



REPORT ON THE
ONLINE NATIONAL SEMINAR ON
“STRENGTHENING AGRICULTURAL WATER USE LAW,
POLICY AND MANAGEMENT IN INDIA”

Organised By

CENTRE FOR ENVIRONMENTAL LAW, EDUCATION,
RESEARCH AND ADVOCACY, NATIONAL LAW SCHOOL OF
INDIA UNIVERSITY

In Association With

UAS, GKVK- BENGALURU and ICAR-IIWM, BHUBANESHWAR

DATE: 26TH MARCH, 2021

Our Websites: nlspub.ac.in/nlsenlaw.org/nlsabs.com

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ACKNOWLEDGEMENT

The Centre of Environmental Law, Education, Research and Advocacy expresses its sincere gratitude to the **Indian Council for Agricultural Research – Indian Institute of Water Management, Bhubaneshwar** and the **University of Agricultural Studies, GKVK, Bengaluru** for their support, co-operation and encouragement in organising the **Online Seminar on “Strengthening Agricultural Water Use Law, Policy and Management in India”** held on 26th March 2021 under the project on AGRI-Consortia Research Platform on Water. We specially acknowledge the support extended by **Dr. Susanta Kumar Jena**, Principal Scientist, ICAR-IIWM and **Prof. (Dr.) P. S. Srikantha Murthy**, Professor, UAS, GKVK, Bengaluru.

We would like to extend our sincere gratitude to our Vice-Chancellor, **Prof. [Dr.] Sudhir Krishnaswamy**, for his encouragement.

We are thankful to **Prof. [Dr.] M. K. Ramesh**, our mentor and guide, for his constant motivation and relentless support to the team at CEERA.

We acknowledge the invaluable contributions and rich insights of all the resource persons and invited speakers in making the Seminar a success. We are also thankful to all the participants and paper presenters for their active participation and their contributions to the deliberations.

Finally, we would like to thank the CEERA Team - **Ms. Madhubanti Sadhya, Mr. Rohith Kamath, Mr. Raghav Parthasarathy, Mr. Vikas Gahlot, Ms. Geethanjali K.V.** and **Ms. Lianne D’Souza**, for their help and support in organising this seminar and conducting it seamlessly.

Prof. (Dr.) Sairam Bhat

Coordinator, CEERA

Professor of Law, NLSIU

ABOUT THE SEMINAR

The online seminar on “Strengthening Agricultural Water Use Law, Policy and Management” was designed with the objective of providing a platform for deliberations on the laws and policies governing the use and management of water in the agricultural sector in India. As India is primarily an agrarian economy, the Seminar delved into the varied contours of the legal and policy framework for sustainable use of water for agriculture. The national Seminar aimed at including contributions by experts from the legal and agricultural sector, academicians, agricultural scientists, legal luminaries and policy makers, to discuss and deliberate on the disparate issues of the agricultural sector with specific reference to water availability, use and management.

The Seminar focussed on the following themes:

- Use of Technology in Water Conservation and Usage
- Multi-jurisdictional Comparative Analysis of Water Conservation Policy
- Accountability and Transparency of the Government in Agricultural Water Regulation
- The Regulatory Role of the Centre: A bane for Sustainable Agricultural Water Practices.
- Agricultural Water in India: Compromised by Economic Growth
- Public Private Partnership in Water Management and Utilization
- Efficient Management and Administration of Water Resources: Possible Avenues
- Striking balance between Right to Livelihood and Conservation of Water
- Exploitation of Government Agricultural Programs
- Re-Thinking Decentralization in Water Use and Management
- Sustainable Development Goals and Agriculture sector
- Sustainable Agricultural Practices
- Water and Food Security
- Water Policy for the Agricultural Sector with special emphasis on Climate Change perspective

ABOUT NLSIU

The National Law School of India University, the Nation's premier law university, came into existence through a Notification under the National Law School of India University Act (Karnataka Act 22 of 1986). It signified the culmination of efforts by the Judiciary, the Bar Council of India, the Karnataka Bar Council, the Bangalore University and the Government of Karnataka to reform legal education and to establish a centre of excellence for legal education and research in India. The Law School has undertaken many research projects funded by the UGC, the Government of India, the Government of Karnataka, the Department of Women and Child Development, UN agencies, the World Bank, HIVOS, Department of Justice etc.



The Projects have served to strengthen research and teaching at the Law School. The National Law School of India University since its inception has taken proactive steps in organizing conferences, seminars, workshops, refresher courses and certificate courses to update academicians, law teachers, students, industry personnel in different subject areas.

ABOUT CEERA



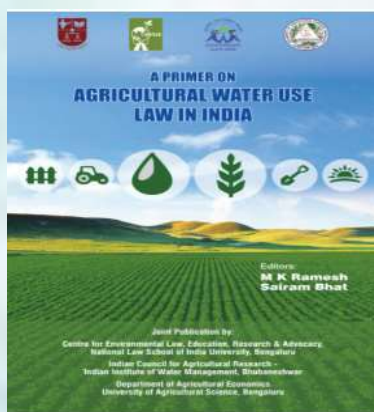
Centre for Environmental Law Education, Research and Advocacy (CEERA), established in 1997 is a benefactor of the Ministry of Environment and Forest (MoEF), Government of Karnataka, the Bar and the Bench in India and abroad. Building an environmental law database, effectively networking among all stakeholders, building up an environmental law community and policy research in the area of environment are CEERA's main objectives. To achieve the aforesaid, CEERA has incessantly and successfully been able to build functional and professional linkages with government agencies and non-governmental organisations in India, the South Asian

Region and at International levels. CEERA annually organises, a University Grants Commission recognized, One-week Law Teacher's Refresher Course. CEERA, has been partnering with Central Pollution Control Board in organising Training Programmes for the officers of various State

Pollution Control Boards and other industry professionals for over eight (8) years. One of the first in India, to successfully be granted a World Bank project and thereafter being a steady choice for the Ministry of Environment Forest and Climate Change, CEERA has been entrusted with research projects and workshops to impart training to Forest Officers, Revenue Officers, Officers of the Central Pollution



Control Board and also of the Government of Karnataka. CEERA is proud to have completed a two-year Research Project granted by the United Nations Development Programme (UNDP) under the Global Environment Facility (GEF), and as one of the deliverables, organised, convened and conducted over twenty workshops at Institutions of national repute creating awareness on the Biodiversity Law and Access and Benefit Sharing (ABS) in less than 2 years. Two research publications on the scanty research area of biodiversity laws were also the outcome of this project.



CEERA has several publications in the area of environmental law, the law and public policy along with Newsletters, CEERA March of the Environmental Law, NLSIU's first e-Journal – Journal on Environmental Law, Policy and Development and manages two websites viz., www.nlsenlaw.org, wherein the law and policy on Environment is regularly updated, and

www.nlsabs.com, a dedicated portal wherein the law and policy on Biodiversity Access and Benefit Sharing is updated periodically. All our publications are duly updated on our online portal www.nlspub.ac.in, which is open for subscription to all readers.

SUMMARY OF PROCEEDINGS

Inaugural Session



The Inaugural Session was graced by dignitaries who collectively set the tone of the Seminar and gave a brief overview of the agenda for the discussions and deliberations that were to follow. The Session commenced with a brief overview of the broad theme of the Seminar delivered by **Prof. (Dr.) Ishwara Bhat**, Vice Chancellor, KSLU. Through his short address, Prof. Bhat stressed on the importance of agriculture to the Indian economy and the correlative importance of water to the agricultural sector. He briefly delved into issues plaguing the agricultural sector by stating that agricultural activities themselves necessitate the presence of water, which unfortunately has fallen prey to immense exploitation owing to industrialization, urbanization and overpopulation. To address these issues,



he stressed on the importance of adopting an integrated approach towards the management of agricultural water.

Following this, **Prof. (Dr.) M K Ramesh**, Professor of Law, NLSIU very efficaciously set the tone of the Seminar, drawing references to his own



personal experiences in water use in the agricultural sector. Prof. Ramesh noted that agriculture forms the backbone of the livelihood and sustenance mechanism for a major chunk of the population in India. As a result, nearly 80% of the available water resources in the country are

utilized in agricultural purposes. He further pointed out the fact that the climate change crisis, in addition to the already existing issues of water shortages and mismanagement, has wreaked havoc on farmers and the agricultural activities they engage in. Thus, it is the need of the hour to come up with adequate policy interventions that would serve the best interests of farmers while simultaneously ensuring water conservation.



In the concluding section of the inaugural session, **Dr. Susanta Kumar Jena**, Principal Scientist, ICAR-IIWM highlighted the importance of tackling the underlying issues in agricultural water use by resorting to technological

advancements. He mentioned that several industrial activities are being undertaken in the name of technological advancement, without much heed being paid to sustainable development. On account of the 300 million tons of food grains produced by the country, our water requirement, along with the goal of sustainability by 2050, amounts to approximately 1447 billion cubic

metres. Furthermore, owing to the ever-increasing industrial growth and demand, water available for agricultural irrigation is projected to drop to 75% in the near future. Thus, it is necessary that the aforementioned activities are conducted within a set legal framework to preclude the aspect of sustainability assuming a position subservient to technological development.

Session 1

The first technical session of the Seminar was chaired by **Prof. (Dr.) M K Ramesh & Prof. (Dr.) Sairam Bhat**. The Session had overall focussed on the constitutional dimensions of water resource management in India and allied issues.

Constitutional Dimensions of Agricultural Water

Prof. V S Mallar engaged the participants by highlighting the constitutional dimensions of the use and management of agricultural water in India. He stated that the vision of our Constitution framers, with regards to agriculture and water



utilized for the same has been captured in the provisions governing Fundamental Rights, Directive Principles of State Policy (DPSPs), Article 262 along with Schedules VI, XI and XII. Furthermore, aspects relating to agricultural water use can be traced to the right to food under Part IV of the Constitution. The Right to Food is an integral part of the Right to Life within

the ambit of Article 21 of the Indian Constitution, which has been accorded a liberal interpretation commencing from landmark judgements such as the case of Maneka Gandhi v. Union of India. Further, the cases of Kishan v. State of Odisha and Centre for Public Interest Litigation v. Union of India are significant as well, owing to the fact that the Supreme Court accorded utmost importance to food security and categorizing it as an indispensable part of Article 21 and the Right to Live with Dignity. Prof. Mallar also delved into a short discussion on various constitutional provisions such as Articles 31A, 31B, 19(1)(f), 39A and Schedule IX. By deliberating upon these provisions, importance was placed on the manner in which the Constitution enables an effective system of managing water use in the agricultural sector.

Resolution of Inter State Water Disputes in India – A Look at Recent Developments



In the next presentation by **Prof. (Dr.) G.B. Reddy and Dr Irfan Abbas**, the issues pertaining to inter-state river water disputes were highlighted. Throwing light on a few examples such as the Polavaram Hydroelectric Project (dispute between Andhra Pradesh and Tamil Nadu), the Ken-Betwa River Linking Project (deadlock between Uttar Pradesh and Madhya Pradesh), etc. it was stated that most water disputes involve the construction of multi-purpose irrigation projects, increasing the heights of dams and refusal to release a specified share of water to affiliated states. As far as the sharing of river water between different states is concerned, the data provided by the Central Water Commission (CWC) indicates that there exist nearly 150 river

water sharing agreements which often give rise to disputes. To resolve such disputes, the presentation focussed on the framework of the Inter-State River Water Disputes Act and the role of the tribunals set up under the Act in ensuring equitable distribution of water.

Strengthening Agricultural Water Use Law, Policy and Management in India



Prof. (Dr) S. Nataraju, Principal, JSS Law College, Mysuru, highlighted the correlation between water scarcity and food security over the course of his presentation. He noted that, the ongoing water crisis has

predominantly resulted from the large mismatch between the ever-growing demand for water in comparison to the depleting water supply, in addition to the incompatibility between economic development and environmental conservation. The need of the hour is to devise an integrated approach to both water conservation and food security, owing to their undeniable nexus with each other. More specifically, water generates energy, which is vital in the production of food via agriculture, which in turn is essential to obtain energy and survive. Drawing reference to a list of case laws such as *Subash Kumar v. State of Bihar* and *PUCL v. Union of India* and legislations such as the Water Act, 1974, the Karnataka Groundwater (Regulation & Control of Development & Management) Act, 2011, and the Indian Easements Act, 1882, Prof. Nataraju threw light on the constitutional and legislative framework relating to food security and water management in India.

Role of Local Self-Government in Implementation of Water Policies in Agriculture Sector: An Assessment



In this presentation, **Dr. N Satish Gowda**, Associate Professor, ULC, Bangalore University, explored the role of local bodies in implementing water laws and policies in the agricultural sector. He drew the participants' attentions to a number of laws and policies with regards to agricultural irrigation, such as the National Mission for Sustainable Agriculture, the Pradhan Mantri Krishi Sanchay Yojana, the Micro Irrigation Funds Scheme, the Karnataka Water Policy, 2002 and the National Water Policies of 2012 and 2019. Following this, Dr. Gowda discussed in brief a few legislations that recognise the role of panchayats in agricultural water management, such as Karnataka Panchayati Raj Act, 1993 and Gujarat Panchayati Raj Act, 1993.

SESSION 2

The second session of the Seminar laid emphasis on irrigation policies and future prospects of improving irrigation techniques in India. The second session was chaired by **Prof. (Dr.) Sairam Bhat and Dr. Gigimon V S.**

ICAR Flexi-check Dam (rubber dam) Technology for Water Conservation and Efficient Use for Agriculture



Dr. Susanta Kumar Jena

deliberated on the technical aspects of irrigation and water conservation in India with specific focus on the technology adopted in Flexi-check Dams. In the introductory section of his presentation, he gave a brief

overview of the challenges and concerns arising in connection with the traditional dams in India. It was pointed out that the traditional dam systems are not equipped to handle extreme weather conditions such as floods, droughts or landslides, thereby rendering them inefficacious in conserving water. Furthermore, it was highlighted that traditional dams do not possess the quality of inflation or deflation to regulate the volume and flow of water.

Following this, Dr. Jena elucidated the structure, build and functioning of flexi-check rubbers to control the flow of water and thereby conserve water to the maximum extent. Through a pictorial representation, he explained the dynamics of the rubber dams. In this backdrop, he also threw light on how these dams can facilitate controlled irrigation systems to check unnecessary outflow of water. Furthermore, Dr. Jena also highlighted the benefits of rubber dams for irrigation in coastal areas, with examples, owing to the topographic and geographical challenges that make the coastal regions more vulnerable climatic extremities. He explained the working of rubber dams in controlling the salinity of water in coastal areas, thereby facilitating better irrigation systems. On a concluding note, Dr. Jena rendered a few remarks on how technological developments in the agricultural sector are underway and such developments will contribute to the conservation and better management of water for agricultural purposes.

Law and Policy on Irrigation in India: Challenges and Prospects



Dr. Uday Shankar delved into the law and Policy on Irrigation in India. Introducing his topic for presentation, Dr. Uday Shankar gave a outline of his presentation which included the situation of water management in the

pre-independence era in India, the constitutional framework and the design in relation to irrigation and the policy structure in this regard. He further highlighted the literature on water consumption in India. In this regard, it was noted that the agricultural sector is one of the largest consumers of water – specially ground water – in India, considering the vast area of land under cultivation in the country. Although agriculture in India is largely dependent of rainfall to meet the water requirements, there has a been a significant increase in the consumption of ground water and surface water for agricultural purposed in India. Therefore, the law has a crucial role to play in regulating the use and management of water in the agricultural sector.

Deliberating on the legal framework for irrigation in India, Mr. Uday Shankar proceeded to highlight certain laws and their relevant provisions dealing with management of water for irrigation in India. He threw light on the Government of India Act, 1935 to explain how the state was vested with the duty to regulate water for irrigation purposed. Following this, he explained how the constitutional design accommodates provisions for irrigation and agriculture in general, by tracing the history of including these provisions through the constitutional assembly debates. An interesting example highlighted in this regard was the constitutional assembly debate surrounding the inclusion of irrigation as a subject in the concurrent list of the seventh schedule of the constitution.

Proceeding this, Mr. Uday Shankar focussed on the importance of ground water in the agricultural sector and the rules and regulations put in place to

regulate the use of ground water. He placed reliance on the Model Groundwater Bill proposed by the Central Government and the Punjab Subsoil and Groundwater Act, to explain how despite the gap in the overall legal framework, there have been initiatives to regulate ground water use and consumption. On a concluding note, Mr. Uday Shankar explained the importance of adopting sustainable irrigation practices by highlighting a few initiatives that incentivise these practices such as the National Mission on Sustainable Agriculture, Participatory Irrigation Management Policies and Pradhan Mantri Krishi Yojana focussing on micro-irrigation.

Water Quality and Agriculture: The Need for a Revisit of Land Use Patterns and Policies



The central focus of **Dr. Vani Kesari's** presentation was threefold: (a) the innate relationship between land use and water quality, (b) water quality and agriculture and (c) land use policies and the existing gaps.

Delving into the first aspect, Ms. Kesari gave a brief overview of importance of water quality in agriculture and the correlation between water quality, land use and agricultural productivity. She highlighted the impact of land use and agricultural practices on water quality. She raised a pertinent question on the need to analyse various patterns of land use in understanding the deteriorating quality of water. Answering this, Ms. Kesari explained that increased industrialisation, domestic discharges, mines discharges, urban discharges, extensive infrastructural development waste disposal and use of chemical pesticides and insecticides deteriorate the water quality. Moving on to the second aspect of her presentation, Ms. Kesari explained how water quality is affected by agricultural practices such as inefficient irrigation systems, extensive use of pesticides, inappropriate crop cultivation, agricultural discharges in common water resources etc. She then explained

the impact of the deteriorating quality of water on human health and wellbeing, aquatic life, animal health and the environment as a whole. Posing a question on the ecological impact improper water use and management in the agricultural sector, she highlighted the interlink between agriculture, water quality and land use.

In the last leg of the presentation, Ms. Kesari ventured into the policies dealing with agricultural land use and water quality in India. She explained how agricultural land use is regulated through a decentralised system at the Centre, State and Local levels. She threw light on the 74th Constitutional Amendment to elucidate on this decentralised system of governance. Following this, she delved into various policies such as, National Commission on Agriculture, National Policy for Farmers, Policy on Agriculture and explained how certain lacunae exist in dealing with land use and water quality as a whole. A brief overview of the situation in the State of Kerala was also provided by drawing reference to the Kerala Land Utilisation orders.

On a concluding note, she gave few suggestions in improving the law and policy on land use planning. Among many points, it was suggested that a coherent policy connecting land use and water quality is required, a GIS and other technologies in studying land use patterns must be adopted, water quality monitoring at local level must be encouraged and water management plans must prioritise ensuring high standards in water quality.

Economics of Irrigation in Conjunctive Use Areas



The last speaker for the session **Dr. Srikantha Murthy** deliberated on the economics of irrigation in conjunctive use areas. In the introductory note, Dr. Murthy gave a brief overview on the relation between property and water

use. Explaining the issue of exploitation or abuse of property rights, he elucidated the importance of resorting to economic and market incentives in irrigation systems, with specific reference to the conjunctive use areas – which are areas fed by two water resources. Following this, Dr. Murthy drew the participants’ attention to a field study conducted in this regard, which covered the command areas of rivers Hemavathi, Bhadra, Krishna, Tungabhadra and Kaveri in the State of Karnataka. He then explained the methods of irrigation studied in the course of his research, to understand the profitability and economic efficiency of water use under different irrigation systems. Dr. Murthy stated that the profitability of surface water irrigation is much higher than that of ground water, whereas conjunctive use areas were better off than ground water irrigation. He explained that the reason for surface water yielding a higher profitability is due to the fact that surface water irrigation is highly subsidised when compared to ground water irrigation systems. However, the savings in conjunctive use irrigation methods was much higher than that of ground water or surface water irrigation systems. Thus, in this respect, irrigation in conjunctive use areas is rather economically efficient and cost-effective when compared to ground water or surface water use wither in conventional or micro-irrigation systems.

SESSION 3

The third session of the Seminar focussed on the approaches in agricultural water management adopted in various states, specifically those adopted in Karnataka, Goa and Jammu & Kashmir. The Session highlighted the legal framework and best practices adopted by these states with specific emphasis on regulating water use in the agricultural sector. The third session was chaired by **Prof. (Dr.) Sairam Bhat**.

A Study of Kattas as Traditional Irrigation Systems in the Districts of Dakshina Kannada, Udupi and Kasargod



Explaining the traditional agricultural methods adopted in the State of Karnataka, **Dr. Akhila B. G. and Ms. Nayashree** gave an introduction of the traditional dams called 'Kattas'. She explained how the technique came to be, clarifying that Kattas are temporary structures as barricades built across rivers and tributaries to store and harvest water. The benefits of Kattas were extensively discussed by the speaker by stating how they rejuvenate ground water, benefit ecology by helping birds and aquatic species, retention of moisture is also due to the Kattas. Working of kattas was further discussed, how location of Kattas is important and only bottleneck shape is chosen. She further explained that soil, rock or granite is laid as foundation to such kattas. The structure requires skilled labour and traditional knowledge, explained Dr. Akhila. Further she mentioned how innovation and technology have brought down the construction time of Kattas from nearly a month to just over a week.

Challenges of Kattas was further discussed by Dr. Akhila like breach in the wall, cost sharing by multiple beneficiaries, crab attacks, decrease of skilled labourers, availability of material for construction. Further deliberating on the involvement of the government, she explained the Schemes launched by Kerala government. Lastly the speaker had some recommendations to suggest like post intervention maps, community participation through water user associations for post rejuvenation sustainable management, mass movements in reviving Kattas, NGO promotion, NSS schemes, campaigning, Katta day initiatives.

Is Ground Water Law a Possibility?



Elucidating the issues of ground water management in India, **Dr. M G Chandrakant**, explained how India can have a comprehensive groundwater law. Explaining the need for such a law, he mentioned that India is the largest extractor of ground water pumping twice that of USA and 6 time more than western Europe. He further stated that lack of well-defined property rights for water affects optimal/ efficient allocation. Mr. Chandrakant then stated that although it might seem that groundwater might be free in a sense, groundwater through well is not free as we must invest in wells. Further right to groundwater is ambiguous in India, as groundwater was never declared as publicly owned in India. Investment in groundwater does not ensure property rights remarked the speaker.

Is it ever possible to enact a groundwater law in a developing country like India? The speaker questioned. Answering this self-posed question, he stated that political will is most essential and gave an example of Karnataka Groundwater Act 2011 (Act to regulate groundwater) and Uttar Pradesh law along the same lines in 2020. The speaker remarked that the groundwater laws were toothless. Dr. Chandrakant stated that sustainability in the long run is important and perennial crops cultivation is important.

Agricultural Water Laws and Policy: The Goan Perspective

Dr. Shaber Ali Gandaman, began his presentation by highlighting the importance of water as it is the most precious resource for our life on this earth. Although 70% of the planet is covered in water only 3% is feasible for human consumption explained the speaker. 2.5% is ice caps so only 0.5% is available for consumption. Speaking of the Goan perspective, he pointed out that during the Portuguese rule everything had a separate code. Giving an example he mentioned about the Portuguese Civil Code, 1867 that is still in force in Goa. Under which water is categorised under different heads like public waters and navigable floatable waters. Further the speaker talked about other laws dealing with agriculture mainly The Goa Daman and Diu Agricultural Tenancy Act, 1964; Land Revenue Code, 1968; Land Revenue Code Amendment Act 1978. Speaking on the water policy in Goa, two acts Goa Irrigation Act 1973, Goa Groundwater Regulation Act 2002 are the main laws applicable said the speaker. Goa Water Policy was adopted in 2010 and a new policy was adopted in 2015. Highlighting the issues and challenges particularly plaguing the State of Goa, Dr. Ali suggested a few measures and reforms that may be appropriate for better water use and management in the agricultural sector in the State.

Jammu and Kashmir Water Resources (Regulation and Management) Act, 2010: An Analytical Snapshot with Special Reference to Irrigation Facilities



In this presentation, **Ms. Kartika Bhakshi** shared a few incites into the legal and policy framework for water management in Jammu and Kashmir. Relying on factual data, she highlighted that although 30% of land area is under cultivation in the State, agriculture provides 65% to 70% of the population with employment. Elucidating on some geographical pointers, she explained how both Kharif and Rabi crops must be cultivated, as Jammu is dry and depends on monsoon said the speaker. Talking about the irrigation in Jammu division the speaker said that Chenab, Ravi, Ujh, Basantar and Neru are rivers that flow in the region. New Pratap canal supplies water to the region and Ranbir canal to RS Pura area having Basmati rice cultivation, explained the speaker. Furthermore, she delved into the legal provisions dealing with water management in the State of Jammu and Kashmir. On a concluding note, a few suggestions were made to overcome the gaps in implementing the law on water management.

SESSION 4

The fourth session of the Seminar focussed on analysing agricultural water use in light of climate change. With specific emphasis laid on the effects of climate change on the agricultural sector, this session gave a birds' eye-view of the issues and challenges for water use and management in India. The fourth session was chaired by **Prof. (Dr.) Sairam Bhat and Ms. Madhubanti Sadhya**.

Rethinking Agricultural Water Use Law and Policies in the Light of Climate Change



The first presentation of the session was presided over by **Dr. Yogendra Srivastava and Mr. Omkareshwar Pathak**, who focussed on the implication of climate change for water laws in India. The presentation began with an overview of the right to water under the International Framework with specific reference to Article 55 of the United Nations Convention. The presentation further delved into the role and responsibilities of the national and state level institutions in the country which are responsible for the implementation of laws relating to water use and management in India. This was followed by statistics on ground water in India including the quantum of ground water available, the rate of recharge and the per capita consumption of groundwater. Following this, the effects of climate change on water resources was briefly touched upon drawing reference to various studies in this regard. Furthermore, the implications of climate change on community and individual water rights were discussed. On a concluding note, the Speakers highlighted the need for weaving issues arising from climate change within the broad framework of water laws in India.

Agricultural Water Regulatory Kinetics

The next presentation of the session was presided over by **Dr. Manjappa C. N.** on the broad topic of 'Agricultural Water Regulatory Kinetics'. The presentation commenced by tracing the importance of conserving water resources in historic texts. Focus was laid on the importance of water rights and how water resources are distributed to balance these rights. Along with this, Dr. Manjappa highlighted the importance of correlative duties of the authorities and state agencies – including the ground water authority, the Common Area Development Authority, the Water Department, the Gram Panchayats and the Municipal Corporations. Drawing references to certain ground realities in the State of Karnataka, the presentation focussed on how the regulatory and legal framework is equipped to achieve water conservation and sustainable use of water.

The Impacts of Climate Change on the Agricultural Sector: Need for Sustainable Water Management in India



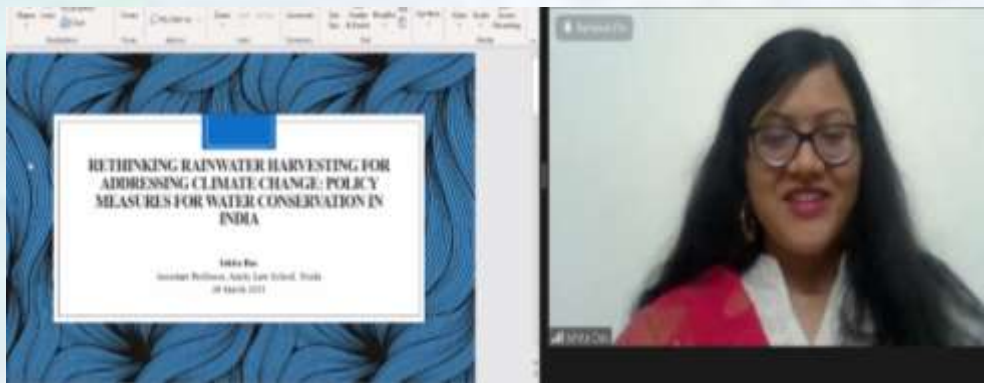
Further deliberating on the contours of climate change in relation to the agricultural sector, **Ms. Vidya Ann Jacob** gave valuable insights on the correlation between water scarcity and climate change. The presentation began with a brief overview of India's performance globally in tackling climate change. She then proceeded into the effects of climate change on the quantity and quality of water, with special emphasis on the consequences of climate change on the agricultural sector. As India is a developing country, which is heavily dependant on agriculture, Ms. Jacob pointed out the overall effects of inaction in addressing climate change on the economy and the environment. Furthermore, she delved into the various challenges that belie the water sector in India, in general, which include physical water scarcity, poor water quality, economic scarcity, issues in allocation of water etc. On a concluding note, Ms. Jacob highlighted how well-equipped the laws and policies in India are to address the interlinked challenges arising from water use, agriculture and climate change.

Managing Urban Wastewater Flows for Irrigation in Peri-urban Areas



Ms. Priyanka Jamwal highlighted the importance of best agricultural practices in peri urban areas. She began her presentation with an introduction into the process of waste water management and use in the agricultural sector with special reference to the use of agricultural waste water for irrigation in peri-urban areas. Ms. Jamwal interestingly pointed out that the lack of fresh water incentivises the resort to recycling waste water and reusing the same for agricultural practices in peri urban areas. Drawing reference to specific rivers such as the Ganga, Yamuna, Musi, Hindon and Kasadri, she explained the dreary situation of how improper waste disposal mechanisms in the agricultural and industrial sectors have lead to high levels of pollution in water resources. To address this situation, she elucidated the benefits of adopting and encouraging the adoption of domestic waste water treatment systems. Furthermore, she explained how such techniques are crucial for waste water management, especially in the agricultural sector, by drawing the participants' attention to statistics on the status of waste water generation in the country. On a concluding note, Ms. Jamwal made recommendation for improving the implementation of waste treatment laws in the country and creating awareness for adopting waste water disposal and treatment systems at a decentralised level

Rethinking Rainwater Harvesting for Addressing Climate Change: Policy Measures for Water Conservation in India



The last speaker of the Seminar, **Ms. Ishita Das** centred her presentation on the crucial role that rainwater harvesting techniques play in addressing climate change; especially the climate induced water crisis. The presentation began with an overview of what rainwater harvesting systems are and how they are the need of the hour in addressing the problem of water scarcity. Further, much emphasis was laid on how climate change can trigger extreme weather conditions such as droughts, floods, snowstorms, avalanches etc. which invariably have an impact on the supply of water. The co-relation between climate change and water scarcity and its allied issues was highlighted by citing a few examples. Finally, on a concluding note, Ms. Ishita gave a few positive suggestions for incentivising water harvesting as a practice among the masses and for improvising the existing techniques of water harvesting in India.

PAPER PRESENTATIONS

The last session of the Seminar involved presentations on the research undertaken by the participants. A total of 6 participants presented the outline and findings of their research by providing a brief glimpse of their research papers. The session was chaired by **Ms. Vidya Ann Jacob and Ms. Geethanjali K V.**

Law and Policies on Ground Water Management in Karnataka: An Analysis - Dr. Shilpa M.L

In this presentation, the presenter focussed on the legal regime governing ground water management in the State of Karnataka. The legal instruments governing water as a subject matter are applicable only to surface water whereas the legal regulations pertaining to ground water are put to darkness. Even though certain legislations on ground water have been formulated by different States it is just half meal and fails to address the issues effectively. Tracing the legal initiatives in the State of Karnataka, the presenter made an attempt to know workability of the provisions of law particularly in the State of Karnataka and tries to assess the lacunas in implementation by providing workable solutions.

Comparative Economic Analysis of Water Use Efficiency and Energy Costs under Godavari command area of Telangana - Banda Sainath and P. S. Srikantha Murthy

In this presentation, the presenters, through their research, made an attempt to evaluate the efficiency of conjunctive use regime vis-à-vis the other regimes of irrigation. The aim of the research was to assess the efficacy of different irrigation systems, by analysing data in the Godavari Command Region. In pursuance of the research, a study was undertaken in Karimnagar and Warangal districts, falling under the Godavari command area of Telangana, to analyse the economics of irrigation among the farm households across surface water (SW), groundwater (GW) and conjunctive use (CU) regimes. The required data was collected from randomly selected 60 farmers each under the three regimes. Data was analysed using descriptive statistics and natural resource economics tools.

Economic Evaluation of Water Productivity under Ramthali Micro-Irrigation Project in Bagalkot District of Karnataka - Shivashankar M Hugar and P. S. Srikantha Murthy

In this presentation, the presenters focussed on the significance of micro-irrigation to agriculture. The research was attempted to test the efficacy of micro-irrigation projects as an institutional and market mechanism to improve the use and management of water for agriculture. With specific focus on Bagalkot District in Karnataka, the research involved a field study on water usage through micro-irrigation, canal irrigation and rain-fed water sources.

Considering the significance of micro-irrigation in boosting production and productivity of agriculture, Government of Karnataka has implemented “Ramthal Micro-irrigation project” in Hungund Taluk of Bagalkot District, Karnataka. Ramthal (Marol) Micro Irrigation Project is one of the largest micro irrigation projects in Asia. The present study was taken up in micro-irrigated farms (MIF), canal irrigated farms (CIF) and rain fed farms (RFF) to analyse the economics and efficiency of irrigation under Ramthal micro-irrigation project, across different irrigation methods.

An Economic Impact Assessment of Supplying Treated Sewage Water to Irrigation Tanks for Farming Under Kc Valley Project in Kolar District of Karnataka. - N. Ramesh and P.S. Srikantha Murthy

This presentation focussed on economic impact of using treated sewage water for irrigation, with the research being limited to a study of the KC Valley Project in Kolar. According to the researchers, the farmers consider treated waste water resource as a boon which ensures irrigation throughout the year and enhances their income and employment. Use of treated sewage water for farming may be tried in other urban and peri-urban areas. However, caution needs to be taken to find out if the treated water contains any harmful chemical residues and if it is so, analyze the long term effect of such residues, before extending similar projects to other regions.

Impact Assessment of Water Users’ Co-operatives Initiative on Efficiency of Irrigation Water use in Bhadra Command Area of Shivamogga district, Karnataka - Seemakowsar, N. And P. S. Srikantha Murthy

In this presentation, the presenters depicted the role of water users’ cooperatives in promoting the economic efficiency of irrigation. The research focussed on the effectiveness of water users’ cooperatives in providing financial, technical and human resources to encourage best practices in agricultural water use. With specific focus on the Bhadra command area, the presenters traced, through their descriptive research the economic efficiency of water use in higher farms through initiatives by water users’ cooperatives.

Water Conservation and Usage in Indian Agriculture - Dr. Misha Bahmani and Yashdeep Lakra

This presentation threw light on the importance of water conservation to stimulate the productivity of the agricultural sector. It was noted by the presenters that the agricultural land needs protection which can be done only when water conservation policies maintain uniform standards. The vegetation depends on the adequate use of water and its proper distribution. It is a crucial time for the Indian government to take drastic measures to save agricultural land. The water demand supply needs to be managed by the government to secure water usage in agricultural land. Usage of rainwater and dam should be environment friendly.