्यों को हासिल किया जा सकता है।

संयुक्त राष्ट्र द्वारा जारी "लैंड डिग्रेशन न्यूट्रिलिटी टारगेट सेटिंग" रिपोर्ट के अनुसार भूमि की बर्बादी के चार बड़े कारणों में पहला सबसे बड़ा कारण जंगलों का अंधाधुंध कटान है। दूसरा आबादी में बढ़ोतरी और संरचनात्मक ढांचे में बदलाव है। तीसरा जमीन का सही तरीके से प्रबंधन न होना और खेती के पुराने तौर-तरीके। चौथा कारण है मौसम की अतिवादी घटनाएं जिनमें बाढ़, सूखा, कम समय में ज्यादा बारिश आदि प्रमुख हैं। असलियत में जलवायु परिवर्तन के प्रभावों के कारण मौसम के रौद्र रूप ने पूरी दुनिया को तबाही के कगार पर ला खड़ा किया है जिसका सबसे ज्यादा असर जमीन पर पड़ रहा है। जलवायु परिवर्तन की सबसे बड़ी वजह मरुस्थलीकरण है। इसका असर आने वाले दिनों में विकासशील देशों के 1.3 से 3.2 अरब लोगों पर पड़ेगा। इस कटु सत्य को नकारा नहीं जा सकता। असलियत यह है कि इसके परिणामस्वरूप बंजर

और मरुभूमि में जमीन के तब्दील होने के कारण मिट्टी में कार्बन की मात्रा कम हो रही है जिससे ग्रीनहाउस गैसों के उत्सर्जन में बढ़ोतरी हो रही है। इंटर गवर्नमेंटल पैनल ऑन क्लाइमेट चेंज की मानें तो बड़े पैमाने पर कार्बन को खुद में समेटे पर्माफ्रॉस्टम या तुषार मिट्टी कहें या फिर जमी हुई मिट्टी अब ढीली पड़कर बिखरने लगी है। तुषार मिट्टी या जमी हुई मिट्टी वह है जो शून्य डिग्री तापमान होने से जम चुकी होती है या ठोस रूप अख्तियार कर चुकी होती है। जो इलाके बर्फ से नहीं ढंके होते हैं, वहां यह मिट्टी की एक परत के नीचे होती है। तापमान में जैसे जैसे बढ़ोतरी होती है, वैसे ही यह बिखरने लगती है। ऐसी मिट्टी कहीं भी हो, उसका असर समूचे विश्व पर पड़े बिना नहीं रहता। अगर प्रदूषणकारी तत्वों के उत्सर्जन में कमी नहीं की गई तो इसके बिखरने की प्रक्रिया और तेज हो जायेगी। इसके गिरने से उसमें समाहित कार्बन डाई ऑक्साइड और मीथेन हवा में घुलेगी, नतीजतन जलवायु परिवर्तन का खतरा और गंभीर रूप से बढ़ जायेगा। अगर प्रदूषण में कमी नहीं लाई गई तो 2100 में कम से कम 30 फीसदी तुषार मिट्टी या जमी हुई मिट्टी ढीली होकर फैल जायेगी।



विशेषज्ञों के अनुसार ग्रीनहाउस गैसों के कुल वैश्विक उत्सर्जन में कृषि, वन और भूउपयोग की हिस्सेदारी लगभग एक तिहाई है। आईपीसीसी की मानें तो खेतों और घास के मैदानों की मिट्टी में कार्बन सोखने की क्षमता प्रतिवर्ष 0.4–8.6 गीगीटन होती है जो अमरीका द्वारा चरम स्थिति में उत्सर्जित सालाना प्रदूषण के डेढ़ गुणा के बराबर है। लेकिन कृषि पद्धतियों एवं भूमि उपयोग में लाये जाने वाले तरीकों से इसमें बदलाव संभव है। जहां तक जंगलों के कटान का सवाल है, जंगलों के कटान के कारण ग्रीनहाउस गैसों के उत्सर्जन में बढ़ोतरी होती है। भूक्षरण के कारण मिट्टी में कार्बन तत्वों के घनत्व में कमी आने के कारण उसी जमीन पर पनपने वाले वन पुराने वनों के स्तर की भरपाई कतई नहीं कर पाते। वन प्रबंधन से वन भूमि पर कार्बन के भंडार को कम करने के प्रयास से भी उत्सर्जन बढ़ता है। देखा गया है कि पारंपरिक खेती के उपयोग वाली मिट्टी लगातार होने वाले ग्रीनहाउस गैसों के उत्सर्जन का स्रोत बनी रहती है। जबकि कृषि भूमि की मिट्टी खेती में इस्तेमाल में लाये जाने से पहले 20 से 60 फीसदी जैविक कार्बन को खो देती है। दरअसल औद्योगिक क्रांति के बाद से ही पारिस्थितिक तंत्र में बदलाव के कारण मिट्टी में कार्बन की मात्रा घटी है। यह सिलसिला अभी बदस्तूर जारी है। आज जिस तरह की चुनौतियां मौजूद हैं, उसके मद्देनजर इस क्षमता को बढ़ाये जाने की जरूरत है।

गौरतलब यह है कि आज समूची दुनिया में करीब 40 फीसदी जमीन बंजर हो चुकी है। यदि इसमें से 6 फीसदी घोषित रेगिस्तान को छोड़ दिया जाये तो यह साफ है कि 34 फीसदी जमीन पर करीब चार अरब लोग निर्भर हैं लेकिन मानवीय हस्तक्षेप के चलते वह बर्बाद हुयी है। इस पर सूखा, यकायक ज्यादा बारिश, बाढ़, खारापन, रेतीली हवायें, आदि के चलते बंजर होने का खतरा मंडरा रहा है। जलवायु परिवर्तन

के चलते यह खतरा दिनोदिन और बढ़ता ही जा रहा है। भारत में करीब 69 फीसदी शुष्क भूमि बंजर होने के खतरे का सामना कर रही है। जमीन के खराब होने के चलते इस पर निर्भर लोगों के ऊपर पैदा खतरे को नकारा नहीं जा सकता। आज दुनिया के 52 से 75 फीसदी देश भूमि क्षरण की मार झेल रहे हैं और हाल-फिलहाल इन देशों के करीब 50 करोड़ लोग इससे प्रभावित हैं। यह खतरा बीते कुछ दशकों से तेजी से बढ़ रहा है। यह आंकड़ा 2007 में करीब 25 करोड़ होने का अनुमान था। 2015 में यह 50 करोड़ के करीब था जो सदी के अंततक बढ़कर दोगुणे से भी ज्यादा हो जायेगा।

शोध और अध्ययन इसके जीते-जागते सबूत हैं कि जलवायु परिवर्तन के चलते भूमि का क्षरण दस से बीस गुणा तक ज्यादा बढ़ गया है। यह भूमि के निर्माण की तुलना में सौ गुणा ज्यादा है। आंकड़ों की मानें तो 1961 से 2013 के बीच भारत समेत समूची दुनिया में शुष्क जमीन एक फीसदी की दर से सालाना बढ़ी है। लेकिन आने वाले दिनों में इसमें अधिक तेजी आने की आशंका व्यक्त की जा रही है। भारत में गंगा बेसिन सबसे ज्यादा संवेदनशील है। जबकि पाकिस्तान में सिंधु बेसिन, चीन में यलो रिवर व चिनयुंग के मैदानी इलाकों से हरियाली पूरी तरह गायब हो चुकी है। यह खतरा एशिया के बाहर के देशों में भी तेजी से बढ़ा है। उत्तरी अमरीका में यह आंकड़ा 60 फीसदी, ग्रीक, इटली, पुर्तगाल और फ्रांस में 16 से 62 फीसदी, उत्तरी भूमध्य सागरीय देशों में 33.8 फीसदी, स्पेन में 69 फीसदी, साइप्रस में यह खतरा 66 फीसदी जमीन पर मंडरा रहा है। जबकि अफ्रीका के 54 में से 46 देश बुरी तरह इसकी जद में हैं।

यह स्थिति भयावह खतरे का संकेत है। 2019 में नौएडा में हुए कॉप-14 सम्मेलन में दुनिया के सौ से ज्यादा देशों के नेताओं ने इसी खतरे से निपटने के बारे में चर्चा की।

सम्मेलन में प्रधानमंत्री नरेन्द्र मोदी समेत विश्व नेताओं ने समवेत स्वर से बंजर भूमि को उपजाऊ बनाने पर जोर दिया और 2030 तक 35 करोड़ हेक्टेयर जमीन को उपजाऊ बनाने का लक्ष्य रखा था। सम्मेलन में जहां प्रधानमंत्री मोदी ने 2030 तक देश में 2.6 करोड़ हेक्टेयर जमीन को उपजाऊ बनाने के लक्ष्य की घोषणा की, वहीं संयुक्त राष्ट्र के कार्यकारी निदेशक इब्राहीम थियाव ने जैविक खेती कर जमीन को बंजर होने से बचाने की अपील की। उनके अनुसार जैविक खेती कृषि पारिस्थितिकी और जैव विविधता के संरक्षण में महत्वपूर्ण भूमिका का निर्वहन करती है। कारण ऐसी खेती से जमीन के पानी सोखने की क्षमता बढ़ जायेगी और उर्वरकों के इस्तेमाल के खतरों से भी बचा जा सकेगा। यह तभी संभव है जबकि भूमि प्रबंधन के तौर तरीकों में बदलाव किया जाये, मिट्टी की कार्बन सोखने की क्षमता बढ़ाने हेतु गहराई तक जड़ें फैलाने वाले पौधे लगाये जायें, कृषि वानिकी, आर्गेनिक सामग्री का इस्तेमाल, फसल चक्र में बदलाव, मिट्टी की किस्म, भूप्रबंधन की वर्तमान और पूर्व में इस्तेमाल की गई पद्धतियों, पर्यावरणीय स्थितियों को दृष्टिगत रखते हुए किया जाये। इससे जहां मिट्टी की गुणवत्ता में सुधार होगा, मिट्टी की कार्बन सोखने की क्षमता भी अपेक्षित बिंदु तक पहुंच सकेगी और फसल उत्पादन में बढ़ोतरी और किसानों को लम्बी अवधि में लाभ भी मिलेगा। इसके लिए इन प्रयासों का क्रियान्वयन बेहद जरूरी है। लेकिन सबसे बड़ी बात जलवायु परिवर्तन की समस्या से निपटने की है। इसके लिए महज बीस अरब डालर की राशि पर्याप्त नहीं है। जबकि जरूरत 68.98 अरब डालर से भी अधिक की है जिसकी फिलहाल संभावना न के बराबर है। इसके बिना सारे प्रयास बेमानी ही रहेंगे।

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वायु प्रदूषण और मानवीय जीवन



जगदीश चौधरी

अध्यक्ष, ग्रीन इंडिया फाउंडेशन ट्रस्ट
सदस्य, विश्व जल परिषद

वायु प्रदूषण के मामले में हमारे देश की स्थिति समूची दुनिया में सबसे खराब है। स्विस आर्गनाइजेशन द्वारा तैयार वर्ल्ड एयर क्वालिटी रिपोर्ट इसका जीता-जागता सबूत है जिसमें इस बात का खुलासा किया गया है कि दुनिया के सबसे अधिक प्रदूषित 30 शहरों में हमारे देश के 22 शहर शामिल हैं। यह हालात की गंभीरता का परिचायक है। यह भी कि देश में वायु प्रदूषण के चलते हृदय रोग, अस्थमा, श्वास, फेफड़ों आदि जानलेवा बीमारियों से ग्रस्त रोगियों की तादाद सुरसा के मुंह की तरह बढ़ती ही जा रही है। यह बेहद चिंतनीय है। दरअसल हवा के प्रदूषित होने से इसमें घुलने वाले छोटे-छोटे कण सांस के जरिये हमारे फेफड़ों तक पहुंचते हैं और फिर वह हृदय, फेफड़ों, श्वास आदि रोगों में बढ़ोतरी करते हैं। दिल्ली स्थित गोर्बिंद बल्लभ पंत अस्पताल में आये-दिन इन रोगियों की बढ़ती तादाद इस तथ्य को प्रमाणित करती है कि वायु प्रदूषण के मामले में देश की राजधानी दिल्ली भी अछूती नहीं है। सबसे बड़ी बात यह कि पार्टिकुलेट मैटर भी खतरनाक स्थिति को पार कर गया है। असलियत में देश की राजधानी दिल्ली दुनिया की सबसे अधिक प्रदूषित राजधानी है और वायु प्रदूषण के मामले में तो उसने

कीर्तिमान बनाया है। देश की राजधानी तो वायु प्रदूषण के मामले में शीर्ष पर है ही, राष्ट्रीय राजधानी क्षेत्र भी वायु प्रदूषण के मामले में उससे पीछे नहीं है। उसमें दिल्ली से सटा उत्तर प्रदेश का सीमांत जिला गाजियाबाद वायु प्रदूषण के मामले में शीर्ष स्थान पर है। यहां वायु प्रदूषण स्वास्थ्य मानकों की दृष्टि से बेहद खतरनाक है।

अक्सर वायु प्रदूषण के लिए वाहनों की बेतहाशा बढ़ती तादाद को जिम्मेदार बताया जाता है। जबकि इसमें केवल वाहनों की बढ़ती तादाद की ही अहम भूमिका नहीं है, भवन निर्माण गतिविधियों पर प्रतिबंध की नाकामी, भवन निर्माण सामग्री का खुलेआम सड़कों पर पड़े रहना, भवन निर्माण सामग्री को ले जाने वाले वाहनों द्वारा बिना ढंके सामग्री ले जाना और औद्योगिक प्रतिष्ठानों द्वारा निकलने वाला जहरीला धुआं भी अहम कारक है। साधारणतया वायु प्रदूषण के लिए खेतों में किसानों द्वारा जलायी जाने वाली पराली को जिम्मेदार ठहरा दिया जाता है जबकि पराली मात्र 2.37 फीसदी ही प्रदूषण के लिए जिम्मेदार है। वैज्ञानिक अनुसंधानों ने इस तथ्य को प्रमाणित कर दिया है। उस स्थिति में हम प्रदूषण बढ़ाने में पराली को पूरी तरह जिम्मेदार नहीं ठहरा सकते। विडम्बना यह कि इसके बावजूद प्रदूषण पर नियंत्रण के लिए जिम्मेदार संस्थाओं के प्रयास नाकाफी हैं। हालात सबूत हैं कि यदि ये संस्थाएं अपना दायित्व ढंग से निबाहतीं तो स्थिति इतनी भयावह न हुई होती।

गौरतलब है कि देश में प्रदूषण से मुक्ति की दिशा में 2017 की शुरुआत में सुप्रीम कोर्ट द्वारा एक अभूतपूर्व निर्णय लिया गया। वह यह कि देश में 31 मार्च 2017 के बाद भारत में स्टेज-3 यानी बीएस-3

वाहनों की बिक्री नहीं होगी और एक अप्रैल 2017 से समूचे देश में बीएस-4 यानी भारत स्टेज एमिशन स्टैण्डर्ड के वाहन बेचे जाएं। प्रदूषण मुक्ति की दिशा में यह एक महत्वपूर्ण कदम रहा। इसकी प्रशंसा की ही जानी चाहिए क्योंकि माना जाता है कि बीएस-3 के मुकाबले बीएस-4 स्तर के वाहनों से प्रदूषण कम होगा। तात्पर्य यह कि बीएस-3 के बनिस्बत बीएस-4 के वाहनों से वायु प्रदूषण बढ़ाने वाले पार्टिकुलेट मैटर का उत्सर्जन तकरीब 80 फीसदी कम हो जायेगा। लेकिन सबसे बड़ी और अहम बात तो यह है कि 31 मार्च तक जिस तेजी से बीएस-3 वाहनों की बड़े-बड़े ऑफरों के नाम पर और रियायत के चलते अंधाधुंध बिक्री हुई, वे और देश में जो लाखों की तादाद में बीएस-3 गाड़ियां सड़कों पर दौड़ रही थीं, वे तो आने-वाले तकरीब 18-20 सालों तक देश में दौड़ेंगी ही। जाहिर है कि वे निर्बाध गति से प्रदूषण फैलाती रहीं और राजधानी क्षेत्र दिल्ली ही नहीं, पूरे देश की जनता इनसे निकले जहरीले प्रदूषण को झेलने को विवश हुई। समूचे देश के लिए यह बहुत बड़ा खतरा और गंभीर चुनौती रही।

वह बात दीगर है कि भारत स्टेज एमिशन स्टैण्डर्ड को हमारे यहां इस सदी की शुरुआत में जब ऑटोमोबाइल के मानकों को कड़े करने की कवायद की जा रही थी, तब अपना शुरु किया था। इसे यूरोप के लिए बने एमिशन स्टैण्डर्ड के आधार पर तैयार किया गया था जो एक तरह से पूरी दुनिया का मानक है। हम दावे कितने भी करें असलियत है कि हम इस मामले में भी विकसित देशों से कितना पीछे हैं, यह इससे जाहिर हो जाता है कि जब हम अपने देश में बीएस-4 लागू करने

की प्रक्रिया शुरू करने के दौर में थे, तब पूरी दुनिया में बीएस-6 की विदाई का दौर जारी था। इससे साफ है कि इस मामले में हम विकसित देशों से तकरीबन आठ साल पीछे चल रहे हैं और यह कि वायु प्रदूषण से फिलहाल मुक्ति नहीं मिलने वाली।

इसका सबसे बड़ा कारण वाहनों की बढ़ती तादाद है जो दिनोंदिन तेजी से बढ़ते जा रहे हैं। हवा में लैंड और हाइड्रोकार्बन की मात्रा दोगुनी होने का सबसे बड़ा कारण दुपहिया वाहन हैं। ट्रकों के बाद प्रदूषण फैलाने में दोपहिया वाहन सबसे आगे हैं। क्योंकि इनकी कुल वाहनों में तकरीब 60 फीसदी हिस्सेदारी है। आईआईटी कानपुर की रिपोर्ट प्रमाण है कि अकेले दिल्ली में 88 लाख से भी ज्यादा गाड़ियां पंजीकृत हैं। 56 लाख से अधिक दोपहिया वाहन हैं जो तेजी से बढ़ रहे हैं। तकरीब 26 लाख से ज्यादा कारें हैं। उनमें 14 लाख रोजाना सड़कों पर निकलती हैं। समस्या की विकरालता का अंदाजा इसी बात से लग जाता है कि वायु प्रदूषण से होने वाली मौतों में पूरी दुनिया में भारत का स्थान दूसरा है। इसका खुलासा ग्लोबल बर्डन ऑफ डिजीज की रिपोर्ट करती है।

देखा जाये तो प्रदूषण का असर हर उम्र के बच्चों पर पड़ता है। नवजात बच्चों का विकास प्रभावित होता है। वे फेफड़ों में संक्रमण और फेफड़े संबंधी बीमारियों के चलते एक से दो माह के भीतर असमय मौत के मुंह में चले जाते हैं। दो से 6 साल तक के बच्चों में अस्थमा, कफ, फेफड़ों की क्षमता कम होने, उनका समयानुसार विकास न होने से वे कई घातक बीमारियों के चंगुल में फंस जाते हैं। स्कूल जाने वाले 6 से 12 साल के बच्चों में अस्थमा, कफ, सांस और फेफड़े की क्षमता कम होने की समस्या पाई जाती है। 12 से 18 साल के बच्चे फेफड़े सम्बंधी बीमारियों के शिकार होते हैं। आईआईटी कानपुर की रिपोर्ट में

खुलासा हुआ है कि दिल्ली की जहरीली हो चुकी हवा में 100 से भी ज्यादा जहरीले रसायन घुले हुए हैं। सीएनजी वाहनों के कारण वायु प्रदूषण पर पड़ा सकारात्मक असर बहुत पहले खत्म हो चुका है। उसके अनुसार दिल्ली एनसीआर में प्रदूषकों के स्तर में कमी लाने हेतु तथा इलाके की हवा को सुरक्षित मानकों में लाने के लिए कड़े हस्तक्षेप की जरूरत है। इसमें 76 फीसदी तक कमी की बेहद जरूरत है।

जहां तक ओजोन का सवाल है, दिल्ली की हवा में ओजोन का स्तर तीन गुणा बढ़ चुका है। यह गंभीर खतरे का संकेत है। इस मामले में हम समूची दुनिया में सबसे पहले पायदान पर हैं। दिल्ली में गर्मी बीते 18 साल का रिकार्ड तोड़ चुकी है। यहां तेज गर्मी और हवा के तेजी से बढ़ते प्रदूषण के चलते ओजोन का स्तर बढ़ रहा है। हवा जहरीली हो रही है। वैज्ञानिक बरसों पहले से चेता रहे हैं कि दिल्ली के लोग रेगिस्तान की झुलसा देने जैसी गर्मी के लिए तैयार हो जायें। यहां पारा चढ़ने के साथ-साथ हवा भी जहरीली होगी। मानक के अनुसार ओजोन का स्तर 100 एक्यूआई से ज्यादा नहीं होना चाहिए जबकि बीते बरसों में राजधानी के विभिन्न इलाकों में ओजोन का स्तर 300 से अधिक था। हवाई अड्डे के आसपास की हवा में ओजोन का स्तर 321 से पार पहुंच गया था। गुरुग्राम और उसके आसपास के इलाके में इसका स्तर 317 के करीब था। असलियत यह है और वैज्ञानिक भी इसकी पुष्टि करते हैं कि हवा में गाड़ियों से निकलने वाली गैसों व हाइड्रोकार्बन की मात्रा अधिक होने पर तापमान 40 डिग्री से अधिक हो जाता है, ऐसी स्थिति में गैसों आपस में क्रिया करके घातक ओजोन गैस बनाती हैं। नतीजतन प्रदूषण के स्तर में बढ़ोतरी होती है।

ओजोन सांस की बीमारी से पीड़ित रोगियों को सबसे ज्यादा प्रभावित करती है।

यह सांस के जरिये रोगी के शरीर के विभिन्न हिस्सों में पहुँच कर सबसे ज्यादा नुकसान पहुंचाती है। विशेषज्ञों का मानना है कि ओजोन को नियंत्रित करने के लिए तत्काल कदम उठाने की जरूरत है। गाड़ियों से निकलने वाले धुंए पर नियंत्रण के साथ ही पॉवर प्लांट, फैक्ट्रियों-कारखानों के धुंए पर भी लगाम लगायी जानी चाहिए। अमेरिकी शोधकर्ताओं के अनुसार जिन इलाकों में वायु प्रदूषण की मात्रा अधिक होती है, वहां रहने वाली महिलाओं को स्तन कैंसर होने का खतरा ज्यादा होता है। शोधकर्ता कहते हैं कि स्तन का आकार उतकों का घनत्व बढ़ने से और बसा की अधिकता से बढ़ता है। उतकों का घनत्व बढ़ने से कैंसर पनपने का खतरा बना रहता है।

दरअसल प्रदूषण वह चाहे जल का हो, वायु का हो, पर अंकुश लगाने में सरकार के दावे और इस दिशा में अभी तक किये गए सारे के सारे प्रयास नाकाम रहे हैं। होना तो यह चाहिए कि वायु प्रदूषण को कम करने की दिशा में जो नीतियां बनायी जायें, वह पर्यावरण हितकारी हों, लेकिन सबसे दुखदायी बात यह है कि आजादी के बाद से आजतक जो भी विकास नीति बनायी गयीं, वह पर्यावरण के अनुकूल नहीं रहीं। उसी का खामियाजा देश आज भुगत रहा है।

विकास जब-जब मानवीय हित और प्रकृति विरुद्ध होता है, उसका दुष्परिणाम सामाजिक, आर्थिक और भौगोलिक स्तर पर तो पड़ता ही है, साथ ही साथ प्राकृतिक संपदा का भी अकूत क्षरण होता है। सच्चाई तो यह है कि जब विकास पर्यावरण हितैषी और जनहितकारी होगा, उसी दशा में प्राकृतिक संपदा सुरक्षित रह पायेगी। जरूरत इस बात की है कि भौतिक सुख-संसाधनों की अंधी चाहत को तिलांजलि दे प्राकृतिक संसाधनों की पुरजोर रक्षा का हरसंभव प्रयास करें। कारण प्रकृति प्रदत्त संसाधन सीमित

हैं और यदि इनका दोहन नहीं रोका गया तो इसके परिणाम भयावह होंगे जिसकी भरपायी असंभव होगी।

असलियत में वायु प्रदूषण की समस्या से कमोबेश समूचा देश जूझ रहा है। कोई महानगर, शहर, कस्बा, धार्मिक स्थल ऐसा नहीं है जो प्रदूषण की मार से बचा हो। हां दिल्ली की हवा में ज्यादा प्रदूषण है, इसे झुठलाया नहीं जा सकता। नीति आयोग भी इसकी पुष्टि करता है। आयोग की मानें तो कोयला आधारित बिजली संयंत्रों, ईट भट्टों, खासकर डीजल से चलने वाले वाहनों,

खाना पकाने, हीटिंग आग जो जलाते हैं, धूल और उत्तर भारत में खासकर पंजाब, हरियाणा और पश्चिमी यू.पी. में फसलों के अवशेषों को जलाना ये वायु प्रदूषण के प्रमुख स्रोत हैं। इसलिए देशभर में सुधारात्मक कार्यवाही के साथ-साथ विभिन्न प्रतिबंधों और यातायात कानूनों का सख्ती से पालन बेहद जरूरी है।

इस पर अंकुश के लिए नीति आयोग का मानना है कि वह पांच सूत्रीय एजेंडा जिसमें पेट्रोल-डीजल पर अधिक टैक्स, उच्च पार्किंग दर, कोयला आधारित बिजली

संयंत्रों को बंद करना, बैटरी चालित वाहनों का इस्तेमाल और सार्वजनिक परिवहन शामिल है, को बढ़ावा देकर आगामी समय में वायु प्रदूषण पर काफी हद तक रोक लगायी जा सकती है। वैसे यह सच है कि देश में भयावह हो चुकी वायु प्रदूषण की समस्या से मुक्ति की राह आसान नहीं है। कानून बनाने से लेकर उसे लागू करने तक इसमें कई बाधाएं सामने आएंगी। इस बीच अहम् सवाल यह है कि इस दौर में हम जियेंगे कैसे?

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Air Pollution

(Research Papers)

AIR POLLUTION IN DELHI NCR REGION: RATIONALE AND POLICIES FOR PREVENTION

Arshi Hussain and Neelam Vashist

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Abstract: Air pollution in India is the fifth largest killer and it is estimated to kill about 2 million people every year. Delhi, the ninth-most populated metropolis in the world second largest if the entire NCR includes especially Faridabad and Gurugram–Haryana, is one of the most heavily polluted cities in India, having for instance one of the country's highest volumes of particulate matter pollution. The reasons of pollution of Delhi NCR air include crop burning in neighbouring states (Punjab, Haryana and Rajasthan), vehicle exhaust, heavy industry such as power generation, small-scale industries like brick kilns, suspended dust on the roads due to vehicle movement and construction activities, open waste burning, combustion of fuels for cooking, lighting, and heating, and in-situ power generation, road dust and industry, with comparatively smaller contributions from unclean engines in transportation, especially diesel-powered city buses and trucks, and 2-wheelers and 3-wheelers with two-stroke engines. Delhi and NCR governments introduced many policies to mitigate and came with many plans and policies in the past like GRAP, NCAP, Odd-Even scheme etc. and new policy to curb air pollution in future by Commission for Air Quality Management in July 2022. This paper provides an evidence-based insight into the causes, status of air pollution in Delhi NCR and its effective control measures.

Keywords: Delhi NCR, Air pollution, Crop burning, Plans and Policies.

AIR POLLUTION: IMPACTS AND CONTROL

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Abstract: Air pollution is a huge global problem. It occurs when gases, dust particles, fumes (or smoke) or odour are introduced into the atmosphere in a way that makes it harmful to humans, animals and plant. Air pollution threatens the health of humans and other living beings in our planet. It creates smog and acid rain, causes cancer and respiratory diseases, reduces the ozone layer atmosphere and contributes to global warming. Many cities around the world have poor air quality. It is a serious global health problem. In some cities it causes a large number of deaths. The World Health Organization says that air pollution kill's around three million people each year.

In this industrial age, air pollution cannot be eliminated completely, but steps can be taken to reduce it. The government has developed, and continues to develop, guidelines for air quality and ordinances to restrict emissions in an effort to control air pollution. On an individual level, we can reduce our contribution to the pollution problem by carpooling or using public transportation. Additionally, buying energy-efficient light bulbs and appliances or otherwise reducing our electricity use will reduce the pollutants released in the production of electricity, which creates the majority of industrial air pollution.

Keywords: Air pollution, Acid rain, Global warming, Carpooling, Respiratory diseases.

COUPLING BETWEEN CLIMATE VARIABILITY AND LONG-TERM TRENDS IN TROPOSPHERIC OZONE OVER INDIAN SUB-CONTINENT

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Abstract: Ozone is a potential oxidant and a greenhouse gas in the troposphere. Production of ozone in the troposphere depends on the concentration of nitrogen dioxide, volatile organic compounds, and meteorological

parameters viz. air temperature, humidity, and wind. Studies to decipher Spatio-temporal variability in tropospheric ozone concentration on different scales and locations have been carried out in India. However, our understanding of the coupling between on-going climate change and tropospheric ozone variability is limited and preliminary. In the present work, we have estimated long-term trends and applied multiple linear regression taking linear trend components of surface ozone (dependent variable), its precursors, and met-parameters (independent variables). Results show a strong coupling between the variability in climate parameters and long-term trends in tropospheric ozone over the North-Western part of the Indian subcontinent including the Indo-Gangetic Plains. The dependence of rate constants of thermochemical reactions responsible for tropospheric ozone formation and the role of air temperature and relative humidity in the ozone precursors' emission could be the plausible direct and indirect routes for the observed coupling. Such coupling has been manifested in urban atmospheres during summer months in the North-Western part of the Indian subcontinent and has implications for acute exposure of ozone to the plant and humans.

Keywords: Ozone, Greenhouse, Indian subcontinent.

POTENTIAL OF AZOLLA PLANTS AS BIO-FILTER FOR CONTROLLING SOIL, AIR AND WATER POLLUTION

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Abstract: Day by day increasing human population coupled with urbanization and industrialization has resulted in over exploitation of natural resources and lowering the natural ecosystem as well as adverse impact on food chain that had given way to increased environmental pollution worldwide. Pollutants like herbicides, pesticide, insecticides, antibiotics and heavy metals (Pb, Cr, Hg, Cu, Zn and Cd) are being discharged directly into soil, water and air. They are getting added/ contaminated with irrigation of water and wind blow metal dust rendering the unhealthy ecosystem. Various technological interventions/ treatment systems which are combination of physical, chemical or biological are used for controlling environmental pollution. But they are very expensive and unaffordable to common men. Thus, search for natural alternative. Azolla is a free floating freshwater fern capable of fixing atmospheric CO₂ and nitrogen as well as bio-filter for various pollutants. Azolla cultivation is an excellent, low cost natural alternative to ward off the air, water and soil pollutants. Pesticides contamination in river fish, sediments and water ecosystem has become one of the most sensational issues due to their deleterious effect on public health and environment. Azolla plants also remove ammonia from freshwater fish breeding areas. The world will eventually face a war like situation for maintaining healthy ecosystem and food chain. Hence, cultivation of Azolla plants is cost effective and efficient natural alternative for controlling soil, air and water pollution.

Keywords: Food chain, Heavy metals, Azolla, Ecosystem.

INFLUENCE OF CONDENSED TANNINS AQUEOUS EXTRACT SUPPLEMENTATION FROM TANNIFEROUS TREE LEAVES ON IN VITRO METHANE REDUCTION AND CONTROL ENVIRONMENTAL POLLUTION

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Abstract: Study was conducted to explore the effect of graded levels of condensed tannins aqueous extract (CTAE) (0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 % of DM) from leaves of *Artocarpusheterophyllus*, *Eugenia jambolana*,

Ficusinfectoria, Ficusglomerata and Psidiumguajava) on in vitro methane production in rumen. Gas volume in 24 hours (ml 200 mg-1) was reduced significantly ($P < 0.05$) as the CTAE level increased from 1-3%. Methane produced in 24 hours (ml g-1 DM) was reduced significantly ($P < 0.05$) as the CTAE level increased from 1-3%. Among the various CT sources, average CH_4 (ml g-1 DM) produced in 24 hours was significantly lower in CTAE of A. heterophyllus leaves followed by comparable CH_4 production among F. infectoria, P. guajava and F. glomerata and the highest CH_4 production in E. jambolana. The percent reduction in CH_4 production was highest ($P < 0.05$) in P. guajava followed by F. infectoria, A. heterophyllus and E. jambolana and least CH_4 reduction was evident in F. glomerata. It was concluded that CTAE supplementation at 1 to 3% levels considerably decline methane production in rumen and control environmental pollution.

Keywords: Methane, CTAE, A. heterophyllus, Gas volume.

AIR QUALITY MODELLING TO INVESTIGATE VARIOUS PARAMETERS PRESENT IN AIR

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Abstract: Air quality models are those which are used to investigate the effects of concentration of air pollutants on environment and human health. Air quality models helps to understand the extremity of studying the various types of air pollution by revealing the contribution of the air pollutants to environmental decision-making authority. Some modelling techniques have been used for many scenarios including, finding the concentration of both air pollutants. *i.e.*, primary and secondary including the highly complexed secondary air pollutants like ozone and also focussing on study areas. Studies on the basis of the performance using the methodical science which were carried out in different parts of India majorly in northern and central region of India but in the megacities only rather than small cities which require more attention in future. On the basis of the many methods, conclusion is that the highly preferred method of air pollution determination is hybrid methods. Air quality forecast (AQF) used to improve the air quality and lowers the effects on public health, agriculture and climate. Sportise in 2007 was found that there were some uncertainties from which the air quality modelling and simulation suffers. Present studies suggested some recommendations for building an AQMs includes-Manufacturing the AQMs according to goal, and Focus on directing towards its limitations and potential. Present study mainly targets on the current status determination as well as prioritize on types of modelling techniques.

Keywords: Air pollutants, Air Quality Modelling, Air Quality Forecast, Environment, Human health.

DESIGN AND FABRICATION OF VERTICAL AXIS HELICAL WIND TURBINE

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Abstract: The current world is struggling with the power availability and its sources because the conventional sources will end someday. So, to find a solution for power we need to think about using non-conventional sources of energy. This paper consists of development of a helical shaped wind turbine which can produce more power as compared to the usual Savonius Wind Turbine. The paper aims not only to use a clean source of energy to power everyday needs, but also to provide a cost reduction in the large amount of funds that are spent yearly on generating power. The turbines that are going to be created are safe in nature and are very cost efficient. With the help of this design extracted power from wind when wind velocity is 10 m/s than extracted power is 171.5watt, when wind velocity 15 m/s 578.8 watt. Economically, this project is more ideal on a small-scale implementation such as rural areas. Where producing and transmitting sufficient energy can be very expensive.

Keywords: Savonius Wind Turbine, Cost reduction, velocity.

CARBON SEQUESTRATION POTENTIAL OF PINUSROXBURGHII IN THE WESTERN HIMALAYAS

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Abstract: Growing global concern over increasing levels of CO₂ in the atmosphere has led to emphasis on mitigation options. Sequestering carbon in trees is one such option. Forests are efficient source for sequestering carbon as they fix it in the form of wood and retain it for a longer duration. Different forest species are adapted to different climatic conditions; therefore knowledge of a species with respect to its carbon sequestration potential at a particular location is essential. In the Western Himalayan region, particularly in the Shivalik forests, Pinusroxburghii is one of the most common species. A study was carried out at Bill a war forest in Kathua district of Jammu in the union territory of Jammu and Kashmir to estimate the carbon stock and its potential to sequester atmospheric CO₂. The study was conducted in the Pinusroxburghii forest area at an altitude ranging from 1000-1800 m. Random sampling method was used for collecting the data. Fifteen quadrates of size 20 × 20 m² were laid out in the study area. All the pine trees were measured for the diameter at breast height (dbh) using a tree calliper and tree height with Nikon Forestry Pro Laser Rangefinder. The data were analysed through one way ANOVA at p ≤ 0.05 level of significance. Mean tree diameter was 33.2 cm and mean tree height was 17.35 m. The growing stock volume density (GSVD) was 299.34 m³ ha⁻¹ which was determined with the help of species specific regression equation ($\sqrt{V} = 0.05131 + 3.98598D - 1.0245\sqrt{D}$) for Pinusroxburghii of western Himalayas. Above ground biomass density (AGBD), below ground biomass density (BGBD), total biomass density (TBD) and total carbon density (TCD) at the study site was 179.01 Mg ha⁻¹, 50.12 Mg ha⁻¹, 229.13 Mg ha⁻¹ and 107.69 Mg ha⁻¹, respectively. Carbon dioxide equivalent (eCO₂) was calculated by multiplying TCD to factor 3.67 (ratio of CO₂ to C) which was recorded as 395.22 Mg ha⁻¹. The current study shows that Pinusroxburghii plays a significant role in carbon sequestration in the western Himalayan region.

Keywords: Sequestration, biomass density, Shivalik forests, Western Himalayan region.

APPLICATIONS OF AMBIENT NOISE MEASUREMENTS IN UNDERSTANDING LANDSLIDE DIRECTIONAL BEHAVIOR

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Abstract: Northwest Himalayan Mountains have high rate of instability and variability due to landslide processes and neotectonic activities. The landslides are quite common during the monsoon season due to high rainfall, steep slopes, less stability of rocks, and toe erosion. Himachal Pradesh is one such region in northwest Himalaya that suffers several landslides activity due to tectonic and anthropogenic activities in these geologically young and unstable mountains. Some of the landslides in Himalayan regions are located along the tectonic boundaries and often cause severe destruction to residents and agricultural land. One such slide occurred at midnight on October 22, 2013, along the Jawalamukhi Thrust and cause severe destruction to houses and agricultural land located in Niangal village, Soldha area in Kangra district. Field observation carried out after the slide activity reveals that this slides was not due to normal phenomena associated with slope failure causing landslides, but appears to be major evidence for the neo-tectonic activity in the region indicating movement along the prominent the Jawalamukhi Thrust separating the underlying Upper Siwalik Group of rocks from the overlying Middle Siwalik sandstone. Under this study the ambient noise measurements at 30 sites have been performed on the landslide body and analyzed the directional resonance of the slide zone. Using the fundamental frequency and shear wave velocity derived for the region, the thickness of sediments was obtained to know the geometry of the slip surface. The analysis reveals that the Landslide was not unidirectional but had multidirectional components.

Keywords: Northwest Himalayan Mountains, Neotectonic activities, Niangal village, Jawalamukhi Thrust.

EFFECT OF LOCKDOWN AMID COVID-19 PANDEMIC ON AIR QUALITY IN A CITY OF HARYANA

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Abstract: The COVID-19 began in China and soon it has spread in the vast majority of the nations of the world. It was pronounced as a worldwide pandemic in March 2020 by the World Health Organization (WHO). Numerous Nations executed countrywide lockdown across the globe. This total lockdown improved the air quality essentially because of less human intervene in Nature. In India, a total lockdown of was executed in stages from March 25 to May 31, 2020. Air quality in terms of the pollutants: PM_{2.5}, PM₁₀, SO₂, NO₂ from the three most dirtied urban communities of Haryana were taken and analysed. A broad examination of the mean convergence of significant air contaminations has been made for the periods of lockdown incorporating before lockdown period with similar periods in 2019. It is seen that the contamination of PM_{2.5}, PM₁₀, NO₂ and SO₂ has diminished mostly up to 50% under the period of lockdown. Reviewing above there is a critical need to curb the high pollution creating activates and replace these activities with alternative cleaner technologies.

Keywords: COVID-19, PM_{2.5}, PM₁₀, NO₂, SO₂.

ASSESSMENT OF AIR QUALITY PARAMETERS OF DTUAAQM STATION USING WEKA

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Abstract: Air pollution is one of the major global issues and is a real menace to community health. The rise of industrial activities, exhaust emissions, and other sources have led to an increase in the concentration of air pollutants. With the rise of AI technology nowadays, we can use machine learning algorithms to find out the effect of these air pollutants on our society as a whole. The present study is an attempt to analyze the annual variation of air quality parameters, the correlation among various parameters, and the associated reasons behind them of Delhi Technological University (DTU) monitoring station using The Waikato Environment for Knowledge Analysis (WEKA) software. DTU is one of the Air Quality Monitoring (AAQM) stations built across the country under the National Air Quality Monitoring Programme (NAMP). The raw data was obtained through the Central Pollution Control Board (CPCB) official site for the year 2020. Because of the COVID-19 lockdown initially imposed during that period, a great variation in the concentration of the parameters was observed. It was found that PM_{2.5} and PM₁₀ levels decreased during the lockdown period and rose when the lockdown was lifted. However, SO₂ and O₃ levels showed completely different trends. A direct positive correlation was only found between PM_{2.5}, PM₁₀, and CO. This could be attributed to the fact that these pollutants tend to originate from similar sources of emission.

Keywords: WEKA, air pollutants, lockdown, NAMP, AAQM.

ANALYSIS OF AIR POLLUTION USING WEKA

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Abstract: The advancement in science and technology has brought rapid changes in our ecosystem. The league of producing more and fast has stressed the nature and led to the development of air, water and soil pollution leading to drastic climate change. The paper presents the analysis of bulk data of air pollution of different cities of India using a different classification of WEKA software. The main objective is to analyze and compare the

proportionality of pollutants in the air through implementation of classifiers like J48, Naive Bayes, Bayes net, Random Tree, and Hoeffding Tree and establish the best method which would be helpful to take initiatives to decrease the rapid increase of air pollution. According to the experimental result, the higher accuracy achieved through classifier J48 has assured the credibility of results in comparison to others.

Keywords: WEKA, Air pollution, J48, Naive Bayes, Bayes net, Random Tree, and Hoeffding Tree.

UNDERSTANDING CLIMATE CHANGE, ENVIRONMENT AND NATURAL RESOURCES

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Abstract: The inter-linkages between global climate change, environment and its impact on natural resources are very complicated in nature. There are many dynamic factors which influences the quality of air, water, soil and other environmental components. The surface temperature, gaseous composition and climatic conditions of our earth have changed naturally since its origin. In primitive days, climate and other environmental conditions on the earth were not suitable for origin and survival of life. However, due to natural processes it changed and origin of life took place. Researchers and scientists working in the area of environment and climate change have analysed the available data and found that the planet Earth is gradually warming. Based on the historical evidences, scientists have traced seven cycles of glacial advances and retreat during the last 650,000 years and also noticed that about 7,000 years ago, the last ice age abruptly came to an end. The phenomenon of climate change has several impacts on our environment and natural resources. There are several factors such as urbanization, deforestation, forest fires, rate of greenhouse gases emissions and industrialization which affect the climate change. Some of the significant impacts of global climate change include global warming, sea level rise, biodiversity change, natural ecosystem, impacts on agriculture, forestry and food productivity, marine life, change of wildlife habitat, glaciers and impacts on human health. This paper is an attempt to understand the phenomenon of global warming and issues related to climate change, reasons of climate change and its implications on the earth's environment and our natural resources.

Keywords: Climate change, environment, natural resources.

URBAN-RURAL ENVIRONMENTAL INEQUALITY

Tanisha Chhabra

The Author(s) 2022 Deenbandhu Chottu Ram University of Science and Technology, Murthal, Haryana

Abstract: The paper offers a unifying concept of relationship between "inequalities within country and Environmental disparity" for understanding of Rural-Urban disparity impact environment in context with climate change referred here collectively understanding "Social and Economic inequality". How pollution from the urban areas migrate to rural areas causes disadvantages to rural disproportionately from urban areas resulting in future environmental inequality. This paper include identifies main solution by which the inequality aggravating effect on the environment. (a) Pollution is one of the main factors by which environmental inequality within country be can markdown. (b) Conservation of natural capital can help reduce environmental inequality within country. (c) Climate change and Disaster due to inequality within country. It is also note that the same analytical framework and initiative can be used to discuss the innovative solution to reduce the environmental inequality across the country.

Keywords: Inequality/Disparity, Environmental pollution, Climate change; Susceptibility; ability to control; adaptation.

EFFECTIVE LEGAL FRAMEWORK FOR AIR WATER AND SOIL POLLUTION CONTROL

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Abstract: In our much beloved lengthiest Constitution of India specifically mentioning the Seventh schedule of our Constitution embedded with rich and robust material pertaining to forest conservation, soil strength and fertility, ecological balance measures regarding prevention of pollution and biodiversity diseases and preservation of environmental health of Air, Water and Soil in totoper se.

The semi-magna carta of Indian constitution regarding social welfare state concept engrosses in Directive Principles of Welfare State Policy (DPWSP) to preserve Mother Nature and its life giving force inherently embedded in its natural resources which are apparently Air, Water and Soil per se. Preamble as “The identity card of the Constitution” stated by N.A. Palkhiwala, carries authentic weight of Justice-social, economical and political. Adopt, Enact and give to ourselves this Constitution. The Fundamental rights of our citizens to live life with Right to Dignity implicitly states that Right to Health , Right to Environment under article 21 speaks volumes.

By 42nd Amendment Act of 1976, Article 48A states protection and improvement of environment and safeguarding of forests and wildlife. As article 47 relates the duty of the state to raise the level of nutrition and the standard of living as to improve the public health emanates from ambient Water, Air and Soil quality. The moral obligation of the state and of all its citizens to promote the spirit of healthy environment, part-IV A (Article 51A (g)) of the constitution says that, it shall be the duty of every citizen of this country “To protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures” are the epicentre of this research paper.

Keywords: Legal Framework, Seventh schedule, Soil Health, Ambient Air and Water, Standard of living, Moral Obligation.

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Water Pollution

(Research Papers)

WATER CONSERVATION – STRATEGIES AND SOLUTIONS

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Abstract: Any beneficial deduction in the use of water, loss or waste. Water Conservation includes all the policies, strategies and activities to sustainably manage the natural resource of fresh water. India has 16% of the world's population and only 4% of the world's water resources, which are depleting rapidly. Water is one of the most important inputs essential for the crops. And shortage and excess of water affects the development and the growth of the plants, yields and produce quality. There are various methods to reduce such losses and it also improves the soil moisture. These are mulching, utilization of fog or dew by net-surfacing traps, transfer of water from surplus areas to deficit areas by inter-linking water systems, or the desalination technologies such as electro-dialysis and reverse osmosis, use of efficient watering systems such as drip irrigation will reduce the water consumption by plants. The most important step in the direction of finding solutions to issues of water and environmental conservation is to change people's attitudes and habits; this includes each one of us.

Keywords: Water Conservation, Electro-dialysis, Reverse osmosis.

USE OF SULPHUR IN WASTEWATER TREATMENT AND POLLUTION BIOREMEDIATION

Gitanjali

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Abstract: In both natural environments and artificial biosystems, sulphur plays a significant role in biochemistry. The macroelement is also connected to other significant element cycles, such as those for carbon, nitrogen, and iron. As a result, sulphur cycling, which is predominantly mediated by sulphur-oxidising bacteria and sulphur-reducing microorganisms, has significant environmental implications, especially in wastewater treatment and pollution bioremediation. This work describes the microbial sulphur metabolism. Firstly, thorough assessment of recent developments of microbial sulphur metabolisms at the molecular, cellular, and ecological levels, together with their energetics will be given. Then, the effects on the environment of efforts to combat soil and water contamination will be presented. Major obstacles are also noted and examined with regard to understanding microbial sulphur metabolisms and how they relate to environmental applications.

Keywords: Environment, Artificial biosystems, Sulphur, Energetics.

SYNTHESIS OF MoS₂ NANOSHEETS BY LIQUID EXFOLIATION METHOD FOR WASTEWATER TREATMENT

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Abstract: Molybdenum disulphide (MoS₂) nanosheets produced by liquid exfoliation method have a potential in photocatalytic, photovoltaic and optoelectronic applications. In this study, MoS₂ from bulk is synthesized to few layers range via grinding-assisted sonication process with N,N-dimethylformamide (DMF) as solvent. The prepared MoS₂ dispersion is characterized by optical absorption and FTIR spectroscopy. These 2D MoS₂ nanosheets can be used for wastewater treatment in dark and can be improved further if enforced by visible light. Here, MoS₂ nanosheets are demonstrated as an effective alternative for cleaning of wastewater and acts as

an excellent catalyst for the said photocatalytic activity. This study can be helpful to understand the potential of MoS₂ nanosheets for water treatment and purification.

Keywords: Molybdenumdisulphide, Nanosheets, FTIR spectroscopy.

STATUS OF SPRINGS IN THE FRONTAL PART OF HIMALAYA: A CASE STUDY FROM THE JAWALAMUKHI REGION

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²Central Ground Water Board, Regional Office, Dharamshala.

Abstract: Springs are a vital freshwater resource in the Himalaya. In my study area, springs are widely distributed along favorable geological and geomorphological zones. The fracture and joint type of springs are existing in the low topographic areas either along structural weak zone or at the contact of geological formations. Where seepage type springs are formed on the slope of hilly covered with loose materials such as talus and scree or other granular materials. The present study aims to investigate the presence of springs in the study area and analyze some of the springs for the hydro-chemical parameters viz. pH, total dissolved solids, electrical conductivity, total hardness, total alkalinity, and bacteriological parameter during the pre-monsoon season. More than two hundred seasonal and perennial springs have been inventoried in the study area. Thirty-two spring samples were collected during pre-monsoon and were analyzed whereas eight spring water samples were for bacteriological analysis. The results show that the pH value of all the spring water samples ranges from 6.13 to 8.24 with two spring water samples having a pH below 6.5 showing the acidic nature of the spring water. TDS of spring water samples range between 120 ppm to 711 ppm whereas the electrical conductivity ranges between 240 to 1423 micro semen per cm at 250C. The total hardness of the spring water samples lies between 200 mg/l to 650 mg/l whereas the total alkalinity ranges from 250 mg/l to 700 mg/l. The bacteriological results show the presence of Total coliform, fecal coliforms, and E. coli in the spring water samples that making them unsuitable for direct consumption.

Keywords: Springs, Geomorphological zones, Bacteriological analysis, TDS.

POTENTIAL OF BACTERIA IN CONTROLLING WATER POLLUTION

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Abstract: Water pollution is the contamination of water sources which make the water unusable for drinking, cooking, and other activities. The study of 29 European lakes has found that some naturally-occurring lake bacteria grow faster and more efficiently on the remains of plastic bags than on natural matter like leaves and twigs. The bacteria break down the carbon compounds in plastic to use as food for their growth. The scientists say that enriching waters with particular species of bacteria could be a natural way to remove plastic pollution from the environment. The rate of bacteria growth more than doubled when plastic pollution raised the overall carbon level in lake water by just 4%. Some of the compounds within plastic can have toxic effects on the environment particularly at high concentrations. These bacteria have great potential in controlling plastic pollution in different water bodies. That plastic pollution is stimulating the whole food web in lakes, because more bacteria mean more food for the bigger organisms like duck and fish. The studies involved sampling between august and September 2019. To across a range of conditions these differed in latitude, depth, area, average surfaces temperature and diversity of dissolved carbon-based molecule. The study shows that when carrier bags enter lakes and rivers they can have dramatic and unexpected impacts on the entire ecosystem. Enriching water bodies with these bacteria can help in removal of plastic pollution and natural clean-up of the environment.

Keywords: Lake bacteria, Plastic pollution, Ecosystem, Natural clean-up.

NOVEL TECHNOLOGIES FOR IMPROVING IRRIGATION MANAGEMENT AND ENHANCING WATER PRODUCTIVITY

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Abstract: Water use for agriculture is being more strictly regulated as a result of growing global water scarcity as irrigation is the largest consumer of fresh water in the world and is essential for maintaining agricultural productivity. Ineffective irrigation management can impair crop output, abuse water resources, diminish producer income directly, and have detrimental effects on environmental sustainability. So, the precise timing and volume of irrigation are likely the most crucial elements for effective irrigation management, saving water, increasing water use efficiency and water productivity. Additionally, it is also critical to accurately assess the water requirements and match the frequency of irrigation to the features of the soil and the development of plant roots in order to reduce deep percolation of water. In the current business climate, technological advancements have become crucial and countries are continuously working to improve irrigation management techniques by adopting and integrating various technologies to offer the highest level of operational effectiveness while reaching the required performance outcomes. Recent developments in data processing, data management, smartphone irrigation scheduling, automation etc. prospects for improving decision making in watering regime. An effective combination of soil, plant, and weather sensors combined with these cutting-edge systems, delivering real-time data to an adaptive decision support system, creates a ground-breaking platform for improving irrigation management and water productivity.

Keywords: Water, Agriculture, Sustainability, Irrigation management techniques.

IMPORTANCE OF IRRIGATION SCHEDULING CRITERIA IN FIELD CROPS

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Abstract: Irrigation scheduling is the process used by irrigation system managers to determine the correct frequency and duration of watering. The following factors may be taken into consideration *i.e.* precipitation rate of the irrigation equipment how quickly the water is applied, often expressed in inches or mm per hour. Where water is scarcer or expensive, irrigation should be planned to maximize water productivity but where good land is scarcer than water, it be planned to obtain maximum production per unit of area. Several other factors such as soil hydraulic properties, depth, salinity and nutrient status of root zone, ground water level, method of water application, availability and quality of water, weather conditions, plant characteristics and other specific needs such as crop cooling, frost protection etc. must be considered. Irrigation scheduling procedures consists of monitoring indicators that determine the need for irrigation. Various indicators are used to assess irrigation needs, including soil moisture measurement, plant indicators and climatological indices.

Keywords: Irrigation, Water productivity, Crop cooling, Frost protection.

WATER CONSERVATION: EVALUATION OF ROOFTOP RAINWATER HARVESTING SYSTEM AND GRAVITY FED DRIP IRRIGATION SYSTEM IN RAINFED AREA OF JAMMU REGION

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Abstract: The effective use of water is the key factor for crop production in rainfed areas of Jammu. For marginal farmers', Gravity fed drip irrigation system provide a means of maximizing return on their cropland by increasing the agricultural productivity per unit of land and through increasing cropping intensity during the dry season. The experiment was conducted at Advanced Centre for Rainfed Agriculture (ACRA), SKUAST-J, Dhiansar (Samba), Jammu during the year 2019-2020. The total head required for gravity fed drip irrigation system was worked out to be 1.8 m. Frictional losses of main, laterals, and other fittings and head required for the farthest emitter to operate were found to be 1.16, 43.27, 4.5 and 130 cm respectively. Various parameters such as average emitter discharge (qa), relative emitter discharge (R), standard deviation of emitter flow rate (Sq), coefficient of variation of emitter flow (Cv), statistical uniformity (Us), emission uniformity (Eu) and uniformity coefficient (Uc) were evaluated. The average emitter discharge for the system was found. 3.40 l/h. This was lower than the manufacturer's specification of 4 l/h. The values obtained for Cv, Us, Eu and Uc were 0.19, 81.37 %, 80.92 % and 83.95 % respectively. The overall performance of Cv, Us, Uc and Eu were very good, good, good and good respectively.

Keywords: Low cost drip irrigation system, rooftop rainwater harvesting system, Frictional losses, emission uniformity.

FERTIGATION STUDIES AND IRRIGATION SCHEDULING IN DRIP IRRIGATION SYSTEM IN TOMATO CROP

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Abstract: Fertigation is a technique of applying fertiliser in which the drip irrigation system incorporates the fertiliser into the irrigation water. In this technology, irrigation is used to uniformly disperse fertiliser solution because nutrients are so readily available during drip irrigation, the effectiveness is higher. Both liquid and water-soluble fertilisers are employed in this manner. This technique raises fertiliser usage efficiency from 80% to 90% in tomato crop. Applying NPK through drip irrigation in ten equal splits at intervals of 8 to 10 days saved 20 to 40% fertiliser when nitrogen was applied in two equal splits using furrow irrigation (at planting and one month later). Similar to this, the drip technique used 25–35% less water and resulted in a fruit output that was 3.0–13.5% higher in tomato crop. When comparing water usage efficiency across nitrogen levels, drip irrigation frequently outperforms surface irrigation. When 75% of the fertiliser was administered via fertilisation and 25% of it was applied in solid form, the fruit production is at its highest. Dry matter of the plant, leaf area, plant height, and apparent nitrogen recovery were all higher with drip irrigation than with furrow irrigation when total fertiliser absorption was supplied in a 25:75 ratio. The typical tomato fruit colour and size were unaffected by drip irrigation scheduling. Comparing liquid fertilisers to soil-applied fertilisers, it was also found that the incidence of pests was reduced. Lower leaf resistance was lower than upper leaf regardless of the irrigation methods used.

Keywords: Fertigation, drip irrigation, furrow irrigation, surface irrigation

EFFECT OF VITAMIN C SUPPLEMENTATION ON SOME HORMONAL AND BIOCHEMICAL PARAMETERS IN WATER DEPRIVED GOATS (CAPRA HIRCUS) IN DIFFERENT SEASONS

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Abstract: In this experiment, the effect of vitamin C on some physio-biochemical parameters in water deprived goats was studied. Total 18 numbers of adult male goats were selected for the experiment during summer and

winter seasons and divided into 3 groups viz. control, T1 and T2 ($n = 6$). In T1 group, water was restricted and subdivided into 3 experimental periods: in period 1 (day 1 to 7), animals were adapted to water restriction regime by limiting access to water gradually from 1.5 to 3 hrs/day. In period 2 (day 8 to 14), animals of the treatment groups had access to water for 3 hrs/day. In period 3 (day 15 to 22), animals had access to water only every second day for 6 hours. In T2 group, the same protocol as mentioned above was followed with addition of vitamin C supplementation at a dose rate of 180 mg/kg b. wt./animal/day. In control group, water was offered ad lib throughout the experimental period. Blood was collected on 1, 7, 14 and 22 days for the estimation of different parameters. In T1 group, increasing trend ($P < 0.05$) of urea, creatinine, liver and oxidative enzymes, serum electrolytes and cortisol levels were seen; with significantly ($P < 0.05$) decreasing trend in regard to water and feed intake, body weight and T3 and T4 levels. In T2 group, ALT, AST, ACP, K, Cl, SOD, GPx, catalase, LPO and cortisol levels were increased upto day 14 and then decreased on day 22; whereas, WI and FI decreased up to day 14, then increased on day 22. Serum enzymes, electrolytes, oxidative enzymes and cortisol levels in T1 were significantly higher ($P < 0.05$) than T2; whereas, the values of WI, FI, body weight, T3 and T4 were significantly lower ($P < 0.05$) in T1 than T2. Overall summer values of drinking duration and frequency, enzymes, Na, Cl and cortisol levels were higher as compared to overall winter values. To conclude, water deprivation had negative impact on behavioural, biochemical and hormonal parameters, which can be ameliorated by supplementation of ascorbic acid at the rate of @180mg/kg b.wt./day in goat.

Keywords: Biochemical, hormonal, season, water deprived goats.

SEMI-ARID AGRO ECOSYSTEM OF INDIA: FUTURE CONCERNS FOR SUSTENANCE

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Abstract: Agro ecosystem of India is diverse in nature consisting of various agro-ecological regions viz. arid, semi-arid, sub-humid, and humid-per humid including coastal and island regions. Semi-arid agro-ecological region is the largest of all having more than 35% of area under cultivation (approximately 79 million Ha). Human caused disasters are taking its toll either directly or indirectly on our agro ecosystem with long term consequences. Water deficit with drought looming large at many places is a major concern. Severe drought is experienced almost every three years. At many places deficiency of nitrogen, phosphorous and zinc elements in soil creates nutrient imbalance. The paper discusses semi-arid Agro ecosystem of India with associated concerns and possible solutions for sustenance on long term basis.

Keywords: Agro ecosystem, Drought, Water deficit, Nutrient imbalance.

IMPACT OF DRIP PLACEMENT AND FERTIGATION THROUGH ORGANIC AND INORGANIC SOURCES ON WATER USE EFFICIENCY AND PRODUCTIVITY OF CUCUMBER UNDER PROTECTED CULTIVATION

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Abstract: With increased demand of water in priority sectors (domestic, industrial, energy, etc.), the availability of water for irrigation has reduced. Efficient methods of irrigation such as drip could increase the water productivity of different crops with reduced amount of water for irrigation, particularly for widely spaced crops in water scarce, undulated, sandy or hilly areas. Sub-surface drip system may prove better in reducing evaporation and deep percolation losses, increasing moisture uniformity in root zone and improving water-use efficiency over the surface system. Low to very low nutrient use efficiency under conventional methods of irrigation (flooding, furrow, check basin, etc.) imposing serious economic problems and environmental concerns demands for the supply of nutrients with irrigation (fertigation). Drip fertigation could maintain optimum nutrient and water

supply in the root zone as per the specific need leading to higher yields and better-quality produce. Therefore, an experiment was conducted on cucumber crop under a naturally ventilated polyhouse with surface and sub-surface drip irrigation and five different fertigation treatments viz., compost tea, vermiwash, compost tea + 75 % recommended dose of fertilizers (RDF), vermiwash + 75 % RDF and 100 % RDF. Among the different treatments, the water use efficiency and productivity of cucumber turned out to be significantly higher under the compost tea + 75 % RDF and 100 % RDF with under sub-surface drip irrigation treatments.

Keywords: Irrigation, Polyhouse, Vermiwash, RDF, Fertigation.

DEVELOPMENT OF ECO-FRIENDLY CONCRETE USING LIQUID AND SOLID WASTE MATERIALS

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Abstract: Construction is a profoundly asset intensive procedure utilizing materials, land, energy and water in immense sums. Since structures are required to satisfy our essential requirement for shade, so utilization of these assets is basically unavoidable. Notwithstanding, with depleting stock of regular assets and lowering eco-framework, the utilization of assets must be savvy, reasonable and non-wasteful. Quest for alternative and reused materials, numerous floor spaces and utilization of sustainable power source are a portion of the arrangements that people have found throughout the years against the apparent danger of materials, land and energy limitations separately. The objective of this study was to comprehend the physical and chemical properties of concrete utilizing secondary treated sewage water and solid waste. The samples of water used were secondary treated sewage water (STSW) and fresh water (FW). Compressive strength test and slump test were carried out for each concrete mixes. Fresh water was replaced with treated sewage water in different percentage by weight, recycled coarse aggregate (RCA) was used to replace 25% of normal coarse aggregate (NCA) and 30 % of cement was replaced by flyash. This modified concrete was tested for its fresh and hardened properties. The results of compressive strength and workability of concrete after replacement of materials in respective percentages was found to be in the acceptable range as per IS 456:2000.

Keywords: STSW, FW, Flyash, NCA

PHYSICO-CHEMICAL CHARACTERISTICS OF GROUNDWATER/DRINKING WATER SAMPLES IN SUNDERBANI AND NOWSHERA TEHSILS OF RAJOURI DISTRICT, JAMMU PROVINCE, J&K, INDIA

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Abstract: The present study aims to assess the drinking water quality of selected areas in Sunderbani and Nowshera Tehsils of District Rajouri, J&K, India. After collecting samples from selected sampling locations, analysis using APHA methodology and BIS standard methods (BIS methods for Ca and Mg analysis) was done. The physicochemical parameters analysed were colour, odour, Turbidity, TDS, TSS, TS, pH, Temperature. Conductivity, Total hardness, Calcium (Ca_2^+), Magnesium (Mg_2^+), CO_3^{2-} , HCO_3^- , OH^- , and Total Alkalinity. Obtained results were compared with BIS: IS 10500 (2012) and WHO Standards. Our Results showed that most of the samples are above acceptable range for hardness and magnesium level. In general, the values obtained for the parameter Colour, Odour, pH, Turbidity are within the permissible range except for sample No. 08. The Total Hardness and Total Alkalinity were found above the acceptable limit of IS 10500:2012. The level of TDS was above the acceptable limit for 31% of the samples analysed. The high level of Calcium and Magnesium ions noticed in all the drinking water samples studied suggests that a Preliminary Treatment is required before direct

consumption. Hydroxide and Carbonate was all together absented in all the drinking Water samples except for Location No. 3 and 4. The level of Nitrate was below the Detection Limit (DL = 2 mg /L) for 92% of the water sample analysed. Thus, present study would serve as a baseline database for the regional water resources of the J&K UT for any future studies to assess change over a time gap.

Keywords: Colour, Odour, Turbidity, TDS, TSS, TS, pH, Temperature, Detection Limit.

DESIGN OF AUTOMATED BOILER SAFETY SYSTEM

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Abstract: Coal and gas based boilers are used extensively for power and steam generation in small and medium scale industries. Safe boiler operation requires continuous inspection and maintenance at specific time intervals. Most of the inspection and monitoring is done manually by human being. Most of the time observer is not having any data on boiler operation and maintenance. Therefore, decisions of boiler operators are solely based upon his past experiences. A standardized system based upon the available data is required to be designed for safe and reliable operation of the boiler. In the present work design and development of boiler safety system is presented and the system is automated based upon the previous data available. Boiler automation includes the monitoring of temperature, pressure and water level using different sensors. The present system is helpful in achieving profitability with safety.

Keywords: Coal, Gas, Boiler automation, Temperature, Pressure.

ASSESSMENT OF CYTO-TOXIC EFFECTS CAUSED BY MICROPLASTICS IN TERRESTRIAL PLANTS

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Abstract: Present scenario shows that accumulation of micro-plastics (MPs) in the environment has resulted in various ecological and health concerns. Keeping this in view, present study was conducted to measure the effect of different sizes (80, 100, 200, 500, 1000, 2000, 4000, 8000 nm) of polystyrene MPs (PS-MPs) on root length and cell division of root tip cells of *Allium cepa* using *A. cepa* root chromosomal aberration root tip assay. *Allium* bulbs were treated with two different concentrations of PS-MPs (100 and 400 mg/l). It was observed that MPs particles of size 4000 and 8000 nm showed highest reduction in root length with respect to negative control (Milli Q water) while, mitotic index decreased significantly in both size and concentration manner, where lowest (12.06 %) was recorded in 100 nm size PS-MP at 100 mg/l. Also, induction of different types of chromosomal aberrations, with the highest percent of clumped chromosomes (CC), followed by C-mitosis (CM), delayed anaphase/s (DLA), vagrant/s (VG), laggard/s (LG), distorted/disturbed metaphase/s (DM), multi-polarity (MP), bridge/s (BG), break/s (BK), ring chromosome/s (RC) and nuclear anomalies like micronuclei (MN) and nuclear bud (NB) in root tip cells of *A. cepa* were reported. Chromosomal abnormality index (CAI) and nuclear abnormality index (NAI) showed significant decrease with respect to size of PS-MPs. Present study concluded that irrespective of sizes and concentrations MPs can cause cyto-toxic effects and nuclear damage to the plant cells by adversely impacting their cell division and spindle formation.

Keywords: Micro-plastics, C-mitosis, Chromosomal abnormality index, Nuclear abnormality index.

ANALYSIS OF WASTE WATER EFFLUENT IN MALIANA SANJAULI STP SEWAGE TREATMENT PLANT, SHIMLA

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Abstract: The physical and chemical properties of the Maliana STP's (Sewage Treatment Plant) waste water treatment facility were investigated in the current study from January to July, which corresponds to the varying seasons of winter, summer, and rainy season. Each day, samples of the sewage from the intake and outlet are taken, and the mean values for that month are then recorded. The average values of the following parameters were determined i.e. pH, Total Dissolved Solids, Total Suspended Solids, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Dissolved Oxygen demand (DO). pH was measured (8.18- 9.21) at the intake and (7.6-8.2) at the outlet, which is mildly alkaline. At the intake, COD Chemical Oxygen Demand (450–670 mg/l) and BOD Biological Oxygen Demand (264–381 mg/l), and at the outflow, (12–24 mg/l) and (108–212 mg/l) respectively. However, there is no significant difference in the total dissolved solids at the inlet (473-658 mg/l) and outflow (312-554 mg/l), whereas the total suspended solids at the intake (570-820 mg/l) and outflow (54-90 mg/l) have substantially changed. The inflow has very little dissolved oxygen, although after treatment of waste water outflow has more dissolved oxygen (0.3–5.64 mg/l). This study examines the current status of Maliana STP's waste water management system and the water quality following treatment of the waste water. Furthermore, this research intends to produce a solid waste (or treated sludge) that may be disposed of or reused as well as a fluid waste stream that is safe for the environment (usually as farm fertilizer).

Keywords: Maliana STP's, BOD, COD, DO.

WATER POLLUTION CONTROL AND CONSERVATION EFFECT OF PESTICIDES ON SOIL AND WATER POLLUTION

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Abstract: The present study was conducted in Jammu district of Jammu Kashmir Union Territory to find out how the empty containers of the pesticides were disposed by the farmers. The information was collected by personal interview method from 100 vegetable growers. Majority (90%) of the farmers reported that they throw away the empty containers after spraying. Very few farmers bury the empty containers properly. The farmers also reported that they used to throw away the empty containers in the running water. Even farmers of the opinion that they have less understanding of the inverted triangles mentioned on pesticide containers in different colours. Thus, the study indicated that farmers were doing the wrong practice of proper disposal of the empty pesticide containers that are creating soil and water pollution. It is therefore suggested that awareness activities should be planned for the farmers to sensitize them about the side effects of improper disposal of empty containers and to educate them about the use of safe pesticides that are less hazardous.

Keywords: Vegetables, pesticides, pollution, disposal.

ROLE OF NANOTECHNOLOGY IN WATER PURIFICATION

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Abstract: Clean water is the global need and need of life for all the human kinds. Crowded, expanding cities in many parts of the world are experiencing an increased demand for fresh water, and planners are unclear

as to how the water needs of tomorrow will be met. But the clean water resources are being contaminated in present time, due to the effects of pollution combined with global climatic change. Water contamination not only effect environment and human health, but it has also impacts on economic and social costs. There are various ways used commercially and non-commercially to fight this problem which is advancing day by day due to technological progress. Nanotechnology is one of the key technologies of the 21st century with numerous innovations in the field of environmental applications. Nanotechnology has also proved to be one of the finest and advance ways for waste water treatment. There are various reasons behind the success of nanotechnology and scientists are still working on further enhancement of its usage. Nanoparticles have very high absorbing, interacting and reacting capabilities due to its small size with high proportion of atoms at surface. It can even be mixed with aqueous suspensions and thus can behave as colloid. Nanotechnology is an easy and practical approach to clean waste water by using different methods. Different types of bacteria, toxic chemicals like arsenic, mercury etc., and sediments can be removed by using nanotechnology. Nanomaterial based devices are being used for water purification. Nano filtration method has advantages over other conventional method as low pressure is required to pass the water through filters and these filters can be cleaned easily by back flushing. Smooth interior of carbon nanotubes makes them convenient for the removal of almost all types of water contaminants. Because of larger surface area nanostructured materials have advantages over conventional micro structured materials. Since water treatment by using nanoparticles has high technology demand, its usage cost should be managed according to existing competition in market (Crane *et al.*, 2012). There are various recent advances on different nanomaterials (nanostructured catalytic membranes, nanosorbents, nanocatalysts, bioactive nanoparticles, biomimetic membrane and molecularly imprinted polymers (MIPs) for removing toxic metal ions, disease causing microbes, organic and inorganic solutes from water.

Keywords: Nanoparticles, Nanotechnology, Nanosorbents, Molecularly imprinted polymers, Nanocatalysts.

DETECTION OF ALKALI METALS IN WATER SAMPLE

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Abstract: Alkali metals have vital roles to perform in the human body. In physiology, industry, and medicines also, they are very essential. Sodium ions are needed to convey nerve impulses and regulate muscle contraction and relaxation, they are also crucial for maintaining the body's water balance. Potassium plays a significant role in maintaining the osmotic pressure between cells and interstitial fluid. It is also used to treat a variety of illnesses, including hypokalemia, muscle weakness, and cardiac issues. Potassium ions aid in the movement of waste items outside of cells as well as nutrients from food inside of cells. People can develop a variety of diseases if they drink water with an incorrect concentration of these metals over an extended period of time. This work of the present study is an effort towards compiling themethodsto detect these metals in water samples using different techniques.

Keywords: Alkali Metals, Concentration, Detection, Techniques.

A MICRO LEVEL STUDY OF INCREASING POPULATION PRESSURE ON WATER RESOURCES IN SUKETI RIVER BASIN, HIMACHAL PRADESH

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Abstract: The demand of water has risen due to uncontrolled population growth in last few decades, and pressure on limited water resources has been increasing continuously. Due to increased population water requirement for drinking, domestic, agricultural and industrial purposes have also increased exponentially. Population of both rural and urban areas have increased rapidly since last four to five decades in India. The state of Himachal

Pradesh which is located in the north-western Himalayan region of the country has more number of rural populations than urban population. The Suketi river basin is located in the central part of the state in the district of Mandi has been taken as the study area. The central part of the basin is called Balh valley, is densely populated due to its favourable living conditions, whereas situation is opposite in surrounding hilly areas. Due to higher population concentration in the central part of the basin, pressure on water resources is continuously increasing. Therefore, the present study is an attempt to analyse the availability and utilization pattern of water in the river basin. Water requirement for 1991, 2001 and 2011 has also been analysed in the study, simultaneously efforts have been made to project the increasing water requirement for the year 2021 and 2031.

Keywords: Water Availability, Utilization, Population Pressure, Suketi River Basin.

CLIMATE CHANGE AND STRESS ON BIODIVERSITY LIVELIHOOD SECURITY IN RAINFED AREAS THROUGH MIXED CROPPING SYSTEMS

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Abstract: An on-farm trial was carried from rabi 2015-16 to 2017-18 in existing four year old citrus orchard under rain fed ecosystem. At the citrus orchard various interventions like-construction of rain water harvesting structure, growing field crops in the inter row spaces of fruit trees, application of recommended fertilizer and manures to the fruit trees as per their age, etc. were carried to maximize yield of both field as well as fruit trees. Traditionally, intercropping in fruit orchard was practiced under irrigated situation, but with the harvesting of rainwater it was possible to utilize the land unit efficiently by putting it under cultivation of field crops, which helped in increasing both production and productivity. In general, farmers develop orchards for fresh fruit production and do not consider it for intercropping. The study indicated enhanced yield of citrus fruit trees along with intercrops (wheat and mustard taken in rabi season and maize and bajra taken in kharif season). The mean increase in fruit yield due to interventions, after three years of study was to the tune of 23.0 percent. The production of fruits significantly increased due to intercrops and it was maximum in citrus in association with wheat and mustard (4920 q/ha) during rabi 2017-18. Mean yield of inter row crops increased by 33.0 percent for wheat, 32 percent for mustard and 45 percent for maize, due to various interventions. Benefit cost ratio increased to 6.2 after three years of study as compared to 4.68 before interventions. System profitability was also worked out and it was seen that Citrus-Maize-Wheat showed maximum profitability of Rs 414/ha/year, followed by Rs.371/ha/year under Citrus-Bajra-Wheat. It was confirmed that citrus based agri-horticultural systems were effective in bringing about improvement in the soil properties as reflected by the significant increase in organic carbon, available nitrogen, phosphorus and potassium. The study showed that intercrops did not exert adverse effect on the growth and productivity of citrus. The field crops intercropped (raised in the interspaces of the fruit trees) in the orchard provided seasonal revenue to the farm family. Intercropping in citrus was effective in bringing improvement in the soil fertility, leading to a sustainable production system.

Keywords: Agri-horti system, water harvesting, Benefit cost ratio, farm profitability.

APPLICATION OF FE₃O₄ PARTICLES IN DE-EMULSIFICATION OF OIL IN WATER EMULSION

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Abstract: In metal industries, oil in water emulsions (relatively stable), are used frequently in cooling and lubrication processes. Such emulsions, can withstand adverse environmental conditions, and often difficult to treat. Thus, can cause hazardous effects in the environment if disposed-off untreated. According to Hazardous Waste and Management Society, the maximum waste generated is related to oil (oil spills or emulsions), i.e. 1000 kg per year. According to the Ministry of Environment and Forests' notification, the permissible (concentration) limit for oily waste discharge is 10 mg/l. The conventional processes used for de-emulsification are either costly,

non-eco-friendly, time-consuming, or energy intensive. Our method of de-emulsification by Fe_3O_4 particles is quick, eco-friendly, and cost-effective. In this work, we treated 5% (v/v) oil in water emulsion. Fe_3O_4 particles can be synthesized by several methods such as co-precipitation, sol-gel, and thermal decomposition followed by characterization using XRD, SEM, and TEM techniques. These particles can easily be regained from the processed stream by a simple application of a magnetic field.

Keywords: Emulsion, oil in water emulsion, Fe_3O_4 particles.

CONSTRUCTED WETLAND AND WASTE WATER REMEDIATION

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Abstract: Constructed wetlands are a suitable option for secondary wastewater treatment designed on the principle of natural wetland to treat wastewater that comes from different sources. This paper reviews the different types of constructed wetlands, mechanisms and processes (physical, chemical and biological) involved in pollutant removal in reed bed CWs, planted and unplanted CWs, wetland using different varieties of substrate etc. The vegetation generally used in CWs is *Cannaindica* and *Phragmites australis* etc. Contaminant removal efficiencies of different types of constructed wetlands ranges upto for BOD 90%, COD (85%), and TSS (95%) also useful in removing phosphorus and ammoniacal nitrogen. The performance of the artificial wetlands was influenced by the design specifications, vegetation, and environmental factors. CWs can be used as a low-cost nature based engineering solution for septic tank effluents.

Keywords: Constructed wetland, Removal efficiency, Substrate, Waste water treatment, Artificial wetlands.

REMEDICATION OF HEAVY METAL IONS FROM WATER/WASTEWATER BY USING NATURAL ADSORBENTS: EXPERIMENTAL AND OPTIMIZATION STUDIES

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Abstract: Water is one of the most useable compounds throughout the world. Water pollution is more common due to easily accessibility of water and highly polar nature of water (Universal solvent). Heavy metals such as cadmium, lead, arsenic, mercury etc. are highly used in different products, industrial materials, and many other daily useable materials. Water pollution is due to mainly from not treated industrial waste water containing various dissolved and immersed materials. Heavy metals in the water cause various harmful chronic and acute diseases in living organisms. Thus water must be free from these heavy metals and other contaminants. A numbers of techniques and materials have been applied to solve this problem. Adsorption technique and natural adsorbents are highly appreciated by the scientific community. The aim of this paper is to explore the natural materials and their remediation properties. Also experimental and theoretical optimization results are compared to get the best results in terms of efficiency of the materials.

Keywords: Adsorption, Heavy metals, Waste water, Remediation, Optimization.

REMOVAL OF HEAVY METAL LEAD FROM WATER USING PEANUT HULL AND RICE HUSK

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Abstract: Although most of the Earth's surface is covered by water, the availability of fresh water is far less. Access to fresh water has become a global concern over the years with the fast-deteriorating rate of the water bodies all over the world. In India itself access and availability of fresh water source has become a major concern due to the excessive defilement of the water bodies providing water for our basic necessities. Globally tonnes of agricultural wastes are being generated although they are biodegradable unlike the waste generated from industries; their utilization to their utmost potential is not met. Utilization of such agro wastes can be reused for various purposes to give positive impact and the wastes generated after their use is also degradable. For this study, the shells of *Arachis hypogaea* (peanut-hull) and *Oryza sativa* (rice husk) are used for the removal of heavy metal Lead. Most of the samples showed positive results. These materials are cheap and easily accessible and are recommended to be used for the removal of heavy metals from water, replacing the conventional types used which are costly and hard to maintain. Thus, the use of such agro waste materials can be of universal benefit.

Keywords: *Oryza sativa*, *Arachis hypogaea* (peanut-hull), Heavy metals, Agro wastes, Biosorption.

PHYSICO-CHEMICAL CHARACTERIZATION OF ELECTROPLATING WASTEWATER COLLECTED FROM COMMON EFFLUENT TREATMENT PLANT, FARIDABAD

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Abstract: Haryana is one of the industrial towns containing industrial clusters situated along the river bank and contributes to 6.1% of its catchment area. As per the Action Plan for River Yamuna, Govt. of Haryana report (2019), there are 14 Common Effluent Treatment Plants (CETPs) in Haryana for the complete treatment of industrial and domestic wastewater generated in most of these industrial regions. The present investigation involves physicochemical characterization of wastewater samples collected from the CETP Sector 58, Faridabad, meant to treat wastewater of electroplating industries before their final discharge for six months. Various parameters like colour, pH, EC, TSS, TDS, COD, chloride, sulphate, phosphate, and nitrate were analysed. In addition to these parameters, metals such as Cd, Cr, Cu, Fe, Ni, Pb, and Zn were also determined to assess their potential toxicity to the aquatic ecosystems. The electroplating wastewater was found to be highly acidic (pH; 2.95±0.37). Very high concentrations of other parameters including heavy metals like Cr, Ni, and Pb were found in the wastewater. Therefore, it becomes imperative to adopt appropriate measures to reduce the concentration of parameters well below the prescribed limits for the safe disposal of electroplating wastewater.

Keywords: Heavy metals, Wastewater, CETP, Electroplating, Physicochemical characterization.

PHYSIO-CHEMICAL ANALYSIS OF GROUNDWATER QUALITY OF CHARKHI DADRI, DUDHWA VILLAGE HARYANA, INDIA

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Abstract: In certain regions, the effects of the global climate change are causing a water problem, and in India, state of Haryana is one of those places where the groundwater levels are dropping year after year. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. Ground water samples were collected at 35 different places to analyse the physio-chemical parameters. To assess the quality of groundwater, each parameter was compared with the standard desirable limit of that parameter in drinking water as prescribed by WHO and BIS standards. The physiochemical parameters such as pH, Ec, Ca⁺, TH, Mg²⁺, Na⁺ K⁺, total alkalinity, total acidity, Cl⁻, sulphate, turbidity, fluoride, nitrate, total suspended solid, phosphate,

TDS were analyzed to know the present status of groundwater quality. The correlation coefficient “r” between the parameters was calculated systematically, and the significant values of the observed correlation coefficient between the parameters were calculated. There was strong positive correlation among various physicochemical parameters. A good positive correlation of EC was noticed, TDS (0.988), Cl⁻ (0.907), Sulphate (0.876), and Mg²⁺ (0.852). Similarly, it was moderately positive correlated with TA (0.512) and Na (0.302). These parameters strongly contributed to change the electrical conductivity of water. Appropriate recommendations were made to raise the standard of the groundwater in the Charkhi Dadri districts.

Keywords: Correlation analysis, Physiochemical characteristics, Water quality.

REMEDIATION OF CONTAMINANTS FROM WATER USING BIOPOLYMER-BASED NANOMATERIALS

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Abstract: Nanomaterials plays an important role in remediation research. These include carbon-based, metal-based and biopolymer-based nanomaterials. Biopolymer based nanomaterials have attracted the researchers as these materials are biocompatible, biodegradable, and environment friendly with minimal toxicity, in addition to their unique characteristics of nanomaterials. This paper highlights the various biopolymer-based nanomaterials used as adsorbents for removal of contaminants from water. Performance of various proposed bio-polymer based nanomaterials for remediation under specific set of conditions have also been compared. In addition, recent advances in the synthesis of biopolymer-based nanomaterials have been discussed.

Keywords: Nanomaterials, biopolymer, remediation, water, synthesis

EVALUATION OF PHYSICO-CHEMICAL PROPERTIES OF GROUND WATER IN VILLAGE OF PALWAL DISTRICT IN HARYANA, INDIA

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Abstract: Ground waters include all the water occupying voids, pores and fissures with geological formation which originates from atmospheric precipitation directly by rainfall or rivers, lakes or canals. Sand, gravel and sand stones are usually present in ground water. Ground water is an important source of drinking water. The chemical and physical characteristics of ground water determine its usefulness for various purposes. The current work involves the investigation of pH, electrical conductivity, temperature, turbidity, total dissolved solids, odour and colour of water samples collected from a well of village Thanthari, Palwal district, Haryana. Sixteen water samples were collected in four different seasons from well which is under use by local people. The physicochemical parameters have been determined by standard methods. The correlation matrix for different variables is also formulated where in the correlation between different variables of surface water is established.

Keywords: ground water, correlation matrix, health effects, Haryana, Physiochemical parameters.

NOVEL COST-EFFECTIVE BIOCHAR COLUMN FOR RAPID REMOVAL OF FLUORIDE FROM DRINKING WATER

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Abstract: Fluoride is a contaminant commonly encountered in groundwater. Elevated fluoride level is the root cause of many dental and skeletal problems. The present work described in-house fabrication of magnetic and

non-magnetic biochar-based columns and comparison of their defluorination potential. The fabricated glass columns (1.4 × 50 cm) were packed separately with magnetic and non-magnetic biochar (2 gram) between two layers of activated charcoal beads (2 cm each) to avoid chocking of column. The factor affecting the removal efficiency of fluoride such as, pH, the dosage of biochar, concentrations of fluoride and contact time were optimized. Characterization studies (FTIR, SEM, and Raman analysis) of biochar samples before and after adsorption indicates the mechanism of adsorption of fluoride is based on electrostatic adsorption of fluoride by biochar. The experimental data were fitted well by Freundlich isotherm and pseudo-second-order model, the maximum fluoride adsorption capacity of biochar being 10.2 mg/g. The result showed that magnetic biochar has shown 98% removal of fluoride at optimum conditions (*i.e.* pH 9.5 with 1.5 L/hr flow rate) while non-magnetic biochar showed less than 80% removal efficiency under similar conditions. It was observed that biochar based column purifier can be used upto six cycles of sorption/desorption with almost same efficiency. These results indicate that magnetic biochar-based column can act viable approach to fabricate a reusable, cost effective system for cleaning of water.

Keywords: Reusable column, defluorination, Biochar, Pyrolysis, Magnetic biochar, Adsorption, Removal efficiency.

INNOVATIVE PHYTOREMEDIATION TREATMENT METHODOLOGY – ANAPHYTO

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Abstract: The issue of water scarcity and need for innovative methods for wastewater treatment and recycling has been well discussed around the globe. Large centralized sewage treatment systems have their limitations as they require a large area for construction, electricity for operation and skilled manpower. To overcome these challenges, decentralized systems that leverage natural treatment technologies need to be adopted. The AnaPhyto Treatment Methodology by Anant Udyog is a system that is a completely natural, aesthetic and economical solution for wastewater treatment. The system can be operated without electricity and uses a combination of anaerobic treatment and phytoremediation for wastewater treatment. The wastewater is screened to remove grit and large solid particles, followed by an upflow anaerobic settler and reactor. This step removes the excess sludge and provides partially treated water for the constructed wetland beds for phytoremediation. Additionally, LECA filter beds are provided to prevent silt from entering wetlands, thereby reducing the chances of clogging. LECA acts as porous media for attached growth. The constructed wetlands are carefully layered with different substrates like gravel, coconut shells/husk, fly ash, bricks and soil. The wetlands have dual action of biological consortia attached to wetland substrate media and specific species of wetland plants like *Canna indica*, *Typha*, *Phragmites* etc. This filters the water and further reduces BOD. The treated water is expected to have a TSS of < 100 mg/l and BOD of < 30 mg/l. Chlorine dosing tank disinfects the water and it is now suitable for non-potable reuse in irrigation or construction activities.

Keywords: AnaPhyto, LECA filter beds.

ADSORPTION CAPACITY OF MODIFIED PLANT-BASED ADSORBENTS FOR HEAVY METAL SEQUESTRATION FROM WASTEWATER - A REVIEW

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Abstract: Researchers have been studying the sequestration of pollutants that including heavy metals from wastewater using modified plant-based adsorbents to purify water for both home and industrial uses. Although there are a number of promising strategies for removing contaminants from wastewater, the adsorption process is regarded as the best affordable option. The utilization of modified plant-based adsorbents for the effective

removal of heavy metals is the main topic of this review study. In-depth discussion is given on a number of activation and modification techniques, including physical, chemical, and composite production with materials such as polymers, carbon nanotubes (CNT), graphene, layered double hydroxides (LDHs), and metal oxides. In general, the adsorption capacity of these modified plant-based adsorbents was significantly increased. In addition, the impact of several parameters on the adsorption efficiency, including adsorbent dosage, initial contaminant concentration, pH, temperature, and contact time, has been examined. Solid waste wasn't produced according to the regeneration of utilised adsorbent. Researchers using modified plant-based adsorbents for wastewater treatment will find reading this review to be of great use.

Keywords: Carbon nanotubes, Heavy metals, Adsorption, Regeneration, Wastewater remediation.

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Soil Pollution

(Research Papers)

URBAN SLUMS AND THEIR IMPACT ON ENVIRONMENT: A GEOGRAPHICAL ANALYSIS OF HARYANA

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Abstract: The world is urbanising at a rapid pace. Large tracts of forest and agricultural lands are being converted into the urban centres. Urbanisation itself brings many issues such as pollution, shortage of houses, high density, lack of basic amenities and facilities, and development of slums within and on the periphery of the cities. Slum proliferation is a universal phenomena. The growth of slums in urban area is one of the major issues for urban authorities. In recent time, most urban centres of the world, irrespective of their location and size have invariably developed slums. The definition of 'slum' varies from country to country. In India, it is defined as places where buildings are in any respect unfit for human environment. Further, the slums the areas that are overcrowded, where quality of life is deteriorating, building arrangement and design is faulty, streets are narrow and haphazardly arranged. Besides, the area lack clean drinking water, fresh air, ventilation, light, sanitation facilities or any combination of these factors which are detrimental to safety, health and morals of the residents. In Haryana, rapidly growing slum population is a matter of serious concern especially in the industrial area located in the NCR. The present paper is an attempt towards developing better understanding of how distribution of slum population in a state's industrial area impacts the urban environment. The main objective of the study is to find out the impact of expanding slum population on environment of the Faridabad city located in NCR. Some major findings and fruitful suggestion have been given in full paper.

Keywords: Urbanisation, Slum proliferation, Faridabad city.

SYNTHESIS AND CHARACTERIZATION OF LOW-DENSITY POLYETHYLENE-EPOXY-BASED FILMS

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Abstract: Low-density polyethylene (LDPE) has been used for many years in a range of products, including bags, bottles, pipes, and food packaging. It is an environmental threat, though, at the same time due to its small rate of degradation. In this work, waste Low-density polyethylene trash (*i.e.*, plastic water bottles) was used to blend with epoxy polymer for depositing the films. The LDPE-epoxy-based blends were effectively created by mechanically mixing at high RPM and utilizing a magnetic stirrer. For casting films on a glass substrate, the drop-casting technique was used. FTIR and UV-Visible spectroscopy were used to investigate the films' absorption band and chemical structure, and also prepared films were compared with the pure epoxy film. This study intends to examine the impact of LDPE addition to a pure epoxy solution as well as the impact on films made from LDPE-epoxy.

Keywords: LDPE, FTIR, Polyethylene trash, Spectroscopy.

LADAKH, ON FOREFRONT OF CLIMATE CHANGE

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Abstract: Ladakh, a cold and ecologically fragile region in the rain shadow parts of the Himalaya between Karakoram in the north and the Great Himalayas to the south. Till now area was mostly self-sustained economy with small-scale agriculture and Livestock (sheep, yak, goats and cows) which were ultimately dependent on glacier water but, with changing lifestyle and rapid increase in population apart from high seasonal tourist

influx has put a major stress on the natural balance. Therefor increase in annual rainfall, reduced snowfall and unrepresented rise in mean temperature of about 0.75°C was recorded in the past 100 years, the regional temperature alone rose to an average 0.6°C in every 25 years. The main reason for accelerated snow melting could be due to increase aerosol thickening and black carbon emissions from car and machines entering region enhancing temperature rise causing reducing glacier and catastrophic flash avalanches, landslides and erosions leading to significant ecological loses. Biologically ecological stress in high Himalayan region like Ladakh could be scaled by reduced quantity of Daphnia, the Cladoceran zooplankton, a key freshwater species in the Himalayan lakes, which are found to be highly sensitive to climate change. Many methods have been made to reduce the impact of glacial loss including artificial glaciers and Ice stupas.

Keywords: Climate change, Ecology, Ladakh, Artificial glaciers, Ice stupa.

SOIL ORGANIC CARBON AND AVAILABLE NUTRIENT CONTENT AS INFLUENCED BY EROSION CONTROL MEASURES IN LOWER SHIVALIKS OF JAMMU

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Abstract: Nutrient losses are a major issue in erosion prone soils of the Shivaliks due to runoff, especially during the monsoon season. Not only the soil is lost, along with it organic carbon and nutrients are also lost. In this context a research experiment was conducted to study the impact of various erosion control measures on soil organic carbon and other nutrient content in lower Shivaliks of Jammu. The experiment was laid out in a catchment area with sandy loam texture and 3-6% slope gradient. The various erosion control measures employed included cover crop, agrostological measures, terrace farming, contour plowing, perimeter runoff control and overgrazing prevention. From the study it was concluded that the organic carbon content was highest under cover crop (8.14 g kg⁻¹) followed by agrostological measures, contour plowing, terrace farming, perimeter runoff control and lowest in overgrazing prevention (2.11 g kg⁻¹). In case of available nutrient content a similar trend was observed in case of nitrogen, phosphorous and potassium. In cover crop the content of available nitrogen, phosphorus and potassium was recorded (426.22 kg ha⁻¹, 28.52 kg ha⁻¹, and 292.04 kg ha⁻¹, respectively). So from the above study it was concluded that these erosion control measures have the ability to reduce runoff and sediment yield and are also effective in maintaining soil organic carbon content and nutrient status of soil.

Keywords: Erosion control measures, Runoff, Sediment yield, Organic carbon, Available nutrient.

EFFICACY OF nZVI IN REMEDIATION OF ARSENIC CONTAMINATION IN SOIL

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Abstract: Arsenic, a toxic and trace element, is a major source of concern due to its presence in the environment. In today's context, technological intervention in reducing arsenic contamination in ground water and, as a result, its bioaccumulation in (SPAC) soil-plant-atmosphere continuum appears to be critical. Nanotechnology, the science and art of manipulating matter at the atomic or nanoscale (1nm = 10⁻⁹ m), appears to be crucial in novel as remediation. Because of its high reactivity and mobility, iron nanoparticle technology evolving nano scale zero valent iron (nZVI) has found to be effective in arsenic mitigation in soil systems. In this study nZVI was investigated for different adsorption isotherms and was found that maximum arsenic removal (99.72%) was found at 5ppm of nZVI. It shows good sorptive characteristics owing to their high surface to volume ratio. nZVI particles have core shell structure including Fe⁰ coupled with iron oxide layers coated over it. In the presence of water, it oxidized Fe⁰ to Fe⁺² and the Fe⁺² reacts with OH⁻ to produce ferrous hydroxides. For defining proper adsorption techniques, different adsorption isotherms were studied for three different soils namely alluvial, red and calcareous soil. The percent removal of arsenic was maximum in 200 ppm (99.67%), 1000ppm (99.75%) and 1000ppm (98.25%) for alluvial, red and calcareous soil respectively.

Keywords: nZVI, SPAC, Arsenic, Nanoparticle.

DETERMINATION OF RADIOACTIVITY OF SOIL AND GRAIN

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Abstract: Humans are continuously exposed to natural radiations which are embedded in environment because of their daily interaction with the environment (Joel *et al.*, 2019). So, it becomes important to understand this interaction and its consequences. The measurement of environmental radiation aims at determining the amount of radiation exposure from environment sources, and to estimate the health risk caused by radiation (Durusoy *et al.*, 2017). The present study deals with the estimation and calculation of radioactivity present in soil and the grain (wheat) from the same place. Soil and grains from different villages of Punjab were collected and with the help of G.M counter their radiation count was determined. Among all the six villages the soil sample of Jhajjal was found to have the highest count followed by Jalalana and Chautala the least count was seen in Talwara(7.8). Similar pattern was also seen in grain samples. The observation has been for one week. During this period the slope of count tend to decrease but after a certain period the curve flatten without any further decrease. This high radioactivity of grain and soil is consequent of increased use of chemical fertilizers, establishment of factories and oil refineries. The deposition of chemical and waste having radioactive element in soil is further taken up by plants and crops grown in those high-risk zone areas. Hence leading to crops with higher radioactivity which is hazardous to human health.

Keywords: Radioactivity, G.M counter, high-risk zone, chemical fertilizer.

QUALITATIVE AND MORPHOMETRIC ANALYSIS OF COMPOST DEVELOPED IN DECENTRALIZED IN-VESSEL REACTOR

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Abstract: An optimized waste decomposer microbial formulation comprising of the bacterial strain *Bacillus subtilis* A3 and the fungus strain *Aspergillusniger* P19 were chosen for their ability to produce multiple carbohydrases and utilization of inexpensive carbon sources. *Bacillus subtilis* A3 and *Aspergillusniger* P-19 transformed the biodegradable solid waste into compost having plant growth promoting capability. The waste decomposer formulation stabilized the organic materials, and the in-vessel composter provided an adequate environment for rapid composting. The composting process took 16 days and resulted in high-quality compost with stabilized organic matter that improved the growth yield of *Brassica juncea* (mustard), *Spinaciaoleracea* (spinach), and *Raphanussativus* (radish). The current effort was done to create the high quality compost which can be used for the improved plant growth.

Keywords: *Aspergillusniger* P19, *Bacillus subtilis* A3, *Spinaciaoleracea*, *Raphanussativus*.

PHYSICAL PROPERTIES ALTERED BY SOIL EROSION CONSERVATION PRACTICES IN LOWER HIMALAYAS OF JAMMU

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SKUAST-Jammu, Jammu and Kashmir, India

Abstract: Lower Himalayas of Jammu because of their fragile ecosystem are very sensitive to erosion problems. So an experiment was conducted in lower Himalayan region of district Kathuato observe how the soil physical

properties get affected by various erosion conservation practices. The experiment was laid out on a catchment exhibited sandy loam texture and 3-6% slope gradient. The various erosion conservation practices employed include cover crop, agrostological measures, terrace farming, contour plowing, perimeter runoff control and overgrazing prevention. From the study it was noticed that among all the resource conservation techniques bulk density was highest in overgrazing prevention (1.43 g cm^{-3}) and was lowest in cover crop (1.34 g cm^{-3}). The mean value of infiltration rate was highest in cover crop (8.55 cm hr^{-1}) followed by agrostological measures and was lowest in overgrazing prevention (3.61 cm hr^{-1}). No significant impact of erosion conservation practices was recorded on soil texture and particle density. Therefore from this experiment it was concluded that these erosion conservation practices have a positive and significant impact on bulk density and infiltration rate, while particle density and texture remain unaffected.

Keywords: Erosion conservation practices, Bulk density, Infiltration rate.

MANAGING WOOLLY APPLE APHID USING NATURAL FARMING PRACTICES

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Dr. Y S Parmar University of Horticulture and Forestry, Krishi Vigyan Kendra Lahaul and Spiti-II at Tabo, Himachal Pradesh

Abstract: Agriculture in Spiti is the mainstay of the local economy and shares a delicate balance with the geo-climatic conditions of this cold desert region. Harsh climatic conditions *i.e.* dry and cold weather; extremely low temperatures, heavy snowfall and low annual rainfall characterize this cold desert region. Apple cultivation is considered as an important source to increase the economy of tribal farmers of lower Spiti valley. Due to changing climate scenario and increasing area under apple cultivation in Spiti, the orchardists are facing some problems pertaining to insect and disease attack in their orchards. The trials on the efficacy of conventional method (Chloropyriphos 20EC), organic farming (Azadirachtin 0.003%) and natural farming (Thuklang local shrub as main ingredient in Agniastra) practices (SPNF) over the management of woolly apple aphid, WAA (*Eriosomalanagerum*) population and its parasitoid wasp (*Aphelinusmali*) were conducted during 2020-21 and 2021-22 in three different blocks with 40 apple plants in each block. The results indicated a sharp and effective decline of WAA population in conventional method while it also destroyed the population of parasitoid wasp, where as in natural farming 2.96 number of woolly apple aphid colonies per twig (cottony masses clustered) after 7 days of treatment were recorded. Maximum population of parasitoid wasp (2.88) was observed in apple block where Azadirachtin as biopesticide was applied. Possible reason for the buildup of wasp parasitoid population was the availability of abundant host (4.48 number of woolly apple aphid colonies per twig) after 7 days of treatment. Under natural farming, the repellent and deterrent behaviour of local shrub was effective against the woolly apple aphid population build-up. Using such products may help in reducing the use of pesticides and chemicals and thus reducing input cost, and soil and water pollution.

Keywords: Agriculture, natural farming, Azadirachtin, *Eriosomalanagerum*, *Aphelinusmali*.

MANAGEMENT OF SOIL POLLUTION

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Abstract: Soil pollution has increased over the last decades and may pose a risk for human and ecological health. Soil pollution refers to the presence in the soil of a chemical or substance out of place and present at a higher than normal that has adverse effect on any non-targeted organisms. The status of The World's Soil Resource (SWSR) identified soil pollution as one of the main soil threats affecting global soil and the ecosystem services provided by them. Based on scientific evidence, soil pollution can severely degrade the major ecosystem services. Pollutants also directly harm soil microorganisms and large soil dwelling organism and hence affect the biodiversity. To reduce soil pollution there are some management available such as: Recycling of waste before

disposal, Proper disposal of sewage system ,Avoiding deforestation and promoting forestation, Conducting many pollution awareness programme, Phytoremediation Technique to control soil pollution, Controlling pollution by industrial activities in soil.

Keywords: Soil pollution, Management, Phytoremediation technique.

AGRICULTURAL LAND DEGRADATION IN THE OUTER HIMALAYAS: CAUSES AND MITIGATION STRATEGIES

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Abstract: Himalayas are a fragile eco-system. Rampant soil loss occurs in the outer Himalayas resulting in large scale land degradation. A major cause of this degradation is soil erosion by water. Nearly 80% of total annual rainfall falls from July to September resulting in water scarcity for most part of the year. The rains received are of high intensity resulting in wide scale soil erosion, washing away most of the top fertile soil. Poor moisture retention and degraded soil results in poor crop productivity and scarce natural vegetation. Increasing population has also put pressure on land with reduced land holdings resulting in illegal deforestation. Marginal land holdings result in difficulty in adoption of soil and water conservation practices. Moreover, poor returns from agriculture means, investing in land and water remain the least of farmer's priorities. All the above factors lead to continuous land degradation, thereby reducing the productivity of these lands, which in turn affects the economic condition of the farmers. Cheap technologies for water conservation like mulching and organic manuring can enhance moisture storage. Our studies in the lower Himalayas have indicated that agricultural soils are among the poorest in soil carbon content. Their fertility is low. In an attempt to arrest soil erosion, various practices such as covering the soil and reduced tillage. We observed that covering the soil significantly reduced soil loss from agricultural fields. Further, zero tillage also reduced soil losses by as much as half of that lost under conventional system. However, the challenge lies in the adoption of such technologies in the region.

Keywords: Land degradation, Shivaliks, Kandi, Foothill Himalayas, Soil erosion.

SHORT-TERM ZINC BIOFORTIFICATION EFFECTS ON MORPHO-ECONOMIC PARAMETERS OF RICE IN RICE-WHEAT SEQUENCE IN INCEPTISOLS OF JAMMU, J&K

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Abstract: A field trial comprising three different sources of zinc viz. zinc sulphate, zinc oxide and zinc chelate each with two levels of zinc (Zn), were applied both as soil and foliar application in rice cultivar (Pusa-1121). The experiment was carried out during the monsoon season of 2020 at field research station of Division of Soil Science and Agricultural chemistry SKUAST-Chatha, Jammu. The treatment combination consisted of seven treatments viz. T1-Soil Application of $ZnSO_4 \cdot 7H_2O$ (12.5 kg /ha) + Foliar Spray (1.6%), T3-Soil Application of ZnO (5 kg/hectare) + Foliar spray (0.50%), T4-Soil Application of ZnO (5 kg/hectare) + Foliar spray (0.65%), T5-Soil Application of Zn-EDTA (10 Kg/ha) + Foliar spray (1.0%), T6-Soil Application of Zn-EDTA-chelate (12.5 Kg/ha) + Foliar spray (1.5%) and T7 – Control and were replicated thrice in randomized complete block design. Each plot measured 3.0 m × 2.0 m (6 m²), with plant spacing of 20 cm × 10 cm between rice seedlings. Fertilizers were applied on basis as per the recommended nutrient requirement of basmati-Pusa-1121 (N:P:K). Short term effect of zinc biofortification was studied on morpho-economic parameters of rice viz. plant height, No of effective tillers, grain yield, straw yield and dry matter accumulation at harvest. Zn EDTA-chelate at 12.5 kg ha⁻¹ along with foliar application @ 1.5% proved to best treatment and recorded significantly higher plant height, effective

tillers m⁻², grain yield, straw yield and dry matter accumulation. The percentage increase of 16.7, 18.82, 10.10, 12.3 and 15.43 were registered among all respective parameters as compared to control, whereas treatment T2-Soil Application of ZnSO₄·7H₂O (15 kg) + Foliar spray (2.5%), and T5-Soil Application of Zn-EDTA (10 Kg/ha) + Foliar spray (1.0 %) were statistically at par with treatment T6-Soil Application of Zn-EDTA-chelate (12.5 Kg/ha) + Foliar spray (1.5 %)

Keywords: Zinbiofortification, Pusa-1121, Morpho-economic parameters, Harvest.

FACTORS INFLUENCING THE FARMERS' DECISION TO ADOPT DIRECT SEEDED RICE TECHNOLOGY: CASE OF BARNALADISTRICT OF PUNJAB

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Abstract: Due to labour scarcity, rising labour costs, and a declining water table, resource-intensive puddled transplanted rice in the Barnala district of Punjab, India, is no longer considered profitable. However, the majority of the farmers in the district are still growing puddled transplanted rice. Direct seeded rice is a better alternative to address these challenges in the district. This study investigates the factors influencing the adoption of direct-seeded rice technology in the Punjab district of Barnala. A survey of rice cultivating farmers using a multistage random sampling technique was conducted in all three blocks of the district. Data were taken from a total of 100 farmers, and R software (version 3.6.1) was used for statistical and econometric estimations. Results reveal that the severe weed infestation, nutritional disorders, increase in soil-borne pathogens (nematodes), rat damage, poor crop establishment, the evolution of weedy rice, the incidence of the blast, and brown leaf spot have a significant ($p \leq 0.01$) effect on the adoption of direct-seeded rice. The study findings imply that the adoption of direct-seeded rice technology can be accelerated by increasing farmers' knowledge, training, and communication with KVK. Most significantly, agriculture extension departments should take the direct-seeded rice technology to the farmers in the district.

Keywords: Barnala, Nematodes, Direct-seeded rice technology.

EFFECT OF MULCHING ON SOIL MOISTURE CONSERVATION AND IMPROVING APPLE YIELD IN COLD DESERT REGION IN NORTH-WESTERN HIMALAYAS

Upinder Sharma^{*}, Sumit Vashisth and Sudhir Verma

Dr. Y S Parmar University of Horticulture and Forestry, Krishi Vigyan Kendra, Lahaul and Spiti-II at Tabo, Himachal Pradesh

Abstract: Apple (*Malus domestica*) is grown in cold desert region of lower Spiti valley in Lahaul and Spiti district of Himachal Pradesh. High diurnal temperature variation, negligible rainfall (< 200 mm annually), high wind velocity, high evaporation losses during summers, heavy snowfall and very low minimum temperature during winters (-20 to -30°C) are some of the main features of the climate of this region. The glacial melts serve as source of irrigation during summer. The soils are shallow, sandy loam in texture, low in organic matter and neutral to alkaline in reaction and having low water holding capacity. High evaporation losses during summers, low water holding capacity and timely availability of scarce irrigation water makes the plants prone to water stress. Considering the above factors, on-farm trials were conducted for three years in lower Spiti region at 3200 m amsl during 2019-20 to 2021-22. The trial consisted of four treatments viz., T1- Farmers' practice (no mulching), T2- mulching with black polythene, T3-mulching with grey polythene and T4- mulching with dry grass. Results from the pooled data for three years revealed that maximum soil moisture content (%) throughout cropping season (April–October) was recorded in treatment where dry grass was used for mulching. On an average the dry grass mulching in apple basin resulted in 33.1 per cent higher moisture content in soil followed by 17.1 per cent in grey polythene mulch and 15.7 per cent in black polythene mulch as compared to farmer's practice where

no mulch was applied. Highest apple fruit yield (pooled for 3 years) of 30.8 Mg ha⁻¹ was recorded in treatment T4 followed by 28.2 and 27.8 Mg ha⁻¹ in treatments T3 and T2, respectively. Lowest yield of 25.2 Mg ha⁻¹ was recorded in treatment T1. Thus, mulching with dry grass was most effective, followed by plastic mulching in conserving soil moisture.

Keywords: Spiti region, *Malus domestica*, High wind velocity, High evaporation.

ECO-FRIENDLY MANAGEMENT OF SOIL-BORNE PATHOGEN IN PEA UNDER DRY TEMPERATE ZONE, SPITI, HIMACHAL PRADESH, INDIA

Sumit Vashisth and Sudhir Verma

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Abstract: Pea is the most remunerative crop in non-apple growing areas of Spiti valley, grown as an off-season cash crop during summer season (April to September). Due to extensive cultivation of green pea in this tribal cold desert area (Zone IV) of the state, the incidence of root rot/wilt complex of pea is becoming a serious threat to realize the optimum returns. Due to soil borne in nature and complexity of the pathogen, the disease is very difficult to manage with existing practices. Further, the soils of Spiti valley are coarse textured and thus have a risk of soil and environmental pollution due to leaching losses. Keeping this in view, trials on the effect of eco-friendly option of biocontrol agents on pea root rot/wilt complex were conducted during 2020-21 and 2021-22 at farmer's field. Studies on the management of root rot/wilt complex through (i) bio-agents as seed treatment with Trichoderma viride @ 8.0 g/kg seed; (ii) soil application with Trichoderma viride @ 2.5 kg/ha with 62 kg farmyard manure (FYM); and (iii) seed treatment with Carbendazim 50% WP (Bavistin) @ 2.5 g/kg seed as farmer's practice were conducted. Soil application as FYM with T. viride resulted in lowest disease incidence after 90 days of sowing and comparatively high yield (88.50 q/ha) with maximum B:C ratio as 2.48 (average of two years). Using bioagents like T. viridae against soil/seed borne diseases can contribute tremendously in reducing pesticide pollutant in nature.

Keywords: Pea, Trichoderma viride, Carbendazim, biocontrol agents.

BIOREMEDIATION OF FLUOROQUINOLONES BY USING BACTERIAL CULTURES ISOLATED FROM HOSPITAL SEWAGE PLANTS AND VETERINARY

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Abstract: Antibiotics are playing significant role in the medical healthcare world, but their extensive usage and high prevalence has posed some detrimental effects to the environment. During the past few years, antibiotic drugs have been detected in the aquatic ecosystems in a large amount. Fluoroquinolones (FQ) were found to be most ubiquitous among other antibiotics in the environment and has emerged as major environmental pollutant. FQs are broad-spectrum antibiotics used in the treatment of various bacterial infections such as gastrointestinal, urinogenital infections, septicemia, pneumonia, typhoid etc in both humans and animals. But, the presence of the fluorine atom in Fluoroquinolones makes them persistent, highly electronegative, strong, recalcitrant, and less compatible with microbial degradation. The most known and commonly used FQs are ciprofloxacin, norfloxacin, and ofloxacin. After human and animal administration, about 70% of these drugs are excreted out in unaltered form into the environment. As a result, these substances may subject microorganisms to selection pressure, which assists in the evolution of bacteria into multi-drug resistant species. These antibiotics not only cause resistance, but they also have ecotoxicological effects on many animal and plant species. As a result, it is critical that these contaminants should be removed from the environment. In this study, the biodegradation potential of bacteria isolated from WWTPs of hospital and veterinary has been explored to degrade FQs particularly ciprofloxacin,

norfloxacin, and ofloxacin. And degradation efficiency has been checked by using analytical techniques such as high-performance liquid chromatography (HPLC).

Keywords: Antibiotics, Fluoroquinolones, ciprofloxacin, norfloxacin, and ofloxacin.

BIODEGRADING POTENTIAL OF FUNGI ISOLATED FROM KITCHEN WASTE

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Abstract: The non-edible portions of food that are wasted during handling, processing, or after consumption are referred to as “kitchen waste”. It contains unavoidable food wastes from refrigerators and food preparation areas, as well as garbage from homes, businesses, institutions, and other sources. Due to its high moisture concentrations, kitchen waste is difficult to handle using conventional methods, such as incineration. However, it is crucial to find an alternative to securely dispose of organic waste since landfills and incinerators are closing at an alarming rate. Efficient decomposition of food waste may be achieved by a variety of fungus that uses cellulose, proteins, lipids, and carbohydrates to fulfill their energy needs. Therefore, it is possible to accelerate the biodegradation of kitchen trash by establishing consortia of these fungi. In the present study, eight fungal isolates were isolated from kitchen waste samples collected from the canteen and mess of SKUAST-Jammu. The screening of the isolates was done by measuring zone of clearance and halo formation around the growth on specific media viz. tributyrin agar, skim milk agar, carboxy methyl cellulose agar, and starch agar and five potential isolates were screened out followed by their morphological and microscopic identification. The compatibility of the potential isolates was checked by dual culture method and a consortium was prepared by the inoculation of compatible isolates in Potato dextrose broth followed by incubation at 28°C for 48 hrs. 450 g of kitchen waste was used in different trials separately at different pH (5.7, 6.5, and 7.5) and temperatures (25°C, 30°C, and 40°C), and the study showed that at 30°C temperature with pH 5.7, weight reduction was highest (90.80%) The effect of consortium on pre-treated kitchen waste (acid and thermal treatments) was also studied and the results revealed that the pre-treated kitchen waste with consortium significantly degraded the waste over control and among them, acid treatment of kitchen waste with consortium showed the maximum degradation of kitchen waste (37.47%). This study concluded that the consortium of potential biodegrading fungi enhanced the biodegradation process of kitchen waste.

Keywords: Kitchen waste, incineration, fungal consortium, pre-treatment.

AN OPEN SOURCE INFORMATION TECHNOLOGY BASED APPLICATION FOR SPATIAL RESOURCES STORAGE AND VISUALIZATION

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Abstract: Information Communication Technology based location services and data management technology has huge impact on natural resource management. This work deals with spatial road network data management effectively for developing applications for querying and visualization of water reservoirs including their pollution level. Underlying data is huge in size and its spatial attributes brings complexity in storage. A detailed technique is presented to solve storage complexity. Application architecture is presented which leverages spatial and non-spatial attributes of data for use in querying and analysing the data. Proposed application enables users for planning and can also be useful for civic authorities like municipality, security agencies for querying Databases for resource management and Planning. Framework is built using open source technologies for data storage and visualization.

Keywords: Spatial Data, Resource Management, OSM, Post Gis.

CULTURE AND ECOLOGY: HIMACHAL PRADESH

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Abstract: Himachal Pradesh known as 'Dev Bhoomi' meaning 'adobe of the Gods', situated between lofty mountains and valleys in the lap of Himalayas. Nearly every hamlet in this hilly state has its own deity, commonly known as Deo, Devta, and Devi, especially in the upper Ravi, Beas, and Sutlej valleys. Originating from the very roots of nature these deities enjoy strong dominance over the Pahari community. Devta has an unwritten constitution based on traditions and conventions which are known as cars and antars in the local dialects. The administration of peaceful day to day activities in his followers life, allocating natural resources like water, land, and forests, and delivering justice are a few of the primary duties of the Devta institution. Because of the influence of these local deities, the Pahari community instinctively cares about the environment of the hills. Many of them being named after the nature phenomena, aims at nature protection and established an understanding of nature being powerful. In their sphere of influence, the dieties also guard the woodlands. They must give their consent before cutting even single tree. Following a qualitative approach the study aims at finding out the religious dominance of local dieties towards the ecology and environmental growth of the hilly state.

Keywords: Devta, Pahari, Deities, Community, Forests, Ecology.

STRATEGIES IN SHUNNING CROP RESIDUE BURNING: A STEP TOWARDS CLEAN AND GREEN ENVIRONMENT

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Abstract: Management of paddy residue has emerged as a major challenge to the contemporary agriculture in region of Punjab, Haryana and Western Uttar Pradesh. ICAR-ATARI, Ludhiana and its Krishi Vigyan Kendras have been working to drive attention of all the stakeholders to the problem of residue burning and popularize in-situ residue management. A Central Sector Scheme was launched for promoting agricultural mechanization for in-situ management of crop residue through awareness and capacity building. ICAR was given the responsibility to organize activities under the Information, Education and Communication (IEC) component. ICAR-ATARI, Ludhiana was acted the Nodal Agency and 60 KVKs were the actual implementing agencies at the grass root level. KVKs organized different environment building and capacity building activities to sensitize all the stakeholders. Method and demonstrations were organized to persuade farmers about effectiveness of the technologies. Convergence with different state departments, organizations, institutions, NGOs, religious saints, school and college students, farmers' organizations etc. were established for creating broad based impact. Resultantly, compared to previous years, the events and intensity of burning have significantly reduced. The area under in-situ residue management is on the rise, especially in Punjab and Haryana. The area under direct seeded wheat in Punjab increased from just 50000 ha in 2017 to 6 lakh ha in 2018 and 8.6 lakh ha in 2019. Moreover, 1341 villages in Punjab and 3200 villages in Haryana reported no burning during 2018. Likewise, the air quality during the critical season has seen considerable improvement.

Keywords: Crop Residue Burning, ICAR-ATARI, Krishi Vigyan Kendras.

SOIL AND WATER CONSERVATION TECHNOLOGIES FOR RAINFED AREA OF JAMMU DISTRICT

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Abstract: Kandi area of J&K, UT represents the typical example of rainfed farming where the farmers are totally depending upon the mercy of nature. Shiwalik foothill region of Jammu and Kashmir UT locally known as

Kandi is spread mainly Jammu, Samba and Kathua districts. The area mainly lies on low hills which join with foot hills of Himalayas and extended from Jammu to Uttarakhand. The soil loss has affected the agricultural production and hydrological regime to large extent. Flashy flow has denuded most of the top fertile soil. Due to undulating topography and excess runoff, the area remains short of water throughout the year except during rainy season. The major land and water management problems being faced in this area includes excessive runoff, soil erosion, land degradation and erratic distribution of rainfall with space and time results in sizable loss of soil and nutrients are primarily responsible for low productivity and poor economic status of the farmers. Agrarian community suffers from water scarcity. Keeping this in view different soil and water conservation measures like poly tank, percolation tank, recharging pit, roof water harvesting system, earthen embankment, contour bunding, continuous contour trenching, bench terracing gabion structures and efficient irrigation system like gravity feed drip irrigation system and portable sprinkler kit were constructed/installed and demonstrated at the farmer's field at three villages namely Gargal, Kandi and Godhan of Akhnour Tehsil of Jammu district of J&K UT under DST funded project entitled "Demonstration of technologies for improving productivity of rainfed area in Jammu district. It was found that productivity of the area raised by 80-90% due to technological interventions under the project. It was found that water table in the open well was increased by 1-1.5 m and water retention period was also increased by 30-45 days due to construction of recharging pit at the upstream side of the open well. Availability of water in poly tank and roof water harvesting structures encouraged farmer for growing vegetables crops thus enhanced their income.

Keywords: Kandi area, poly tank, recharging pit, runoff, rainfed area.

RADIOACTIVITY DETERMINATION IN THE SOIL AND GRAINS OF VILLAGE JHAJJAL

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Abstract: In the cotton belt of Punjab for better yielding, plant growth and disease resistance nowadays use of fertilizers viz., Potash, radioactive derivative of potassium, leading to severe health hazards. Village Jajjal (Mansa), belonging to this cotton belt is popular as "cancer village" due to higher number of patients. According to the available data soil of cotton belt exhibit high radioactivity¹. Hence, the correlation of radioactivity present in soil and grains of the same place Jajjal has been determined in the present study. The radiation counts present in the soil and grain samples for fifteen days at the interval of 24 hours have been detected indicating presence of high radioactivity. Although the count was decreasing with passing days until tenth day, no alteration in the radioactive count was observed further. The present study depicts transfer of radioactivity from soil to grain resulting in severe health risks.

Keywords: Cancer, Radioactivity, G.M. Counter, Fertilizer, oil refinery.

CONSERVATION AGRICULTURE FOR PRESERVING SOIL CARBON AND NITROGEN IN FOOTHILL SHIVALIKS

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Abstract: Land degradation has increasingly become a major concern for Indian agriculture on which two-third of the population depend for their livelihood. The rainfed foothill Shivaliks of Jammu, commonly called as the kandi belt has all the ingredients of impending agricultural disaster because of the undulating relief and high intensity seasonal rainfall, where the major cause of land degradation is water erosion. The problem is further expedited by poor management practices. As soil organic carbon and nitrogen are important components from the viewpoint of soil fertility along with their significant role in plant growth and nutrition, but the persistent use

of conventional farming practices based on extensive tillage combined with in situ burning of crop residues has magnified their losses through erosion. The restoration of such degraded lands thus becomes necessary to maintain long term fertility of soil and the sustainability of the agricultural lands. A study was, therefore, undertaken in the erosion prone kandi area of Jammu to assess the influence of conservation agricultural practices on losses of soil carbon and nitrogen through eroded sediments and runoff under maize crop. Three tillage variations *i.e.* conventional tillage (CT), minimum tillage (MT) and zero tillage (ZT) were employed, and were combined with management practices such as intercropping (i), mulching (m) and residue retention (30%) (r). It was observed that the application of residue or mulches or intercropping with pulses effectively reduced the dissolved C losses while the maximum amount of sediment loss occurred in CT. A significantly higher concentration of NO₃-N was observed in runoff from ZT plots which was statistically at par with CT, MT, ZTm and ZTr while the minimum amount of NO₃-N loss occurred in MTm which was statistically at par with all other treatments except ZT. Total ammonical N loss in runoff was maximum in CT while the minimum NH₄-N loss occurred in ZTr. Maximum Kjeldahl N loss was observed in CT while the minimum amount of N loss in sediments occurred in ZT with mulching and ZT with residue retention (30%). The application of residue or mulches or intercropping with pulses effectively reduced the losses mainly because of the reduction of runoff under these treatments while the maximum amount of sediment loss occurred in CT as tillage played significant role in accelerating nutrient losses through oxidation of organic matter and destruction of soil aggregates leading to significant water erosion and surface runoff of C and N rich sediments. Zero tillage with soil cover, either through mulching, residue retention or intercropping proved an effective strategy in reducing carbon and nitrogen losses, than zero tillage alone, thus contributing to the restoration of degraded lands.

Keywords: Degraded lands, Water erosion, Carbon losses, Nitrogen losses, Conservation agriculture.

EFFECT OF SEED TREATMENT AND FOLIAR APPLICATION OF NANO DAP ON YIELD AND ECONOMICS OF FINE RICE UNDER IRRIGATED SUBTROPICS OF JAMMU REGION

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Abstract: The field experiment was conducted during Kharif, 2021 at the Research Farm, Division of Agronomy, SKUAST-J, Main campus Chatha, Jammu to assess the effect of seed treatment and foliar application of Nano DAP on yield and economics of fine rice. The soil of the experimental field was sandy clay loam in texture, slightly alkaline in reaction (7.42), low in organic carbon, available N, but medium in available P and K. The experiment was laid out in Randomised block design with ten treatment combinations, replicated thrice. The experimental results revealed that treatment 75% recommended N: + 100% recommended K (37.5:18.75:15 kg/ha) + Seedling. Treatment with Nano DAP @ 5 ml/litre + Foliar Spray with Nano DAP @ 4 ml/litre recorded significantly higher effective tillers m⁻², number of grains panicle⁻¹, 1000-grain weight, grain yield and straw yield during study and remained statistically at par with treatment T5 75% recommended N:P + 100% recommended K (37.5:18.75:15 kg/ha) + Seedling Treatment with Nano DAP @ 5 ml/litre + Foliar Spray with Nano DAP @ 2 ml/litre, T1050% recommended N:P + 100% recommended K (25:12.5:15 kg/ha) + Seedling Treatment with Nano DAP @ 5 ml/litre + 2 Foliar Spray with Nano DAP each @ 4 ml/litre, T9 (50% recommended NP and 100% recommended K (25:12.5:15kg/ha) + Seedling Treatment with Nano DAP @ 5 ml/litre + 2 Foliar Sprays with Nano DAP each @ 2 ml/litre) and T2 (100% recommended NPK). However with regard to net return and B:C ratio, 75% recommended NP and 100% recommended K (37.5:18.75:15 kg/ha) + Seedling Treatment with Nano DAP @ 5 ml/litre + Foliar Spray with Nano DAP @ 2ml/litre recorded highest net returns and B:C ratio to the tune of 78078.98 ha⁻¹ and 1.71 respectively which was closely followed by 75% recommended NP and 100% recommended K (37.5:18.75:15kg/ha) + Seedling Treatment with Nano DAP @ 5 ml/litre + Foliar Spray with Nano DAP @ 4 ml/litre to the tune of 76757. 14 ha⁻¹ and 1.70 respectively.

Keywords: Rice, Foliar application, Nano urea, Grain Yield, Straw yield.

A COMPARATIVE STUDY OF NATURAL FARMING, ORGANIC FARMING AND CONVENTIONAL FARMING IN RICE BASED CROPPING SYSTEM UNDER SUBTROPICS OF JAMMU REGION

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Abstract: Agricultural production systems are the methods, a farmer employs to use different resources to satisfy their needs for production. Here we study three different production system which are organic, conventional and natural farming. The conventional crop production systems have increased the dependence on the use of chemical fertilizer and pesticide thereby causing environmental pollution and creating human, animal and soil health problems. Moreover, these have become costly enough for the farmers to afford their purchases under intensive cropping. Therefore, it is imperative now to look for sustainable alternative farming methods which are socially acceptable, economically viable and ecologically sound. In the context of late now organic farming have emerged as eco-friendly approaches to sustain the soil health and in term of the soil productivity. Many techniques used in organic farming like FYM, vermicompost, biofertilizer, panchgavya, hybrid seed, biological pest and disease management are crucial components but organic farming is not suitable for poor Indian farmers, as it requires huge quantity of FYM, making their agriculture unremunerative. Natural farming is an intense organic farming model. Natural farming is believed to increase the natural growth of plants without adding any fertilizer, Natural farming approaches should be considered as one of the chemical-free food alternative. Natural farming is an indigenous cow centric production system, all of the necessary nutrients are present in the soil, but in an inaccessible form. Microorganisms, which found in abundance in indigenous cow dung and uncultivated soil, can transform them into usable form. specific method like jivamrutha, bijamrutha, ghanjivamrutha, mulching, intercropping, local cultivars seed for pest and disease control like agniastra, brahmastra, nimastra are used in NF. Natural farming has benefits of less use of inputs, lower production cost so that higher B:C is obtained.

Keywords: Natural Farming, Organic Farming, Conventional Farming.

NANOFERTILIZERS FOR SUSTAINABLE AGRICULTURE

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Abstract: The excess use of mineral fertilizers and unsafe pesticides has led to pollution and serious health issues. Traditional fertilizers are not only costly for the producer, but may be harmful to humans and the environment. Nanofertilizer is an important tool in agriculture to improve crop growth, yield and quality parameters with increased nutrient use efficiency, reduction in wastage of fertilizers and cost of cultivation. Nanofertilizers are applied either to soil and/or leaves. It promotes the direct entry of nutrients into the plant system, thus reduce the wastage of fertilizer. Hence, foliar application of nanofertilizer leads to higher nutrient use efficiency (NUE) and has given a rapid response to the growth of crops. The characteristics of controlled release capacity and targeted delivery of nanofertilizer and nanopesticide showed high activity in comparison to conventional fertilizers and pesticides. Different nanofertilizers and nanopesticides such as silver, zinc, iron, titanium, phosphorus, molybdenum and polymer nanoparticles have shown great potential as plant growth and pest control agents. In the present work, the recent attempts and formulation of smart fertilizers and the utilization of nanotechnologies in agriculture will be discussed, which may help provide solutions for current and future chemical fertilization problems.

Keywords: Foliar spray, Nanofertilizer, Nutrient use efficiency, target delivery, agriculture.

NATURAL FARMING FOR RESTORATION OF AGRICULTURAL ECOLOGY

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Abstract: Agriculture is one of the major contributors of global warming through a share of about 10-12% increase in total anthropogenic GHG emission. Carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) are major GHGs emitted by agricultural activities. It is estimated that globally agriculture accounted to 50 and 60% of total anthropogenic CH₄ and N₂O emissions, respectively. Agro ecosystems are highly sensitive and vulnerable to climate change. Climate change is a severe threat to both food production and human health. It influences agriculture through increased temperature, precipitation variability and amplified intensity of weather extremes. Climate change affects agriculture directly through altering the agro ecological conditions and indirectly by increasing demand of agricultural production. Climate change is a serious threat to all aspects of agriculture including production, distribution, food accessibility and food prices. During 1980 to 2008, there was a 5.5% fall in wheat yields and a 3.8% fall in maize yields globally, compared to their yields in stable climate. Climate change also affects the invasive crop pest species, livestock production and aquaculture. Sustainable and safe food production is one of the major challenges of the twenty-first century in the era of climate change, which is one of the greatest threats to agricultural systems at global level including increasing population and natural resource degradation coupled with biodiversity loss. Green Revolution though multiplied agricultural production several folds but we have paid a huge environmental cost including climate change. It has shaken the ecological integrity of agro-ecosystems by intensive use of fossil fuels, natural resources, agrochemicals and machinery. Moreover, it has threatened the age-old Vrikshayurveda based natural agricultural practices, our traditional wisdom of natural farming. Natural Farming can be defined as “chemical- free farming and livestock based”. Well-grounded in agro-ecology, it is a diverse farming system that integrates crops, trees and livestock, leading to optimum use of functional biodiversity. Natural farming holds the promise of increasing farmers' incomes while providing many other benefits, such as the restoration of soil fertility and environmental health, and reducing and/or reducing greenhouse gas emissions. It is based on natural or ecological processes that exist in or around farms. Natural farming is considered a form of regenerative agriculture - an important strategy to save the planet. It has the potential to manage land practices and sequester carbon from the atmosphere in soil and plants, where it is actually useful rather than harmful. But there is an urgent need to popularize and adopt natural farming technologies for the restoration of agricultural ecology.

Keywords: Natural Farming, agricultural ecology, Climate change.

EFFECT OF DIFFERENT LAND USE SYSTEMS ON SOIL CHEMICAL AND BIOLOGICAL PROPERTIES AT VARIOUS DEPTHS OF CHANDANWARI MICRO WATERSHED

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Abstract: Chandanwari micro-watershed of Lidder Catchment is situated in southern part of Kashmir Valley. This micro-watershed is located between 34°00'59"N to 34°03'43"N latitude and 75°19'18"E to 75°21'56"E longitude. After traversing the whole Chandanwari area, several aspects like climate, vegetation, and relief were recorded and micro-watershed was selected for study purpose. The samples were taken from three different land uses (Agriculture, Forest and Fallow) at three depths *i.e.*; 0-15 cm, 15-30 cm, 30-45 cm. The various chemical and biological properties of soils in different land uses were evaluated conducting both field and laboratory studies. The average value of pH was found to be highest in Agriculture land use (7.18) while as the lowest value was observed in Forest land use (5.68) showing a slight surge while going to the deeper depths in all the land uses. Higher EC was observed in Agriculture land use (0.29dSm⁻¹) and the lowest value was found in Fallow land use (0.15dSm⁻¹). The EC showed a slight decline while going deeper into the soil. OC concentration was found to be highest in Forest land use (1.77%) and the lowest content was observed in Fallow land use (1.09%) and the OC concentration showed a diminishing trend with increase in the depth. The highest population of Phosphate Solubilizing Bacteria (PSB) was detected in Agriculture land use (20.46cfug⁻¹) and the lowest being observed in Fallow land use (7.40cfug⁻¹). Similarly, the population of Potassium Solubilizing Bacteria (KSB) and Zinc Solubilizing Bacteria (ZnSB) was witnessed highest in the Agriculture land use *i.e.* 17.80 cfug⁻¹ and 13.80 cfug⁻¹

respectively and lowest in Fallow land use *i.e.* 7.40 cfug⁻¹ and 11.20 cfug⁻¹ respectively. With increase in depth, the population of PSB, KSB and ZnSB showed a gradual decrease in number.

Keywords: Land use, Micro-watershed, Catchment.

IMPROVING BIOLOGICAL ACTIVITY IN SODIC SOILS THROUGH HALOPHILIC MICROBIAL AMENDMENTS

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Abstract: Land degradation has emerged as one of the critical environmental problems in the past few years and most of the regions of the world are being or have been affected by this problem to certain extent. Avoiding, reducing and reversing land degradation are essential for retrieval of nature-based food, fodder fuel and, fibre and ecosystem services in a sustainable mode. Restoration of degraded agricultural land is achieved through several agronomic and biological techniques. Soil/Land degradation through sodicity is universal concern. A number of techniques have been employed for reclamation of sodic soils. Gypsum as an amendment is one of the most common techniques employed for reclamation of sodic soils. However, its availability and cost are a cause for concern. Hence, we always strive for relatively cheaper options to reclaim such soils. Halophiles are salt-loving organisms that inhabit hypersaline environments. These microbes can survive in saline and sodic environments where normal biofertilizers become ineffective. Bioformulations made from halophilic microbes therefore, have a potential to improve the quality of sodic soils at a much cheaper rates. A pot experiment was conducted during Kharif season of 2019, at the Division of Soil Science and Agriculture Chemistry to study the efficacy of halophilic biofertilizers *i.e.* Halo-Azotobacter, Halo-Phosphate Solubilizing Bacteria (Halo-PSB), Halo-Zinc and Halo-Mix on the biological properties of soil as well as growth and productivity of paddy (PR-113). Biological parameters such as, microbial biomass carbon, dehydrogenase activity, alkaline phosphatase activity and bacterial count increased significantly in sodic soil with application of halophilic microbial formulations over corresponding control values. Application of Halo-mix, a microbial consortia of N-fixing, P and Zn solubilizing bacteria resulted in maximum value of MBC (90.89 $\mu\text{g g}^{-1}$) in sodic soils, which was significantly higher than control (69.17 $\mu\text{g g}^{-1}$). Similar trend was also observed for dehydrogenase and phosphatase activity in soils. In nutshell, it was observed that Halotolerant strains of bio-fertilizers viz. Halo-Azotobacter, Halo-phosphorus solubilizing bacteria, Halo-zinc and Halo-mix (combination of all three) were found to be effective in sodic soils. Our study concludes that application of multi-strain halophilic bacterial consortia could be an effective approach and need to be further explored.

Keywords: Land degradation, sodic soils, Halophiles, bioformulations, Microbial Biomass Carbon, Dehydrogenase activity, Phosphatase activity.

REVOLUTION OF CRISPR CAS9 TECHNOLOGY TO ENGINEER BIOTIC AND ABIOTIC STRESS TOLERANCE IN CROPS

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Abstract: Crop productivity in plants is reduced primarily as a result of a diverse range of environmental stresses, which are classified based on the nature of the stress, *i.e.*, abiotic (non-living factors) stresses and biotic (living organisms) stresses. Environmental stresses such as drought, salinity, heavy metal toxicity, extreme temperatures, pathogenic interactions, etc. have significant effects on plant growth and development given the increasing obstacles posed by global warming. Genetic engineering techniques have numerous applications in crop improvement for biotic and abiotic stress tolerance resulting in product quality enhancement. With the development of CRISPR/Cas9, precise genome modification for desired traits has become possible. By combining sophisticated techniques with the significant advancements in CRISPR/Cas9 genome editing technology,

biologists are now able to modify genomes with a high level of efficiency and precision that was previously unthinkable. The CRISPR Cas9 system is a reliable, effective, and beneficial method for developing crop varieties that are climate change-resistant. CRISPR/Cas9 technology has enormous potential for reproducing plants with desired traits while also revolutionizing the field of genome engineering by removing barriers to targeted genome editing. The current paper focuses on the advancement of CRISPR-Cas9 technology in its use to alter plant genomes for desired traits to develop high-yielding and Climate-change resistant crop varieties.

Keywords: Genome Engineering, CRISPR Cas9, Biotic and Abiotic Stresses, Climate-Change resistant crop, Crop improvement.

ROLE OF IMAGING TECHNIQUES IN DETERMINING ABIOTIC STRESS IN CROP PLANTS

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Abstract: Image based identification of phenotypic features of plants is an emerging science that combines multiple methodologies and protocols to measure growth, morphology, architecture, function, and composition at multiple scales. Change in climate increase the incidence of diseases, which causes a huge loss in crop production. Thermal, Fluorescence and Multi-Hyperspectral image based techniques are used in phenotyping for determining the disease in crops on different range level. Climate change is the major barrier to the advancement of crops and agricultural losses. Such constraints foster the development of High Throughput Plant Phenotyping (HTPP), which is largely based on imaging approaches and automatized plant data retrieval and processing. ImageJ is a popular open source imaging platform which has emerged as a good choice for implementing an image analysis system for automatic plant disease detection through RGB levels and is efficient in performing multiple measurements on the same image. It provides the morphological data through scaling of the image, which is useful for detection and diagnosis of plant diseases and impact of abiotic stresses. Image based analysis can successfully be utilized for phenotyping based identification and solution of climate change imposed biotic and abiotic stresses in plants.

Keywords: Image J, phenotyping, biotic stress, abiotic stress, crop plants.

IDENTIFICATION AND CHARACTERIZATION OF MICRO- AND NANO-PLASTICS IN FOOD, WATER AND SOIL

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Abstract: Micro- and nanoplastics (MNPs) have become prevalent pollutants. They are now a major concern on a global scale. The unique behaviour of MNPs such as high mobility, high rate of diffusion, easy uptake by organisms, high toxicity levels, and their potential for bioaccumulation is due to their micro- and nano-sizes. Plastic products are being used in every aspect of life due to which they are being produced in huge quantities. On being disposed of in the environment, plastics degrade over time due to various environmental factors, forming MNPs. On being exposed to MNPs by inhalation, ingestion and dermal contact, they cause various negative health effects such as necrosis, apoptosis, oxidative stress, and inflammation, metabolic disorders, weakening of immune responses and breathing difficulties. MNPs have been found in all varieties of environmental settings, such as food, water, soil, sediments, air, aquatic life, plants, and animals. This has led to rapid research on the influence studies and risk evaluation of MNPs on the environment and organisms. This review summarizes the need for the detection and characterization of micro-and nano-plastics which make their way into food and water. Therefore, it suggests the necessity for quick and innovative detection methods.

Keywords: Micro- and nano-plastics, toxicity, bioaccumulation, exposure, food, water, soil.

DETECTION OF PLANT DISEASES IN CRUCIFEROUS VEGETABLES USING DEEP LEARNING TECHNIQUES

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Abstract: Crucifers are widely grown seasonal vegetables worldwide such as cauliflower, cabbage, broccoli, radish and turnip. The crops are cultivated in winters when temperature and humidity are more favourable for the blooming of bacteria, fungi, viruses and other parasites. The diseases caused by these pathogens can severely affect the growth and productivity of plants leading to yield losses. It is often difficult to detect the infestation of pathogens and disease occurrence timely and accurately, especially in the cases where appearance of symptoms is delayed or obscure. This work aims at the detection of diseases and infestations of pathogens- bacterial, fungal and viral, prevalent in Cruciferous crops, using artificial intelligence and deep learning. The visible symptoms of the plant disease are captured through camera into images at various stages to determine the course of disease progression and data is analysed through deep learning techniques. This paper summarizes the current state of research in image based disease identification through artificial intelligence and deep learning techniques that could lead to mobile application development that would be highly beneficial for farmers.

Keywords: Crucifers, bacteria, fungi, viruses

CROP PLANT PHENOTYPING TO IDENTIFY IMPACT OF ENVIRONMENTAL STRESSES THROUGH HYPERSPECTRAL IMAGING

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Abstract: Plant growth and development are greatly impacted by environmental stressors such as drought, temperature, salinity, and others. Both biotic and abiotic stresses, such as drought and freezing, have an impact on the growth and development of plants. Environmental stresses have a huge impact on yield production as well, which makes it impossible to provide enough food for the entire world's population. Hyperspectral imaging is a potential technique to identify plant stresses. The development of the technique is focused on its deployment for crop monitoring. Technique can be used to identify disease in plants. There are two types of hyperspectral techniques that are commonly used to separate data into categories like healthy and diseased: those that concentrate on a few key wavelengths in the spectrum and those that use the entire spectrum response. The spectrum used in the technique ranges from ultraviolet (UV), which begins at 250 nm, to short-wave infrared (SWIR), which is 2500 nm. In terms of spectral range, hyperspectral imaging is regarded as the best method due to its abundance of clustered narrow wavelength bands. Ability to analyse the reflective properties of soil and plants across a variety of narrow spectral bands in order to characterize a wide range of chemical and biological traits. With sufficient spatial resolution, it is possible to create a dense, information-rich colour data set with many hundreds of data points (pixels) per leaf. The use of hyperspectral imaging and how it is used to find out more about plant health and the ability to predict the onset of disease is a major focus of the paper.

Keywords: Environmental stress, Crop Plants, Hyper-spectral Imaging, Plant Phenotyping band.

CLIMATE CHANGE IMPACTS ON CROPS

Dr. Saurav Sharma, Dr. Pankaj Mittal¹ and Dr. Bheem Pareek

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Abstract: Climate change actually results in large changes in environmental conditions like rainfall pattern, average temperature, heat waves, global change of CO₂ or ozone levels, fluctuations in sea levels in addition

to shift in weed flora, insect pests or pathogens and reduced crop duration. It is a global threat to the food and nutritional security. The modest alteration in the precipitation process and winds do not bring much change but consequently leads to dry area becoming more drier and wet areas becoming wetter. These changes are likely to be frequent in the future and limiting factor for enhancing farm productivity. It is believed that climate change is the main cause of various abiotic and biotic stresses that have been badly affecting the agricultural production. Farmers will have to adapt their current practices to a different climate marked by extreme weather events and changing season patterns. The negative effects of climate change can be mitigated by developing some adaptation measures such as development of new crop varieties with high yield potential and resistant to multiple severe stresses will be critical to sustain production. Judicious use of natural resources such as water is highly critical for adaptation to climate change. The effect of various stresses can be reduced on yield, with adjustment in planting dates.

Keywords: CO₂, Weed flora, Insect pests, Pathogens.

EXOGENOUS CONCENTRATION OF HEAVY METAL IONS IN SOIL CORRELATING WITH PHYSIOCHEMICAL PARAMETERS IN EDIBLE PLANTS

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Abstract: In agricultural practices, soil infertility is an extremely serious condition in several states of India as it supports around 18% of the world's population and 15% of the world's livestock population but has only 2.5% of the world's land area. Abiotic stress like heavy metal pollution is one of the threats to soil fertility. These heavy metals enter the soil-plant environment through anthropogenic sources. These compounds are more soluble than other substances rendering it more available for plant absorption where these could accumulate in edible plant parts existing on the top layer of soil due to deposition from air-containing smoke from vehicles. Heavy metals like cadmium, lead, zinc, chromium, copper and arsenic in toxic concentrations pose a threat to ecology and greatly affect the nutritional, environmental, and evolutionary attributes of the polluted area. Trace concentrations of heavy metals are required by plants to carry out some physiological functions and grow healthy. The degree of heavy metal toxicity or deficiency that a plant can tolerate to survive depends on the species of plant, bioavailability, and the form and concentration of heavy metals. This review is undertaken to provide a comprehensive insight into the occurrence, mobilization, and remediation of the heavy metals in the soil of edible plants with the reference of recent researches, websites and articles.

Keywords: Edible plants, Heavy metals, Remediation, Soil infertility, Toxicity.

SELECTION OF CROPS ON THE BASIS OF CERTAIN SOIL FACTORS: A COMPARATIVE STUDY OF MACHINE LEARNING METHODS

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Abstract: Agriculture is one of the building blocks to boost global economy. Many countries are still using traditional ways of farming and farmers are not educated enough to use emerging technologies such as Artificial Intelligence. Many pitfalls such as lack of knowledge in soil classification, type of crop sown, climate conditions, improper irrigation, requirement of pesticides for a suitable crop and market demand are the common causes that loss to the farmers. These problems increase the farming cost and put pressure on the farmer community. In this paper, various machine learning methods have been discussed by considering the soil parameters such as: Nitrogen, Phosphorous, Potassium, Temperature, Humidity, pH of soil and the rainfall for the selection of particular crop. The results have been presented by the help of python language.

Keywords: Agriculture, machine learning, crop, soil.

IMPACT OF CLIMATE CHANGE ON TERRESTRIAL ECOSYSTEM

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Abstract: Climate change has been the threatening issue for Biodiversity and Ecosystem not only on national point even on the global eye. The main reason for the climate change is the human activities and their results which include changes in land cover, pollution and invasion of exotic species. Terrestrial environment is severely affected by climate change and anthropogenic activities such as soil pollution, causing depletion of soil cover, reduction in soil fertility. Occurrence of toxic and persistent pollutants. Due to these unwanted alters in the environment the species in the biodiversity responding to global climate change through changes in morphology and behavior, phenology, and geographic range shifts, and these changes are mediated by human activities which lead to evolutionary changes in them. In the responses to these changes the species, are leading to widespread changes in productivity, species interactions, vulnerability to biological invasions, and other emergent properties. As biodiversity underpins all goods and services provided by ecosystems that are critical for human survival and well-being, this paper synthesizes and discusses the observed and presumed climate change and impact on biodiversity and biodiversity-based ecosystem resource allocation and livelihoods, as well as what strategies could be employed to reduce current and future risks to human wellbeing.

Keywords: Climate change, soil pollution, soil depletion, biodiversity, ecosystem.

SOIL QUALITY PREFERRED TO PROMOTE GROWTH OF TOMATO AS AN EDIBLE VACCINE

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Abstract: Tomatoes are rich source of Vitamin C, potassium, antioxidant lycopene, folate and oxalic acid, which are essential components of human nutrition. Tomato is identified as a potential candidate for developing Edible Vaccines. Environmental factors that affect the growth of tomato plants also influence the nutritional quality of tomato fruit. Soil type and quality have huge impact on growth, yield and productivity of tomato crop. Loamy soil is more suitable for cultivation of tomato crop as compared to sandy and clayey soil. Sand, saw dust and peat moss are incorporated to improve the texture of clayey soil for supporting the growth of tomatoes. Soil which consists of lots of organic matter and is moderately fertile promotes the growth. Soil highly rich in minerals and micronutrients including phosphorus, potassium, calcium, magnesium and potash gives the best growth and yield. Malaria, Hepatitis B and many others diseases are the most spread out diseases all over the India and treated by using edible vaccines. Edible vaccine is a new form of vaccine that has great potential to overcome the risk of diseases like malaria, measles, hepatitis B, cholera and diarrhea. Edible vaccines are also known as oral vaccines, food vaccines and subunit vaccines. Tomato is suitable for genetic manipulation and is ideal as an edible vaccine to express the gene for the production of vaccine to prevent the diseases.

Keywords: Edible vaccine, tomato, soil quality, diseases.

PRODUCTIVITY AND ECONOMIC ENHANCEMENT THROUGH VEGETABLES INTERCROPPING IN AUTUMN PLANTED SUGARCANE BASED CROPPING SYSTEM

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Abstract: A field experiment was conducted during 2016-17 and 2017-18 to find out the most remunerative winter vegetables grown as intercrops with autumn planted sugarcane under valley conditions of Uttarakhand. Six treatments comprised with intercropping *i.e.* sugarcane sole, sugarcane + coriander, sugarcane + fenugreek

(methi), sugarcane + vegetable pea, sugarcane + cabbage and sugarcane + onion in randomized block design. Based on the two years study, vegetable pea intercropping was found as most remunerative in autumn cane with the highest cane equivalent yield (156.5 t/ha) and net return (Rs. 275850/ha) and it was closely followed by sugarcane + cabbage (CEY 126.3 t/ha and net return/ha of Rs. 218254/ha) among all the intercropping systems. Sugarcane + onion intercropping was also found comparable with sugarcane + vegetable pea/ cabbage intercropping and or produced cane equivalent yield of 125.4 t/ha and net return of Rs. 209108/ha. Whereas, lowest cane equivalent yield and net return recorded under sugarcane+ methi intercropping system among the vegetables. Highest residual soil fertility viz., available N, P and K after harvesting of sugarcane observed when autumn sugarcane intercropped with vegetable pea (N 172.3, P 31.2 and K 228.8 kg/ha) followed by cabbage as intercrops as compared to lowest values as 138.2, 19.6 and 182.5 kg/ha, N,P and K respectively.

Keyword: Sugarcane, intercropping.

OPTIMIZATION OF POLLUTION FREE CZTS SOLAR CELL

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Abstract: In this simulation work, a theoretical study on CZTS Solar Cell with the help of SCAPS software was performed. The theoretical results in CZTS solar cells with efficiencies of 21.96% were presented. The study mainly influences photovoltaic parameters are Short-Circuit current density (J_{sc}), Open circuit voltage (V_{oc}), Fill Factor (FF), and Power Conversion Efficiency (PCE) to bolster solar cell efficiency. Since the thickness of CZTS material play a vital role in the performance of solar cells, we suggested the fair value of thickness of CZTS material to be 0.7 μm to achieve best power conversion efficiency. The importance of P-type CZTS material was discussed. The present work shows the importance of thickness customization to achieve a good performance of this type of solar cell device.

POTENTIAL OF AZOLLA PLANTS AS BIO-FILTER FOR CONTROLLING SOIL, AIR AND WATER POLLUTION

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Abstract: Day by day increasing human population coupled with urbanization and industrialization has resulted in over exploitation of natural resources and lowering the natural ecosystem as well as adverse impact on food chain that had given way to increased environmental pollution worldwide. Pollutants like herbicides, pesticide, insecticides, antibiotics and heavy metals (Pb, Cr, Hg, Cu, Zn and Cd) are being discharged directly into soil, water and air. They are getting added/ contaminated with irrigation of water and wind blow metal dust rendering the unhealthy ecosystem. Various technological interventions/ treatment systems which are combination of physical, chemical or biological are used for controlling environmental pollution. But they are very expensive and unaffordable to common men. Thus, search for natural alternative. Azolla is a free floating freshwater fern capable of fixing atmospheric CO_2 and nitrogen as well as bio-filter for various pollutants. Azolla cultivation is an excellent, low cost natural alternative to ward off the air, water and soil pollutants. Pesticides contamination in river fish, sediments and water ecosystem has become one of the most sensational issues due to their deleterious effect on public health and environment. Azolla plants also remove ammonia from freshwater fish breeding areas. The world will eventually face a war like situation for maintaining healthy ecosystem and food chain. Hence, cultivation of Azolla plants is cost effective and efficient natural alternative for controlling soil, air and water pollution.

Keywords: Herbicides, pesticide, insecticides, antibiotics.

IMPACT OF INDUSTRIAL WASTE ON SOIL MICROFLORA

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Abstract: The growing industrialization has led to soil impurity by industrial waste disposal units. There is a unique character of each type of soil. This individuality is distinguished by the profile of the soil which consist of series of layers that vary from the percolation of waste water released into the earth to wash the impurities down to the following horizons. The effluents emitted from industries into the earth are made up of several harmful substances, mineral acids, bases, etc., which, due to their preservation and adsorption, are deposited in the earth for a period of time. The mineral ingredients in the discharged effluents present in trace amounts favour the growth of certain algal, fungal and bacterial colonies which modify the soil texture. Plants growing in polluted soils may also pick up some of the chemicals deposited. The soil microflora are attracted by organic effluents with high concentration of biodegradable organic matter released to the soil, which increases rapidly in certain instances, leading to bad outcomes or fungal condition soil contamination can occur when industrial waste is discharged into the environment. Inadequate disposal of highly toxic industrial wastes will seriously pollute the soil. This waste can also pollute groundwater.

Keywords: Soil Microflora, Impurity, effluents, Biodegradable.

NATURAL FARMING CULTIVATION OF LEAF LETTUCE IN SUMMER SEASON IN SOLAN DISTRICT OF HIMACHAL PRADESH

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KVK, Kandaghat, District-Solan, H.P-173215

Abstract: In the process of modernization, particularly after the green revolution, the consumption of chemicals has increased substantially in the production system. There is a need to identify the natural farming methods which increases the growth and yield of crops and improves the physico-chemical and biological properties of soil. Natural liquid manures used in natural farming, contain small quantities of macronutrients, micronutrients, and growth-promoting substances, when applied to the crop either in form of foliar spray or through drenching in soil trigger the necessary plant growth and development, which ultimately led a to better crop yield. Leafy Lettuce has garnered a central role in human nutrition as it combines pleasing organoleptic properties with rich content of nutraceutical compounds. The greater challenge for India is to provide safe and healthy food for the growing population in the country. Despite such an important aspect, work has not been done on the use of natural products in the cultivation of leafy lettuce in summer months. District Solan is endowed with variable agro-climatic conditions and production of lettuce is being done in summer months in different pockets of Kandaghat, Solan. Production of lettuce in summer brings golden returns to the farmers. Therefore, the present investigation was conducted at Horticultural Research and Training Station and KVK, Kandaghat, Solan in the spring season of 2022. The experiment was laid out in Randomized Complete Block Design (RCBD) Factorial with three replications comprising of sixteen treatment combination of four levels of organic manure viz., M0 (Control), M1 (FYM @ 10t/ha), M2 (Ghanjeevamrit @ 1t/ha) and M3 (FYM @ 5t/ha + Ghanjeevamrit @ 0.5 t/ha) and four levels of natural liquid manure viz., L0 (Control), L1 (Jeevamrit drenching @ 5%), L2 (Saptadhanyankur spray @ 3%) and L3 (Jeevamrit drenching @ 5%+ Saptadhanyankur @ 5%) in a plot size of 2.7 m². The results revealed that T16 (FYM @ 5 t/ha+ Ghanjeevamrit @ 0.5t/ha + Jeevamrit drenching @ 5%+ Saptadhanyankur spray @ 3%) recorded superior results for majority of characters like days taken to marketable maturity (40.77), leaf length (21.20 cm), leaf breadth (20.61 cm), plant spread (36.83 cm), plant height (29.37 cm), fresh leaf weight (16.02 g), yield per plant (612.55 g), yield per plot (12.25 kg) and yield per hectare (362.88 q), number of leaves (35.51), calcium (108.37 mg/100g) and iron content (3.50 mg/100g). Hence, combined application of FYM @ 5 t/ha+ Ghanjeevamrit @ 0.5t/ha + Jeevamrit drenching @ 5%+ Saptadhanyankurspray @ 3% can be recommended to the farmers for commercial cultivation of lettuce during summers for getting better growth, yield and economic returns in the mid-hills of Himachal Pradesh.

BIODEGRADATION OF ORGANOPHOSPHORUS PESTICIDES BY THE BACTERIA ISOLATED FROM THE APPLE ORCHARDS OF THE KULLU REGION OF HIMACHAL PRADESH

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Abstract: An anthropocentric approach toward development had put the whole of mankind in great trouble and has led to the degradation and extinction of natural resources like drinking water, pure air, soil fertility, fossil fuels, and further the emission of harmful chemicals into the environment. Reports have shown that these pollutants have been responsible for many detrimental effects on humans and other organisms. Therefore, the removal of these pollutants from the environment is very important, microorganisms play a very crucial role in remediating these pollutants from the environment. In this research, we will focus on bacteria that have been isolated from the organophosphorus pesticide sprayed field from the apple orchards of the Kullu region of Himachal Pradesh. Its potential for the degradation of different organophosphorus pesticides like malathion, fenthion, profenofos, and chlorpyrifos has been analyzed in-vitro. Further, the degradation efficiency has been checked by using various analytical techniques like high-performance liquid chromatography (HPLC), and gas chromatography (GC). This study has given insight to future research that with the help of genetic engineering the efficiency of the degradation can be enhanced and fastened. This study has also focused on the biotechnological importance, industrial applications, and medical research so that it can benefit the society in long term.

Keywords: Malathion, fenthion, profenofos, and chlorpyrifos.

LIVELIHOOD SECURITY IN RAINFED AREAS THROUGH MIXED CROPPING SYSTEMS

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Division of Agronomy, FoA, SKUAST-J, Chatha

Abstract: An on-farm trial was carried from rabi 2015-16 to 2017-18 in existing four year old citrus orchard under rainfed ecosystem. At the citrus orchard various interventions like- construction of rain water harvesting structure, growing field crops in the inter row spaces of fruit trees, application of recommended fertilizer and manures to the fruit trees as per their age, etc. were carried to maximize yield of both field as well as fruit trees. Traditionally, intercropping in fruit orchard was practiced under irrigated situation, but with the harvesting of rainwater it was possible to utilize the land unit efficiently by putting it under cultivation of field crops, which helped in increasing both production and productivity. In general, farmers develop orchards for fresh fruit production and do not consider it for intercropping. The study indicated enhanced yield of citrus fruit trees along with intercrops (wheat and mustard taken in rabi season and maize and bajra taken in kharif season). The mean increase in fruit yield due to interventions, after three years of study was to the tune of 23.0 percent. The production of fruits significantly increased due to intercrops and it was maximum in citrus in association with wheat and mustard (4920 q/ha) during rabi 2017-18. Mean yield of inter row crops increased by 33.0 percent for wheat, 32 percent for mustard and 45 percent for maize, due to various interventions. Benefit cost ratio increased to 6.2 after three years of study as compared to 4.68 before interventions. System profitability was also worked out and it was seen that Citrus-Maize-Wheat showed maximum profitability of Rs 414/ha/year, followed by Rs. 371/ha/year under Citrus-Bajra-Wheat. It was confirmed that citrus based agri-horticultural systems were effective in bringing about improvement in the soil properties as reflected by the significant increase in organic carbon, available nitrogen, phosphorus and potassium.

The study showed that intercrops did not exert adverse effect on the growth and productivity of citrus. The field crops intercropped (raised in the interspaces of the fruit trees) in the orchard provided seasonal revenue to the farm family. Intercropping in citrus was effective in bringing improvement in the soil fertility, leading to a sustainable production system.

Keywords: Agri-horti system, water harvesting, Benefit cost ratio, farm profitability, etc.

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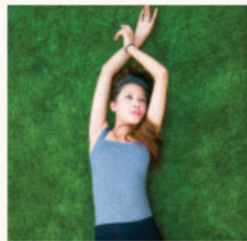
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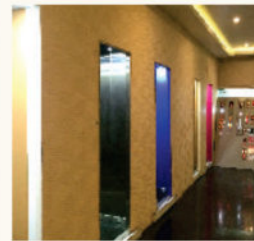
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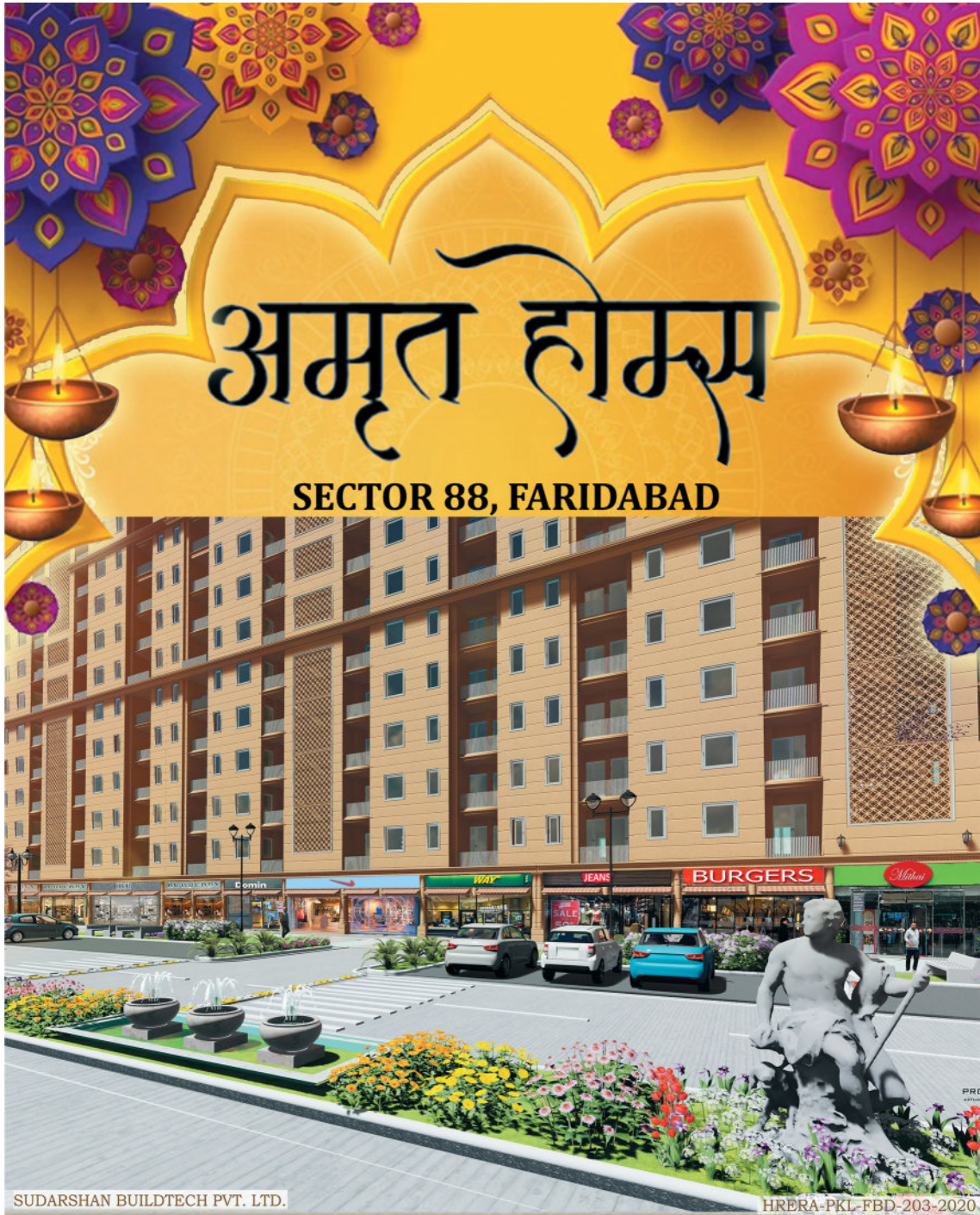


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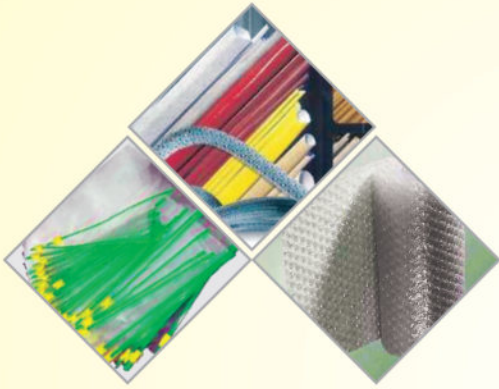
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