Summary

Value Added Course on

"Role of Aquaculture and fisheries in sustainable Development"

(24 June 2025 - 30 June 2025)

DEPARTMENT OF ZOOLOGY

(Environmental Science and Aquaculture)

DEEN DAYAL UPADHYAYA GORAKHPUR UNIVERSITY,

GORAKHPUR-273009 (U.P.)

Time Duration 30 hours

Submitted by

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Convener

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Head
Department of Zoology

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Day 1st 24-06-25

Inaugural function	
Dr. M. Sinha, Ex-Director, retired, Central Inland Fisheries Research Institute, Barrackpore, West Bengal,	**Topic: Future of Inland Fisheries in India**
The future of inland fisheries in India appears promising, with a strong focus on sustainable practices and technological advancements. The sector has seen significant growth, and with continued investment and responsible management, it can play a vital role in India's food security and economic development. Inland fisheries represent a vital component of the country's fisheries sector, contributing significantly to the national economy and providing livelihoods for millions. India, being the second-largest fish-producing country globally, relies heavily on its inland resources. India possesses vast and diverse inland fisheries resources comprising 0.28 million km of rivers and canals, 1.2 million ha of flood plain lakes, 2.45 million ha of ponds and tanks and 3.15 million ha of reservoirs. These resources form the backbone of the country's fisheries sector, making India 2nd largest aquaculture producer in the world.	
Dr. M K Das, Former HOD & Principal Scientist, ICAR, Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India	**Topic: Impact of climate Change on inland fisheries and aquaculture**
Summary Climate change significantly impacts inland fisheries and aquaculture by altering water temperatures, water quality, and water availability, leading to reduced fish populations, shifts in species distribution, and increased risks of diseases and harmful algal blooms. These changes can negatively affect the sustainability	

of fisheries, livelihoods of communities dependent on them, and overall food security. Inland fisheries and aquaculture in India assume a significant role in view of change in temperature and rainfall pattern, breeding and recruitment of fish in river Ganga with special reference to geographic distribution of various species of inland fishes. It has been reported that the annual mean minimum water temperature in the upper stretch of river Ganga has increased by 1.6oC during 1980–2009. The effect of climate change has a great economic impact in fisheries industries as experienced in some of the case studies from the eastern part of India. Efforts have been made to find out the reasons for vulnerability of inland fisheries due to climate change. On the basis of data generated through research various adaptation options have been suggested.

Seasonal pattern of rainfall in the middle stretch of river Ganga: Analysis of the monthly data of rainfall at Allahabad site of the middle. The stretch of river Ganga from 1979–2009 split into three equal periods (January–April), (May–August) and (September–December) indicated that the percentage of total rainfall in the peak breeding period (May–Aug.) declined by 7% whereas it increased by 4% in the post-breeding period of Indian Major Carps (IMC) the most important commercial fishery, when resorption of eggs begins. Water temperature changes in the upper stretch of river Ganga: The annual mean minimum water temperature in the upper colder stretch of river Ganga at Haridwar during the period 1980–2009 increased by 1.6oC (Fig. 2). As a result the stretch of river Ganga around Haridwar has become a more congenial habitat for warm water fishes of the middle stretch of the river. Pattern of air and water temperature and rainfall changes in Gangetic plains (West Bengal): Temperature alteration: In India an increase in temperature is witnessed with the end of the winter months January–February through spring and finally to summer from the months of April–May. This increase in temperature is not linear with sudden temperature increase within a short period of time. The months January to April are the transition months from winter to summer. Analysis of the air temperature data (1984–2009 of IIMT Pune) during the breeding months of the Indian carp fishes i.e., (April–August) from four districts in the Gangetic Plains of West Bengal, India where aquaculture hatchery farms are located indicate that the mean minimum air temperature increased by 0.67oC in the 24 Parganas (N) districts and by 0.1oC in district Bankura. The differences of temperature between the months January–February, February–March and March–April during the period 1964–2009 indicated a shift towards higher temperature during January–February months. Analysis of the data was done taking the frequency of occurrence of (4oC and above) difference of temperature between the three consecutive months as a basis for evaluating the shift of elevated temperature towards cooler months January–February. Analyses showed that the frequency of occurrence of this temperature differences was maximum in February– March (average 55%) and March–April (average 28%) during previous three decades (1964–1994).

Dr S C Rai, Former Dean, College of Fisheries Dr Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India	**Topic: Advances in Fish Nutrition and Feed Technology**
Summary	

Fisheries and Aquaculture are important source of nutritious food, rural livelihood besides employment and revenue generation. Malnutrition and starvation are two serious problems being faced by millions of rural people in most of the developing countries. So, for malnutrition is concerned it should be considered to be even big challenge than hunger. It causes retarded growth, poor mental, physical health specially among children and mother. The freshwater fisheries and aquaculture resources of India are large in terms of 2.4 million hectares of ponds and tanks. 1.3 million hectares of floodplain wetlands (oxbow lakes, waterlogged areas and derelict waters) in addition to 1,95,210km of rives and canals 3.15 million hectare reservoirs.

- Strength of Indian Freshwater fisheries and Aquaculture resources:
- Area under Ponds and Tanks- 2.4 million hectare
- Area under Floodplain wetlands- 1.3 million hectare
- Area under Reservoirs- 3.15 million hectare
- Area under Rivers and canals- 1,95,210 km

State Freshwater fisheries and Aquaculture resources

- UP is landlocked state blessed with vast and varied freshwater aquatic resources which include ponds and tanks, reservoirs floodplain wetlands, rivers and canals.
- Fisheries, aquaculture resources and status of utilization

S. No.	Resources	Area	Production	Potential
1.	Ponds and Tanks	2.648 Lakh Hectare	3000 – 5000 kg/ha/yr	5000-12,000 kg/ha/yr
2.	Floodplain wetlands	4.095 lakh Hectare	200-300 kg/ha/yr	2000 kg/ha/yr
3.	Reservoirs	1.57 Lakh/ha	15 kg/ha/yr	280-300 kg/ha/yr
4.	River	25,000 km	Ganga 1958-61 480-2340kg/km	2009-2010 180kg/km
5.	Canals	4,500 km	-	2000 kg/ha/yr
6.		Conventional Roadside/Railways Lines Ditches, Small ponds, Paddy, Fields		

Day 2nd 25-06-25

Prof. Ajay Singh	Topic: **Sustainable aquaculture: A promising path to livelihood**

Summary

Fish is rich in protein and essential amino acids, and is also a good source of calcium, vitamin A, vitamin B12, and omega-3 fatty acids. People, regardless of age, who do not obtain sufficient nutrients from cereal-based diets, would benefit from the inclusion of fish in their diet. Aquaculture is a rapidly growing sector in India's fisheries industry, with an annual growth rate of over 7%. It not only supplies dietary

essentials for human consumption but also provides excellent opportunities for employment and income generation, especially in economically backwards rural areas. Sixty million people are directly engaged, part-time or full-time, in the primary production of fish, either through fishing or aquaculture, supporting the livelihoods of 10-12% of the world's population (FAO, 2016). Aquaculture currently accounts for over 50% of the global food fish consumption. Globally, India stands second in the culture of fisheries production. China, with one-fifth of the world's population, produces one-third of the total fish harvested and two-thirds of the fish cultivated (FAO, 2016). While in India, the culture system is based on a 3-6 species combination, the Chinese have 10 or more species in a single pond, thus maximising productivity.

Freshwater aquaculture accounts for over 95% of the total annual aquaculture production, which is approximately 5.77 million tons. Technologies of induced carp breeding and polyculture of the three Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) as well as 'composite carp culture' with the addition of three exotic carps (*Hypophthalmichthys molitrix*, *Ctenopharyngodon idella* and *Cyprinus carpio*) in ponds and tanks brought about a perceptible upward shift in freshwater aquaculture production. Recently, the sector has been witnessing diversification with the inclusion of medium and minor carps, catfishes, and murrels. Andhra Pradesh and West Bengal are the top producers of freshwater fish through aquaculture. System diversification has resulted in optimum productivity of 3-6 t ha-1 yr-1. Public and private carp hatcheries produce around 40 billion fry. Input-related, social and environmental constraints of aquaculture in India need to be tackled through horizontal and vertical expansion, technology, as well as climate change mitigation and adaptation, for sustainable development.

Prof Sunil Kumar Srivastava	**Topic: Prawn culture**

Summary

Prawn culture, or aquaculture of prawns, involves raising prawns in controlled environments like ponds or tanks for commercial harvest. It's a significant sector in both freshwater and marine aquaculture, with various species like *Macrobrachium rosenbergii* (giant freshwater prawn) and penaeid shrimp being commercially cultured. The process involves several stages: obtaining berried females (carrying eggs), larval rearing, post-larval rearing, grow-out in ponds, and finally, harvesting. Macrobrachium rosenbergii (giant freshwater prawn) is commonly cultured in freshwater systems, while penaeid shrimp like Penaeus vannamei are popular in marine systems.

Broodstock (breeding prawns) are maintained in controlled environments, with females carrying eggs in a brood chamber. Hatcheries produce larvae, which are then reared in nurseries to develop into post-larvae.

Post-larvae are stocked into ponds where they grow to marketable size. Maintaining optimal water quality (temperature, pH, dissolved oxygen, salinity) is crucial for prawn survival and growth.

Prawns are fed formulated feeds or natural food sources. Harvesting can be done by draining the ponds or using nets to catch the prawns. Disease outbreaks can significantly impact production, so preventative measures and treatments are important. Prawn culture can be integrated with other farming activities like rice cultivation (in paddy fields). Prawns undergo several larval stages (zoea, mysis, etc.) before developing

into post-larvae, which then grow into juveniles and finally adults. Economic Importance:Prawn culture provides economic opportunities for farmers and contributes to the overall seafood supply.

Prof. Veena B Kushwaha	**Topic:** **Water quality management in aquaculture**
Summary Water quality management is a critical component of sustainable aquaculture, directly influencing the health, growth, and survival of cultured aquatic species. The fundamental water quality parameters essential for aquaculture systems, including temperature, dissolved oxygen (DO), pH, ammonia, nitrite, nitrate, alkalinity, salinity, turbidity, and biological oxygen demand (BOD) and the interactions among these parameters and their cumulative impact on aquatic ecosystems were discussed in details in the context of both traditional and modern aquaculture practices. Emphasis was placed on the need for continuous monitoring and control to prevent water quality deterioration, which can lead to reduction in productivity, disease outbreaks, and environmental degradation. The talk also outlined commonly used measurement techniques, such as digital sensors (DO meters, pH meters), spectrophotometers, colorimetric test kits, refractometers, Secchi disks, and titration methods. In addition, sustainable water management strategies—such as recirculating aquaculture systems (RAS), biofiltration, and integrated multi-trophic aquaculture (IMTA)—were discussed as effective tools to enhance water use efficiency and reduce environmental impacts. The talk concluded by highlighting the role of precision aquaculture and emerging technologies in supporting data-driven, adaptive water quality management approaches that align with long-term sustainability goals in the aquaculture sector.	

Prof Rina Chakrabarti, Aqua Research Lab Department of Zoology University of Delhi Delhi 110007, India	**Topic:** **Effect of stress, climate and nutrition in fish health**
Summary: She delivered lecture on abiotic stressors like temperature, dissolved oxygen and UV-B radiation on the physiology (immune system, anti-oxidant enzymes, DNA damage, and expression of various stress related genes) of carp and catfish and its mitigation through enriched (supplemented with plant ingredients, specific amino acids, vitamins C and E) diets. Immunostimulatory and disease resistance properties of seeds of Achyranthes aspera (Family: Ameranthaceae) have been evaluated in various carps in laboratory conditions. Dietary supplementation of seeds enhanced the growth rate of fishes. Presently, we are evaluating the immunostimulatory properties of seeds and leaves of Achyranthes aspera in pond conditions using rohu as model species. We have developed the technique for mass production of zooplankton using organic manures. We have studied the digestive enzyme profiles of carp larvae during ontogenic development. We have studied the digestive enzyme profiles of cold water species - Snow trout, Golden mahseer and Hill-trout in their natural habitat. The culture technique of snow trout has been standardized. Trypsin from digestive systems (discarded part of fishery industry) of various carps has been purified. This purified enzyme has been characterized using biochemical and molecular techniques. The purified enzyme has immense application in food processing and detergent industries. For the preparation of cost-effective feed for fish, we have studied the in vitro digestibility of various plant ingredients by different fish species using pH-stat method.	

Day 3rd 26-06-25

Prof. Jai Gopal Sharma, Ex-Head of Department of Biotechnology Delhi Technological University	**Topic: Use of Technology for Water quality management in aquaculture and Fish Production**

Summary: Fish, being aquatic, are more prone to disease and are difficult to control. The equilibrium between disease, environment, and fish health is essential; any change in this equilibrium leads to stress and makes the fish vulnerable to disease, which in turn influences growth and survival. Water quality management in aquaculture is crucial for successful and sustainable fish farming. It involves monitoring and controlling various physical, chemical, and biological parameters of the water to ensure optimal conditions for aquatic organisms. Effective management minimizes stress on farmed species, reduces disease outbreaks, and enhances overall productivity. Successful pond culture operations primarily depend on maintaining a healthy aquatic environment and producing sufficient fish food organisms in ponds. Physical, chemical, and biological factors play a crucial role in regulating the production of fish food organisms and fish production in the pond. If the water quality is maintained with utmost care, the occurrence of many fish diseases can be prevented. Healthy water is a boon to fish culture. Dissolved oxygen: The optimum dissolved oxygen (DO) content of pond waters is in the range of 5 ppm saturation level. Aeration is a proven technique for improving DO availability. Any agitation improves the DO content, and among these, paddle-wheel, aerators, and aspirators are most common. Temperature influences all metabolic and physiological activities and life processes such as feeding, reproduction, movement, and distribution of aquatic organisms. Fish native to cold water (e.g. Silver Carp) are unable to survive on the plains due to higher water temperature in summer months.

Depth determines the temperature, the circulation pattern of water, and the extent of photosynthetic activity. In shallow ponds, sunlight penetrates up to the pond bottom and facilitates an increase in productivity. A depth of 1-2 meters is considered optimal for the biological productivity of a pond. If the depth is very shallow, the water becomes overheated, which can harm the survival of the fish. In arid and semi-arid areas, the water depth should be more than 2 meters. Turbidity and transparency are both optical properties of light. Transparency causes light to be transmitted in a straight line through the sample. While turbidity causes light to be scattered, thereby restricting its penetration and reducing photosynthetic activity. Suspended particles causing turbidity may also absorb considerable amounts of nutrient elements like phosphate, K, N_2 in their ionic form, making them unavailable for plankton production. Penetration of light depends upon the available intensity of the incident light, which varies with the geographical location of the pond and the turbidity of the water. Water gets its colour due to phytoplankton, zooplankton, sand particles, organic particles and metallic ions in the pond water. Water used for fish culture should be clear, either colourless or light green or blue. The biological characteristics of an aquaculture pond refer to the aquatic organisms that inhabit the pond. This includes both plants and animals. The pH in ponds typically rises during the day as phytoplankton and other marine plants remove CO_2 from the water through

photosynthesis. The pH decreases at night because of respiration and the production of CO_2 by all organisms. Technology plays a crucial role in enhancing water quality through various methods, including monitoring, treatment, and conservation. Real-time monitoring systems, advanced filtration techniques, and AI-powered solutions are transforming how we manage and protect our water resources.

Dr. Ravi Kant Upadhyay	**Topic: Immunity and disease resistance against pathogens and parasites**

Summary

Fish have immune systems that, although simpler than those of mammals, are still sophisticated and capable of both innate and adaptive immune responses. The innate immune system, which encompasses physical barriers such as the skin and mucus, as well as cellular and humoral factors, plays a crucial role in providing early protection against pathogens. Fish also possess an adaptive immune system, comprising lymphocytes, immunoglobulins, and other components, which enables a targeted response to specific threats. The fish immune system differs from that of higher vertebrates, particularly in the absence of bone marrow and lymphatic nodules. Instead, fish rely on the anterior (head) kidney as the primary lympho-hematopoietic organ, which is essential for B cell development. The thymus is responsible for T cell maturation, while the spleen acts as the main secondary lymphoid tissue.The fish immune system is composed of innate (nonspecific) and adaptive (specific) immunity, both featuring cellular and humoral components.

Innate Immunity:

- Physical Barriers:
- Fish skin, mucus, and gills act as the first line of defense, preventing pathogens from entering the body.
- Cellular Components:
- Macrophages, neutrophils, and natural killer (NK) cells play a role in engulfing and destroying pathogens.
- Humoral Factors: Antimicrobial peptides, complement proteins, interferons, and natural antibodies are soluble factors that help fight infection.

Adaptive Immunity:

- Lymphoid Organs:
- Fish have lymphoid organs like the thymus, spleen, and head kidney, which are involved in the development and maturation of immune cells.
- Lymphocytes:
- B and T lymphocytes are crucial for recognizing specific pathogens and mounting a targeted response.
- Immunoglobulins:
- IgM, IgD, and IgT/IgZ are the main classes of immunoglobulins in fish, analogous to antibodies in mammals.

Fish immune system: how to improve aquaculture production through immunity

Traditionally, the immune system is divided into the innate or nonspecific immune system and the adaptive or specific immune system. The fish immune system has both types of immunity, innate immunity, and adaptive immunity.

It is essential to maintain the fish's immune system in optimal condition, as it is responsible for defending the body against external threats, such as viruses, bacteria, or protozoa, and thereby preventing infections.

Effects of stress and the use of immunostimulants in aquaculture

During their culture, fish face a wide variety of stressors associated with environmental, social and management factors. There are several immunostimulant products available that boost the immune system of fish, counteracting the negative effects of stress and ensuring their productivity.

- Factors affecting fish immunity
- Environment:
- Water temperature, salinity, and pollution can all impact fish immune function.
- Nutrition:
- Proper nutrition, including essential fatty acids and vitamins, is vital for a strong immune system.
- Stress: Stress from handling, overcrowding, or poor water quality can suppress the immune system's response

Dr. Keshav Singh	**Topic: Biological waste management through vermicomposting**

Summary

Indiscriminate use of chemical fertilizers disturbs the soil texture and physico-chemical properties, as well as affects human health and the environment. The use of chemical fertilizers has posed a serious threat to the environment and caused the destruction of useful microorganisms, insects, and worms in the soil. Loss of tests and flavors in food materials takes place. Food grains, fruits, and vegetables become more susceptible to diseases with the loss of their storage and keeping quality. Higher use of chemical fertilizers leads to high concentrations of some chemicals and metals, which ultimately affect the crops and the watershed. Such agricultural practices are dangerous for soil fertility and conservation, which may lead to desertification of nutrients like protein, amino acid, vitamins, and ascorbic acid, etc. are reduced due to excessive use of phosphatic nitrogenous and potash fertilizers in soil. Besides this, the nitrogenous fertilizers pollute the water and food items, causing serious health problems. Usually, most of the biofertilizers, for example, vermicomposts, are prepared from biological wastes. The biological wastes are generated by biological systems, which cause environmental hazards and various ill effects on human life and their domesticated animals, if proper management and disposal practices are not available. The production of fly ash on a large scale is a serious environmental problem.

Earthworms belong to the phylum Annelida, class Oligochaeta. Generally, the earthworms are called farmers' friends and used as a bio-indicator of soil fertility. Earthworms support the healthy population of bacteria, fungi, actinomycetes, protozoa, insects, spiders, and millipedes for sustaining a healthy soil. Vermicomposting through earthworms is an eco-biotechnical process that transforms energy-rich and complex organic substances into to stabilized humus-like product. The microbes are responsible for biochemical degradation of organic matter, and earthworms are the important drivers of the process, conditioning the substrate and altering the biological activity. Vermicomposts have less soluble salts, neutral pH, greater cation exchange capacity, and humic acid content. The content nutrients are taken up by the plants readily.

Vermiwash is a pale-yellow liquid biofertilizer. It is the extract of excretory products and the mucus section of earthworms, and a potent fertilizer for better growth and yield of plants. It contains micronutrients, vitamins, hormones, and disease resistance power. Vermiwash is honey brown, having heterotrophic bacteria, fungi, actinomycetes, including nitrogen fixers, phosphate solubilizers, and enriched with macro, micro nutrients, enzymes, hormones, and vitamins. It is a liquid organic biofertilizer, pesticidal in nature. Vermiwash, liquid manure, is very useful as a foliar spray to enhance plant growth, yield, and to check the

development of disease. Vermicomposting is a tool for proper waste management and self-employment. People can save money through the production and marketing of vermicompost as well as improve their socio-economic conditions.

Day 4th 27-06-25

Dr. Mahendra P Singh	**Topic: Integrated farming: a sustainable approach**

Summary

Integrated Farming is a system where various agricultural components like crops, livestock, fishery, poultry, agroforestry, vermicomposting, and others are systematically interlinked. The aim is to minimize waste, enhance productivity, and provide multiple income sources to farmers. This approach reduces dependency on external inputs and optimizes the use of local resources, contributing to food security and sustainable livelihoods. The key components of integrated farming include: Crop production, – the backbone of the system, ensuring food and fodder supply; Livestock rearing – including cattle, goats, and poultry, for meat, milk, and manure; Aquaculture – utilizing ponds or tanks for fish production, integrated with duckery or crop irrigation; Agroforestry – growing trees alongside crops and livestock to improve soil health and diversify income; Vermicomposting and bio-fertilizers – converting organic waste into rich compost, enhancing soil fertility; Mushroom cultivation – using agricultural residues to grow high-value crops; Beekeeping – supporting pollination while providing honey and wax; Biogas production – from animal waste, ensuring clean energy and reducing fossil fuel dependency.

Each element supports the other in a circular system that reduces waste, lowers input costs, and enhances overall farm productivity. Integrated farming is particularly relevant in the context of climate change, rural unemployment, and resource scarcity. It is a promising model for sustainable agriculture, especially in developing regions like India, where land holdings are small and diverse income streams are crucial.

This course or value-added module provides a practical understanding of integrated farming systems, equipping students with the knowledge to implement and advocate for sustainable farming models.

Dr. Ram Pratap Yadav	**Topic: Etiology and Treatment of Diseases of Food Fishes**

Summary The health of aquaculture organisms, including fishes, is due to a state of physical well being. Abnormal changes in the body arises from two factors, one for which the aquatic environment is important (dietary deficiency, attack of pathogens and other stresses) and other is due to cold-bloodedness of the fish (fish's inability to maintain its body temperature). Physical and environmental stresses play significant role in the maintenance of healthy conditions. Although, many pathogens of aquaculture species are generally found in the aquatic environment, yet their presence may not lead to the occurrence of disease.

Disease results due to interaction between the species, the disease agent and the aquatic environment. The balance between these three major factors determines the state of health of aquatic species
An important means of disease resistance is the immune system of fishes and its specific activity against biological agents such as viruses, bacteria and parasites.

The immune system operates through antigen-antibody reactions. The antibodies of fish (teleost) are serum proteins (immunoglobulins) that belong to IgM or IgG class.These are functionally classified as agglutinating, precipitating and virus neutralising. By the stimulation from certain antigens (bacteria, virus, etc.) the agglutinating antibodies are formed. These antibodies bind the antigens rendering them less toxic and more vulnerable for easy phagocytosis	
Dr. Sunil Kumar Singh	**Topic: Water quality management in hatcheries**
Summary: Effective water quality management in hatcheries is crucial for fish survival and growth. Key parameters to monitor and control include temperature, pH, dissolved oxygen, ammonia, nitrite, nitrate, alkalinity, hardness, and carbon dioxide. Maintaining optimal levels of these factors, often within specific ranges for different species, minimizes stress, prevents disease, and promotes healthy development in the hatchery environment. Investing in comprehensive water management and biosecurity practices enhances hatchery efficiency, supports sustainable aquaculture, and contributes to the overall success of the industry. Prioritizing these aspects ensures that hatcheries produce healthy fish and achieve their operational goals, ultimately benefiting the broader aquaculture sector and supporting sustainable food production. By adhering to best practices in water quality management and bio-security, hatcheries can achieve high standards of fish health and productivity, leading to successful and sustainable aquaculture practices.	

Day 5th 28-06-25

Dr. Sunil Kumar Singh	**Topic: Design and construction of fish ponds:**
Fish pond construction involves site selection, soil analysis, pond design, and construction of essential components like dikes, inlets, and outlets. Proper design ensures adequate water depth, slope, and drainage, while construction requires careful consideration of soil type, water source, and the intended cultural practices. A fish pond or fishpond is a controlled pond, small artificial lake or retention basin that is stocked with fish and is used in aquaculture for fish farming, for recreational fishing, or for ornamental purposes. Fish pond preparation is the basic and first step in freshwater fish farming. Pond preparation is to be done intensively to enhance the fish production of the pond. Without proper preparation of the pond bottom if we start the fish culture technique it will create a huge problem and production will be of poor quality. In the case of the pond preparation process, good management practices are the basic solution for obtaining better fish yield. Sustainable methods should always be chosen to make pond preparation more suitable for environment-friendly fish farming techniques.	
Dr. Smita Singh	**Topic: Livestock management**
Addition Course Dr. Smita Singh Livestock management and employment involves managing farm animals and supervising farm workers, which requires knowledge of animal science and animal husbandry, as well as good business sense. The domestication of animals raised in an agricultural setting in order to produce diversified products for consumption such as meat, eggs, milk, fur, leather, and wool. Livestock raising cattle, sheep, goats, swine, poultry	

(including egg-producing poultry), and equine animals are used for food or in the production of resources. It involves transportation and marketing of livestock and its produce. Integrated livestock-fish farming is commonly and narrowly equated with the direct use of fresh livestock manure in fish culture. The integration of livestock and fish, often within a larger farming or livelihood system is beneficial and sustainable approach for farmers. Although housing of livestock over or adjacent to fish ponds facilitates loading of wastes, in practice livestock and fish may be produced at separate locations and by different people yet be integrated. Integrated farming involving aquaculture defined broadly is the concurrent or sequential linkage between two or more activities, of which at least one is aquaculture. These may occur directly on-site or indirectly through off-site needs and opportunities. The different characteristics like good husbandry, proper feeding, and hygiene are the main contributors to animal health on farms, which brings economic benefits through maximized production. Economic implications of livestock production extend to downstream industry (saleyards, abattoirs, butchers, milk processors, refrigerated transport, wholesalers, retailers, food services, tanneries, etc.), upstream industry (feed producers, feed transport, farm and ranch supply companies, equipment manufacturers, seed companies, vaccine manufacturers, etc.), associated services (veterinarians, nutrition consultants, shearers, etc.) which raises employability and value addition to the studies of animal sciences. Integrated Livestock-Fish Farming technique provides better management, variety of food and non-food products; the latter include leather, wool, pharmaceuticals, bone products, industrial protein, and fats. Livestock are also used in small scale agriculture. It is reduces the environment impact and fresh water usage in the world. To meet the upcoming challenges adaptations to climate change in livestock production strategies include various techniques for sustainable development.

Day 6th 29-06-25

Dr. Arundhati Singh	**Topic: Aquaculture Productivity and Its Current Status in India**
Summary Aquaculture is the farming of aquatic organism, including fish, molluscs, crustaceans and aquatic plants.Fisheries and aquaculture production: 223.2 million tones. Aquaculture production: 130.9 million tonnes,Capture fisheries: 92.3 million tones. Aquatic animal production by region: Asia (70%), Europe (9%), Latin America and the Caribbean (9%), Africa (7%), North America (3%) and Oceania (1%). Main producers of aquatic animals by country: China (36%), India (8%), Indonesia (7%), Vietnam (5%) and Peru (3%). India is the third largest fish producer in the world and the second largest aquaculture producer after China.China ranks first and Indonesia ranks second in fish production. India has achieved a record fish production of 175.45 lakh tonnes in the financial year 2022-23 which is 8% of the global production. Pradhan Mantri Matsya Sampada Yojana (PMMSY) enhancing aquaculture productivity, improving fisheries management, establishing integrated aquaparks etc. Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY), aims at addressing weaknesses through financial and technological interventions.Blue Revolution Scheme,integrated approach for development and management of fisheries covering both the marine and inland fisheries. Fisheries and Aquaculture Infrastructure Development Fund (FIDF)provides funding for creation of infrastructure in both marine and inland fisheries. National Marine	

Fisheries Policy 2017 guides conservation and management of India's marine fishery resources.

Dr. Sunaina Gautam	**Topic: Deforestation, Sustainable Resource Use & Freshwater Regeneration**

Summary

This lecture addresses the critical issues of deforestation, sustainable resource management, and freshwater regeneration, with a focus on India's environmental challenges. Deforestation, the large-scale clearing of forests for agriculture, logging, or urbanization, leads to biodiversity loss, soil erosion, increased greenhouse gas emissions, and disrupted water cycles. It negatively impacts freshwater systems by reducing infiltration, increasing runoff, and polluting rivers and lakes. Water sustainability is vital in India due to population growth, agricultural demands (80% of freshwater use), pollution (70% of surface water contaminated), and uneven monsoon-driven water distribution. India faces significant water challenges: groundwater depletion (1-2 meters annually in some areas), polluted rivers (e.g., Ganga, Yamuna), and rising urban demand. Sustainable solutions include rainwater harvesting (e.g., Tamil Nadu's rooftop policy), watershed management, groundwater recharge (via check dams, percolation tanks), and water recycling. Technologies like desalination and reclaimed water, alongside smart water management (e.g., IoT, GIS in Karnataka), are highlighted. Government initiatives like Jal Shakti Abhiyan, Atal Bhujal Yojana, and the National Water Mission aim to conserve water and promote equitable distribution. Community efforts, such as those by Tarun Bharat Sangh, and policies like the Sustainable Water Resource Management (SWAR) project in the textile industry, support sustainability. The presentation concludes with actionable steps: adopting rainwater harvesting, restoring watersheds, reducing wood/paper consumption, and supporting eco-certified products. Collective action, innovation, and policy enforcement are essential to address India's water crisis and ensure sustainable freshwater resources for future generations.

Dr. Manish Pratap Singh	**Topic: Waste water treatment practices**

Summary

Wastewater treatment is a crucial environmental and public health practice aimed at removing contaminants from domestic, industrial, and agricultural effluents before they are released into natural water bodies or reused. The treatment process typically involves three main stages: primary, secondary, and tertiary treatment. In the primary stage, physical processes such as screening and sedimentation remove large particles and suspended solids. The secondary stage uses biological processes, including activated sludge systems, trickling filters, and biofilm reactors, where microorganisms degrade organic matter and reduce biochemical oxygen demand (BOD). Finally, the tertiary stage focuses on advanced treatment methods to remove nutrients (like nitrogen and phosphorus), pathogens, and residual contaminants through processes such as filtration, chlorination, ozonation, or membrane technologies. In recent years, constructed wetlands, anaerobic digestion, and membrane bioreactors (MBRs) have gained prominence for their efficiency and sustainability. In rural or decentralized areas, septic tanks, oxidation ponds, and eco-sanitation methods are commonly used. Moreover, bioremediation techniques using genetically engineered microbes or plant-based systems are being explored for their eco-friendly potential. Proper sludge management, a byproduct of treatment, is also essential and involves stabilization, drying, and safe disposal or reuse as biofertilizer or energy source. In India, the National Mission for Clean Ganga (NMCG) and AMRUT programs have accelerated the development of sewage treatment infrastructure. However, challenges such as under-capacity plants, lack of operation and maintenance, and untreated discharge persist. Effective wastewater treatment not only safeguards aquatic ecosystems and human health but also supports water reuse in agriculture and industry, contributing to sustainable development goals. Going forward, the integration of smart monitoring systems, public participation, and stricter regulatory frameworks will be essential to enhance the effectiveness and efficiency of wastewater management practices globally.

Day 7th 30-06-25

Dr. Sushil Kumar	**Topic: Infectious bacterial and viral diseases of aquatic life**

Summary Infectious viral and bacterial diseases are significant health challenges in aquatic life, affecting both wild and cultured species. Common viral diseases include Koi Herpesvirus (KHV) which affects koi and common carp, leading to gill necrosis, skin lesions, and high mortality. Infectious Hematopoietic Necrosis (IHN) typically affects salmonids and results in anemia, pale gills, and abdominal swelling. Viral Hemorrhagic Septicemia (VHS) impacts various fish species causing hemorrhages on the skin and internal organs, while Infectious Pancreatic Necrosis (IPN) primarily affects young salmonids and leads to dark body coloration, swollen abdomen, and lethargy. Controlling viral diseases relies heavily on biosecurity measures such as quarantine, disinfection, and, where available, vaccination.

Bacterial diseases in aquatic life are caused by harmful bacteria that invade the tissues of fish, often under conditions of stress, poor water quality, or injury. Among the common bacterial diseases is Columnaris disease caused by *Flavobacterium columnare*, which leads to skin lesions, gill damage, and fin erosion. Aeromonas infection is widespread in freshwater fish and results in ulcers, hemorrhages, and septicemia. Vibriosis, caused by Vibrio species, affects marine and brackish water fish, leading to skin ulcers and internal bleeding. Furunculosis, caused by *Aeromonas salmonicida*, is common in salmonids and produces abscesses known as furuncles along with septicemia. Enteric Septicemia of Catfish (ESC) caused by *Edwardsiella ictaluri* presents with ulcers, swollen abdomen, and sometimes neurological signs. Effective control of bacterial diseases involves maintaining good water quality, using antibiotics responsibly, employing probiotics, adopting vaccination programs, and ensuring proper hygiene and sanitation. In conclusion, infectious viral and bacterial diseases are major threats to aquatic health and the aquaculture industry. Preventing these diseases requires strict biosecurity, regular health monitoring, proper management practices, and prompt intervention to minimize economic losses and safeguard aquatic

environments.	
Dr. Noopur Srivstav	**Topic: Recycling of Waste and its Management**

Summary

Separating, recovering, and reusing components of solid waste that may still have economic value is called recycling. One type of recycling is the recovery and reuse of heat energy, a practice discussed separately in Incineration. Composting can also be considered a recycling process, since it reclaims the organic parts of solid waste for reuse as mulch or soil conditioner. Still other waste materials have potential for reuse. Recovered broken glass can be crushed and used in asphalt pavement. Colour-sorted glass is crushed and sold to glass manufacturers as cullet, an essential ingredient in glassmaking. Steel cans are baled and shipped to steel mills as scrap, and aluminum is baled or compacted for reuse by smelters. Aluminum is one of the smallest components of municipal solid waste, but it has the highest value as a recyclable material. Recycling of plastic is a challenge, mostly because of the many different polymeric materials used in its production. Mixed thermoplastics can be used only to make lower-quality products, such as "plastic lumber. Recycling by itself will not solve the growing problem of solid-waste management and disposal. There will always be some unusable and completely valueless solid residue requiring final disposal. **recycling**, recovery and reprocessing of waste materials for use in new products. The basic phases in recycling are the collection of waste materials, their processing or manufacture into new products, and the purchase of those products, which may then themselves be recycled. Typical materials that are recycled include iron and steel scrap, aluminum cans, glass bottles, paper, wood, and plastics. The materials reused in recycling serve as substitutes for raw materials obtained from such increasingly scarce natural resources as petroleum, natural gas, coal, mineral ores, and trees. Recycling can help reduce the quantities of solid waste deposited in landfills, which have become increasingly expensive. Recycling also reduces the pollution of air, water, and land resulting from waste disposal.

Dr. Pankaj Srivastav	**Topic: Carp culture technology, trends and transformations Biofilm and its role in aquaculture**

Summary On the first day of the Value-Added Course on *"Role of Aquaculture and Fisheries in Sustainable Development"*, held from 24th to 30th June 2025, I, **Dr. Pankaj Kumar Srivastava**, from the Department of Aquaculture, DDU Gorakhpur University, delivered a lecture on the topic *"Carp Culture Technology: Trends and Transformations"* from 10:30 AM to 12:00 PM.

During the session, I highlighted the **latest technologies, current trends, and transformative practices** in the field of carp culture. The discussion focused on the importance of adopting **scientific advancements**, ensuring **sustainable resource management**, and implementing innovative systems. The lecture also addressed critical areas such as enhancing productivity, disease management, and the **effective utilization of untapped water resources** for fish farming.

Relevance of Fisheries and Aquaculture in India

The **fisheries sector** plays a crucial role in the **socio-economic development of India**, contributing significantly to:

- Livelihood generation
- Nutritional security
- Employment opportunities
- Export earnings

Fisheries and aquaculture together form a major pillar of food production in India. The sector directly supports over **2.8 crore fishers and fish farmers** at the primary level, with many more engaged through allied activities along the aquaculture value chain.

India is currently the **third-largest fish-producing country** in the world, with a total production of **162.48 lakh tonnes in 2021–22**, contributing approximately **8% to global fish production**. It ranks **second in aquaculture production** globally. In 2022–23, India achieved a total fish production of **17.4 million tonnes**, and the production target for 2024–25 has been set at **22 million metric tonnes**.

Fish and fish products now represent one of the largest groups of India's agricultural exports, generating a record **marine export earning of Rs. 63,969 crores in 2022–23**.

Challenges and Potential in Indian Aquaculture

Only about **35% of India's population** consumes fish. The **per capita fish consumption** stands at **9.8 kg**, which is below the **recommended intake of 13 kg**, indicating room for improvement in both production and awareness.India possesses **extensive inland water resources** suitable for aquaculture, such as ponds, tanks, and lakes. However, only a **small portion is currently utilized**. Of the **16,00,000 hectares** of fish cultivable water area available, only **6,00,000 hectares** are being used. This implies that just **37.5%** of the total available aquaculture area is currently in use. This underutilization reflects a **huge opportunity** for expansion in aquaculture, which can significantly enhance **fish production**, **nutritional outcomes**, **rural employment**, and **economic growth**.

Conclusion

The lecture concluded that **carp culture**, as a key segment of Indian aquaculture, holds immense potential for development through the **adoption of modern techniques**, **scientific practices**, and **sustainable utilization of natural resources**. The session aimed to inspire students and professionals to explore **innovative strategies in fish farming**, contributing to the broader goals of food security, economic empowerment, and sustainable development.

Valedictory function Day 7th 30-06-25

Day 7th 30-06-25

Valedictory function Key note address: Sustainable aquaculture farming

Dr. Pankaj Tiware,
Former Director
Central Sericulture Research Training Institute, Mysore

Aquaculture is the farming of aquatic organisms such as fish, shellfish, and aquatic plants in controlled environments. It involves cultivating these organisms in freshwater, brackish water, or saltwater, and can be contrasted with traditional fishing which harvests wild populations. Aquaculture is a growing industry that plays an increasingly important role in food production, providing a sustainable alternative to wild-caught seafood and contributing to food security. It has an important role in for food security, nutrition, livelihoods, economies, and cultures and is included in the SDGs.

Aquaculture, or fish farming, significantly contributes to achieving several **Sustainable Development Goals (SDGs)**, particularly those focused on ending hunger, promoting good health, and ensuring environmental sustainability. It plays a vital role in providing food security, improving nutrition, and supporting livelihoods, while also offering opportunities for sustainable production and consumption.

Key SDGs and Aquaculture's Role:

- **SDG 2: Zero Hunger:**

Aquaculture is a crucial source of protein and micronutrients, helping to address food security and improve nutrition, especially in developing countries. It can reduce pressure on wild fish stocks while meeting the increasing global demand for seafood.

- **SDG 3: Good Health and Well-being:**

Fish is a highly nutritious food, rich in protein, omega-3 fatty acids, and essential minerals. Sustainable aquaculture practices can improve access to these nutrients, contributing to better health outcomes.

- **SDG 6: Clean Water and Sanitation:**

Responsible aquaculture practices, including water management and pollution control, are essential for maintaining the health of aquatic ecosystems and ensuring access to clean water.

- **SDG 8: Decent Work and Economic Growth:**

Aquaculture can create jobs in coastal and rural communities, promoting economic development and improving livelihoods.

- **SDG 12: Responsible Consumption and Production:**

Sustainable aquaculture practices focus on responsible production methods, minimizing environmental impacts, and promoting efficient resource use.

- **SDG 14: Life Below Water:**

Aquaculture can help to conserve and sustainably use marine resources by reducing pressure on wild fish populations and promoting responsible practices in aquatic ecosystems.

- **SDG 15: Life on Land:**

Aquaculture can contribute to sustainable land use by promoting integrated farming systems and reducing reliance on terrestrial resources.

Key aspects of aquaculture:

- **Cultivation:**

Aquaculture involves actively raising aquatic organisms, often involving interventions like stocking, feeding, and managing water quality.

- **Diverse Environments:**

It can be practiced in various aquatic settings, including ponds, rivers, lakes, coastal areas, and even land-based systems.

- **Multiple Purposes:**

Beyond food production, aquaculture serves purposes like rebuilding threatened or endangered species populations, restoring habitats, and enhancing wild stocks.

- **Sustainability:**

Aquaculture can be a sustainable method of food production, especially when managed responsibly, potentially reducing pressure on wild fish stocks and providing a consistent supply of seafood.

- **Global Growth:**

Aquaculture is the fastest-growing food production system globally, with production expanding significantly in recent decades.

- **Types of Aquaculture:**

Aquaculture can be broadly categorized into freshwater, brackish water (a mix of saltwater and freshwater), and marine (saltwater) aquaculture.

Aquaculture production is growing at more than 10% per year, compared with 3% for terrestrial livestock and 1.5 % for capture fisheries. This growth is expected to continue. Asian aquaculture farmers continue to contribute about 90% of the world's aquaculture production, and more than 80% of total aquaculture yield is being produced in low-income food-deficit countries (LIFDCs).

2. Coastal aquaculture is dominated by the production of aquatic plants (seaweeds) and molluscs. However, a wide range of diverse coastal aquaculture systems has been developed in Asia, Europe, and the Americas, operating at different intensities and scales of production.

3. Aquaculture has great potential for the production of food, alleviation of poverty and generation of wealth for people living in coastal areas, many of whom are among the poorest in the world. The rapid growth of aquaculture in recent years has been consistent across sub-sectors, from low-input systems generating low value products of importance for subsistence and direct food security, to medium and high value products for national and international markets, which are important for improved living standards and foreign currency earning. The great diversity of the sector encompasses very small scale to very large-scale enterprise, implying that aquaculture can contribute significantly to a wide range of development needs.

4. However, significant problems can be associated with coastal aquaculture development. These include unsuccessful development, where the potential for development is not realised, especially among the poorer sectors of society; the vulnerability of aquaculture to poor water quality and aquatic pollution, caused by industrial, domestic, agricultural and aquacultural (i.e. its own) wastes; and over-rapid development, where the undoubted successes of the sector have been tarnished by environmental and resource use issues, social problems, disease, and in some cases, marketing problems.

5. Although some of the social and environmental problems may be addressed at the individual farm level, most are *cumulative* - insignificant when an individual farm is considered, but potentially highly significant in relation to the whole sector. They are also *additive* - in the sense that they may add to the many other development pressures in the coastal zone.

6. These cumulative and additive problems can only be addressed through better planning and management of the sector - by government, in collaboration with producer associations or industry organisations. A precondition for better and more effective planning is also better organisation and representation of the sector.

7. Crucial elements in a more planned approach include:

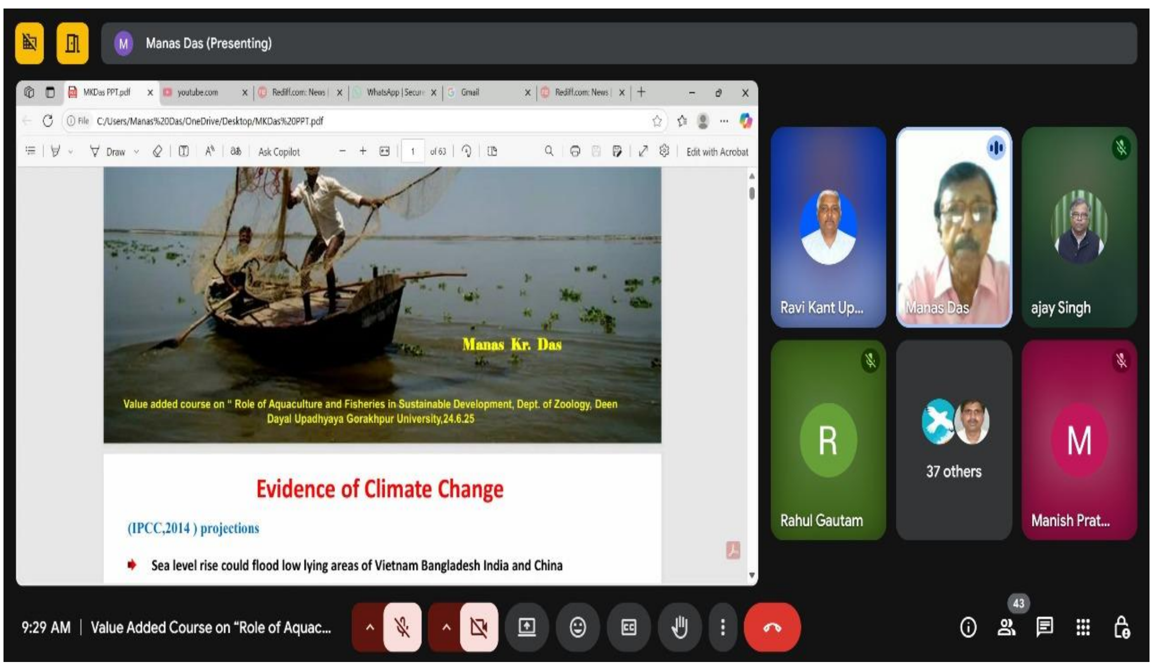
- improvements in siting, design, technology, and management at the farm level;
- better location and spatial distribution of the sector as a whole;
- better water supply for the sector as a whole;
- better fish health management including disease and stock control at individual farm and sector levels;
- improved communication and information exchange;
- improved access to markets and trade opportunities;
- more equitable distribution of the benefits derived from coastal aquaculture development.

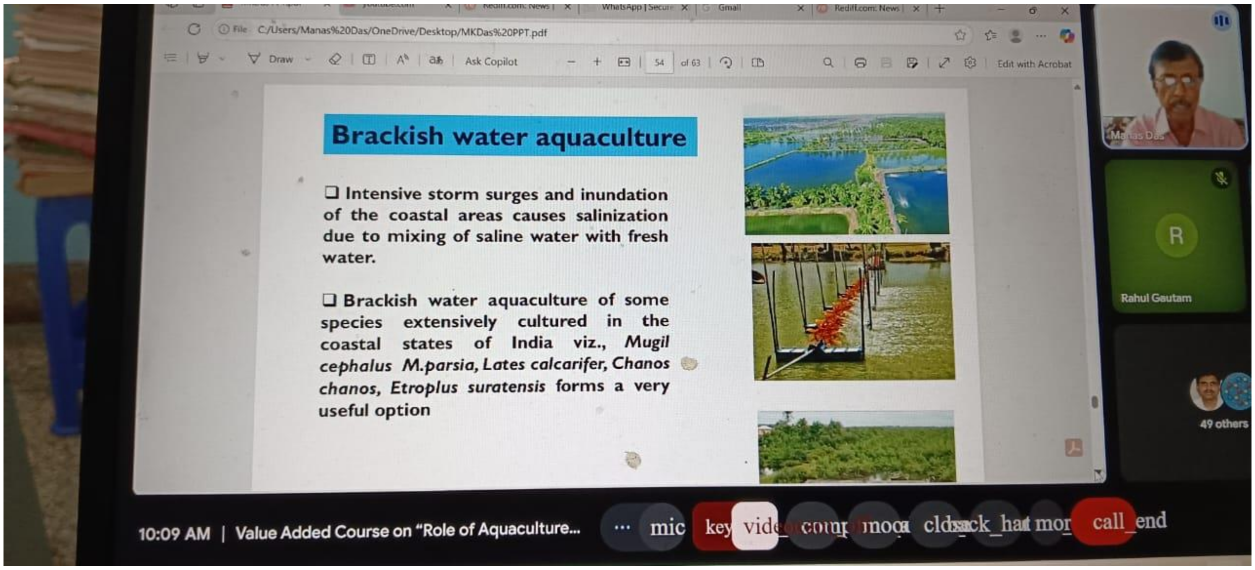
8. In practice many of these are unlikely to be achieved without effective integration with planning and management of other sectors. The framework normally proposed to achieve this is integrated coastal management (ICM).

Graphical course summary:

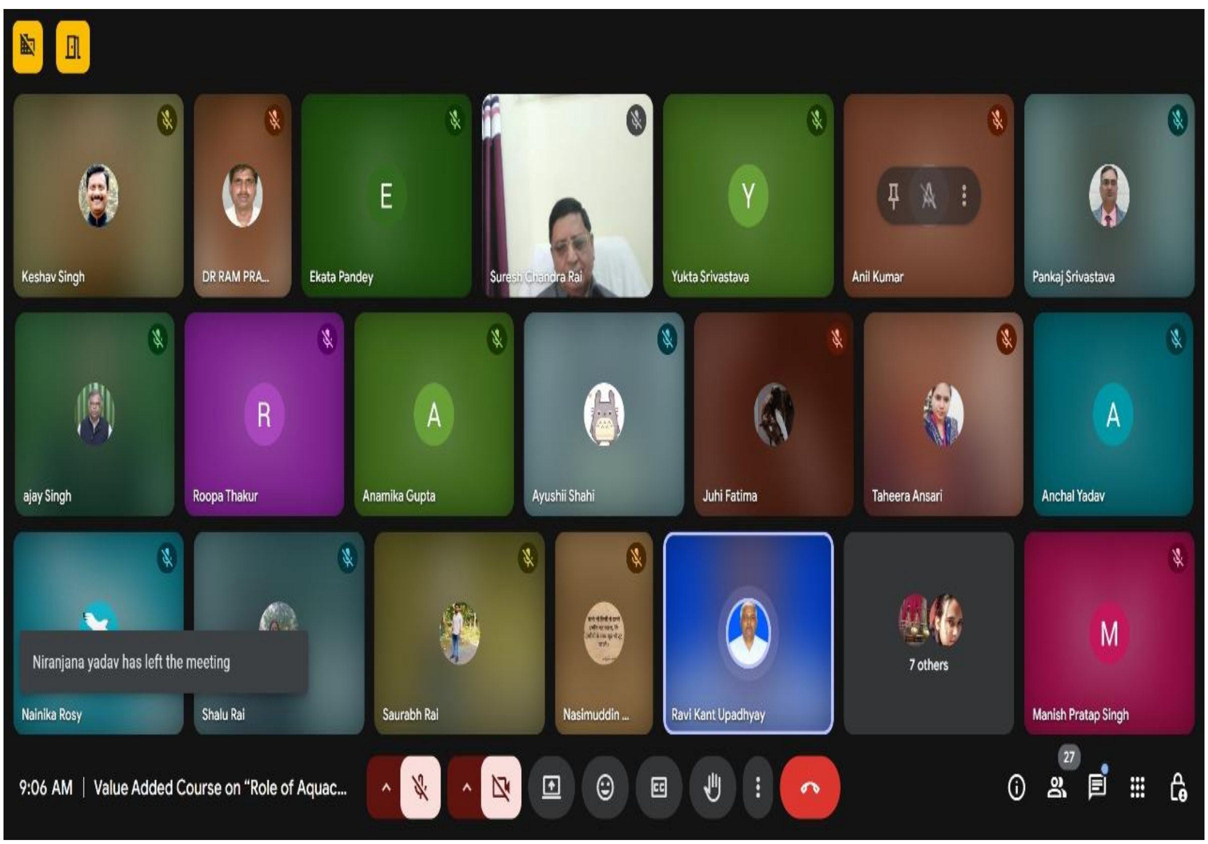
Day 1 **24-06-25**


Ravi Kant Upadh...
Keshav Si...
Veena Kushwaha
ajay Singh
Pawan Arya
DR-SUSHIL KUM...
Pankaj Srivastava
Rahul Gautam
Nainika Rosy
Sanju Yadav
DR RAM PRATA...
Rani Gupta
Harshit Mishra
Aditi Singh
21 others
Manish Pratap ...
9:09 AM | Value Added Course on "Role of Aquac...
36

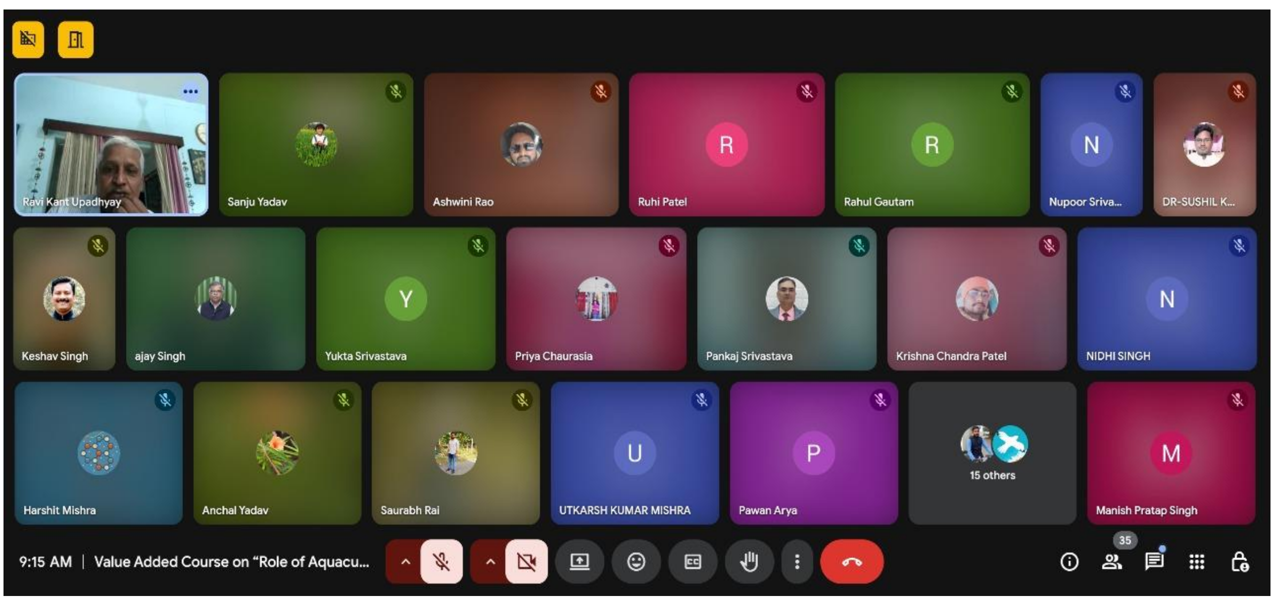

Manas Das (Presenting)
Manas Kr. Das
Value added course on " Role of Aquaculture and Fisheries in Sustainable Development, Dept. of Zoology, Deen Dayal Upadhyaya Gorakhpur University,24.6.25
Evidence of Climate Change
(IPCC,2014) projections
Sea level rise could flood low lying areas of Vietnam Bangladesh India and China
Ravi Kant Up...
Manas Das
ajay Singh
Rahul Gautam
37 others
Manish Prat...
9:29 AM | Value Added Course on "Role of Aquac...
43

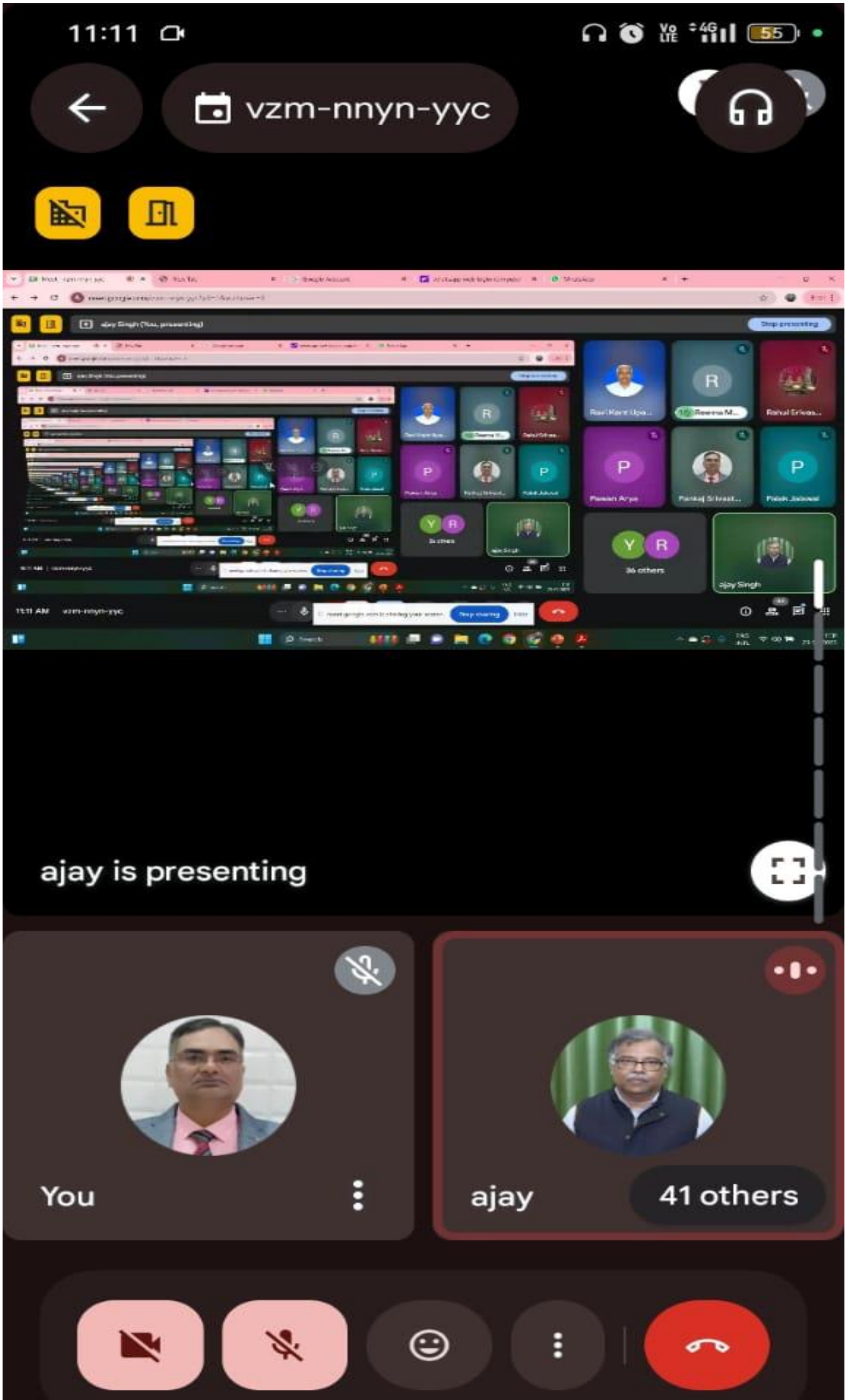

Brackish water aquaculture
❑ Intensive storm surges and inundation of the coastal areas causes salinization due to mixing of saline water with fresh water.
❑ Brackish water aquaculture of some species extensively cultured in the coastal states of India viz., Mugil cephalus M.parsia, Lates calcarifer, Chanos chanos, Etroplus suratensis forms a very useful option
Rahul Gautam
49 others
10:09 AM | Value Added Course on "Role of Aquaculture...

Day 2 25-06-25

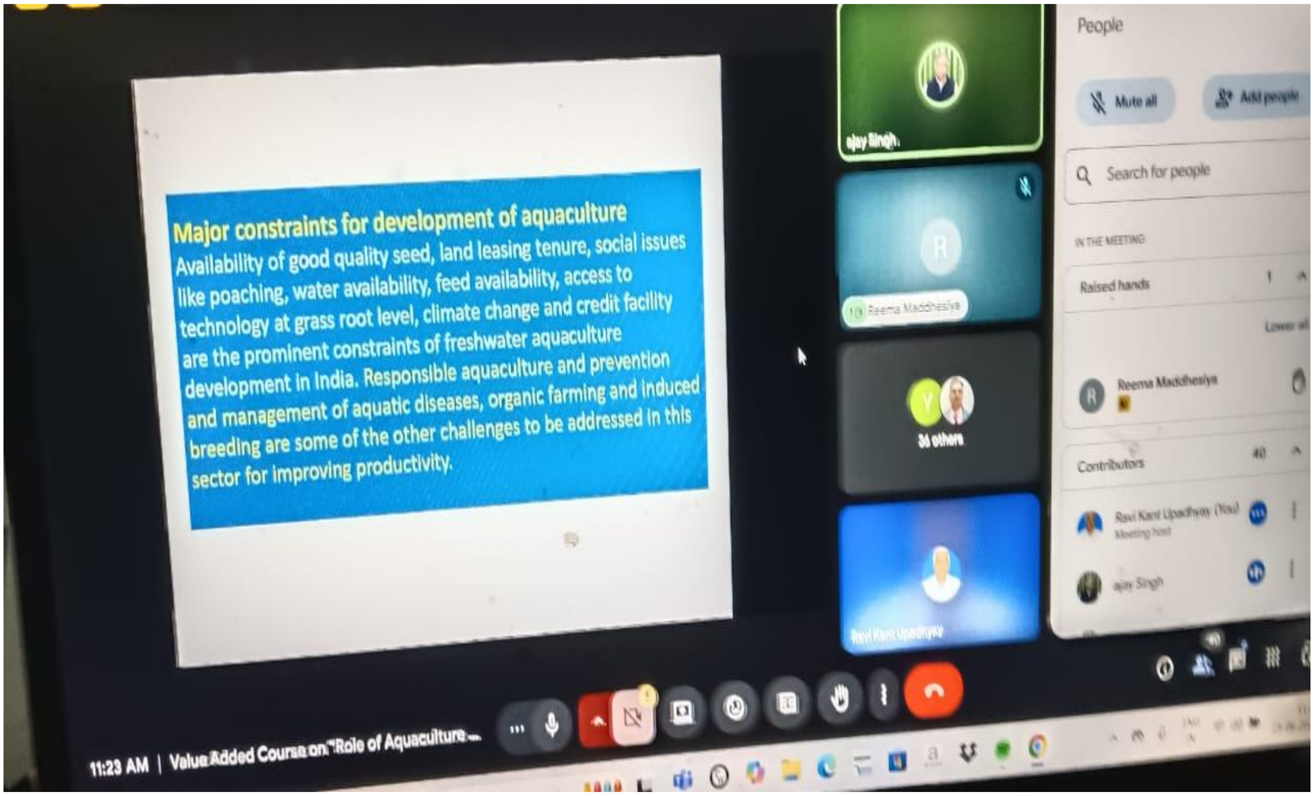

Keshav Singh
DR RAM PRA...
Ekata Pandey
Suresh Chandra Rai
Yukta Srivastava
Anil Kumar
Pankaj Srivastava
ajay Singh
Roopa Thakur
Anamika Gupta
Ayushii Shahi
Juhi Fatima
Taheera Ansari
Anchal Yadav
Niranjana yadav has left the meeting
Nainika Rosy
Shalu Rai
Saurabh Rai
Nasimuddin ...
Ravi Kant Upadhyay
7 others
Manish Pratap Singh
9:06 AM | Value Added Course on "Role of Aquac...

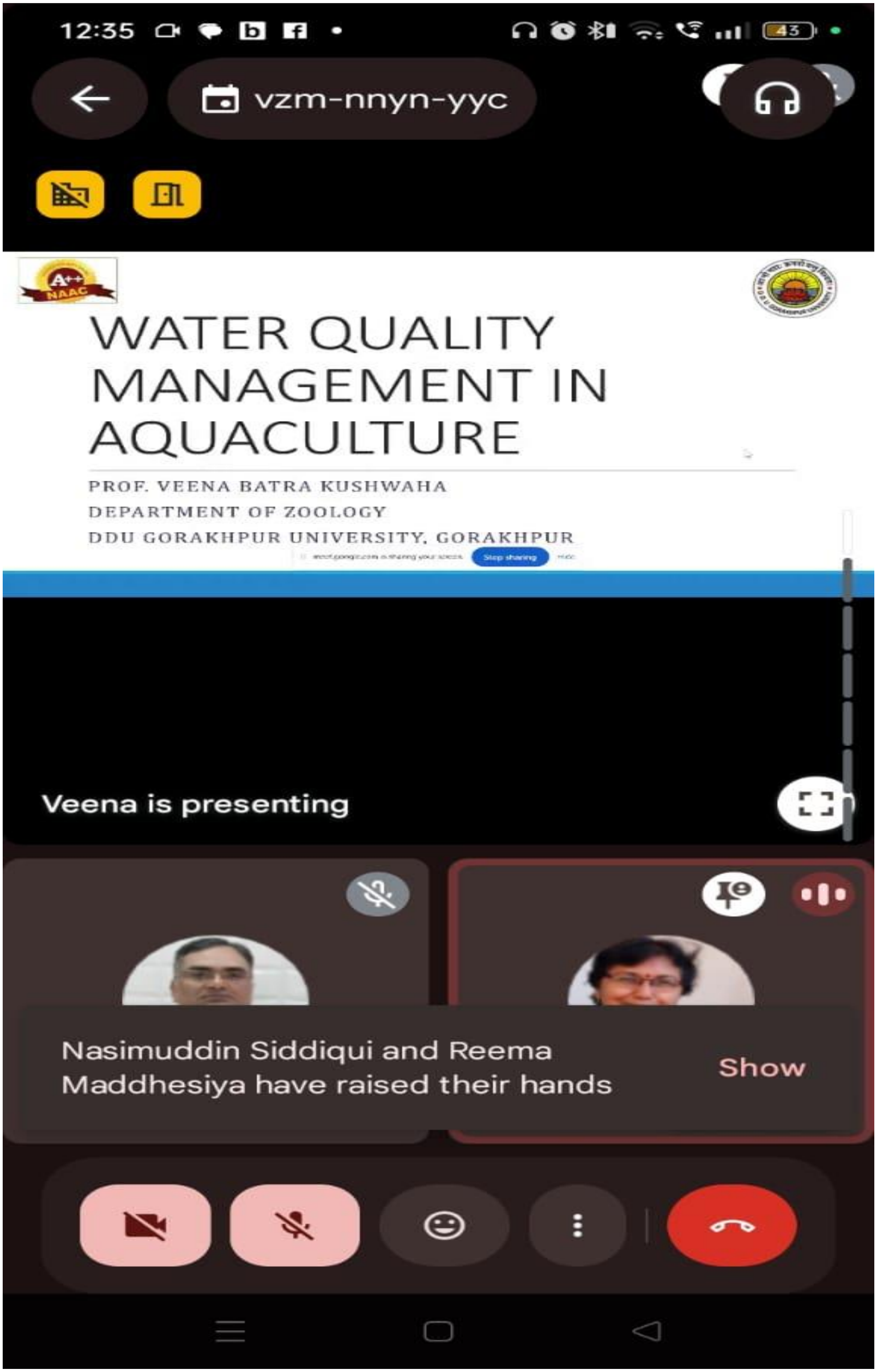

Suresh Chandra Rai (Presenting)
Sustainable Development and Management of Fisheries and Aquaculture Resources
Dr. S. C. Rai
Former Dean
College of Fisheries, Dholi
Dr. Rajendra Prasad Central Agricultural University,
Pusa, Samastipur, Bihar
Ravi Kant Upadhyay
Suresh Chandra Rai
Pankaj Srivastava
Nasimuddin ...
32 others
Manish Pratap Singh
9:12 AM | Value Added Course on "Role of Aquacu...
38

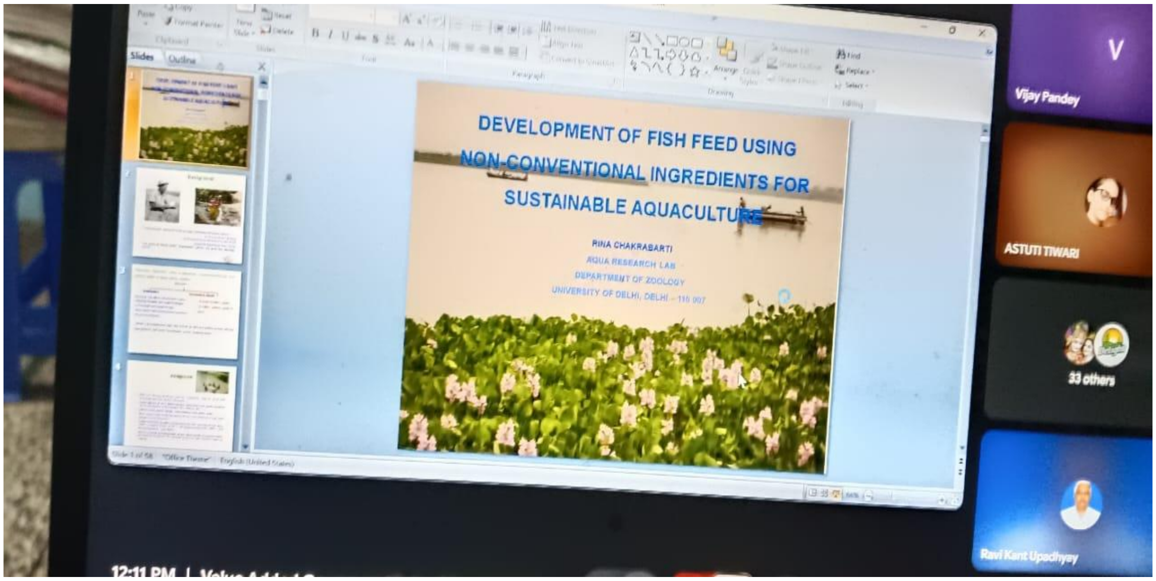

Ravi Kant Upadhyay
Sanju Yadav
Ashwini Rao
Ruhi Patel
Rahul Gautam
Nupoor Sriva...
DR-SUSHIL K...
Keshav Singh
ajay Singh
Yukta Srivastava
Priya Chaurasia
Pankaj Srivastava
Krishna Chandra Patel
NIDHI SINGH
Harshit Mishra
Anchal Yadav
Saurabh Rai
UTKARSH KUMAR MISHRA
Pawan Arya
15 others
Manish Pratap Singh
9:15 AM | Value Added Course on "Role of Aquacu...
35

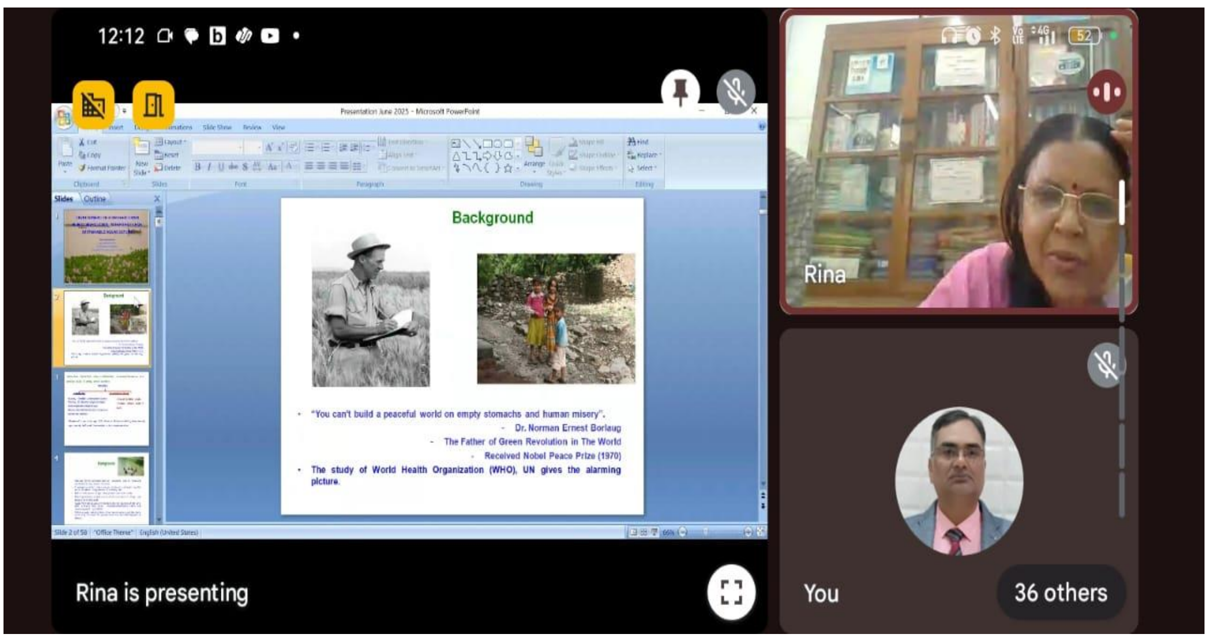


11:11
vzm-nnyn-yyc
ajay is presenting
You
ajay
41 others

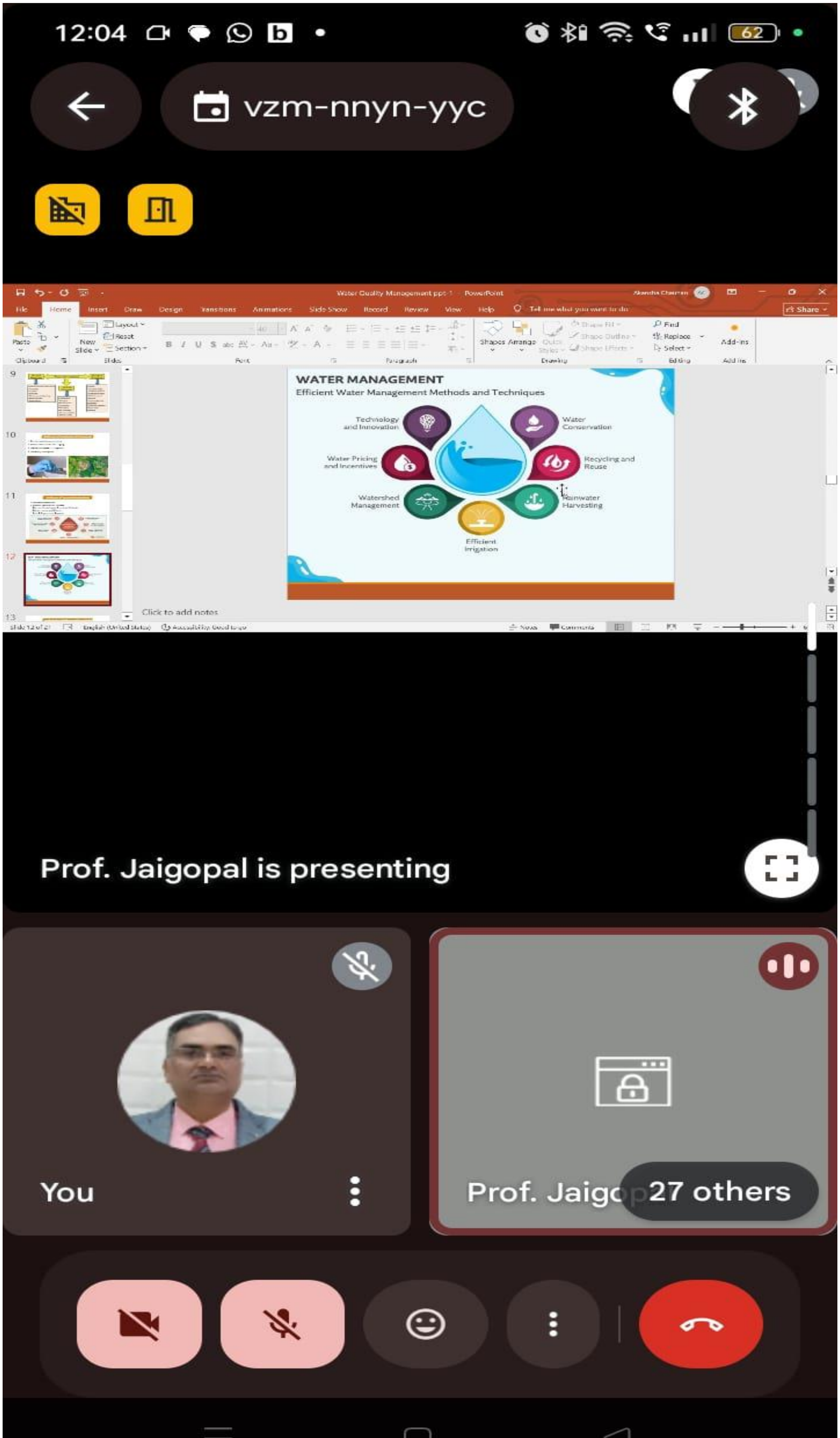

Major constraints for development of aquaculture
Availability of good quality seed, land leasing tenure, social issues like poaching, water availability, feed availability, access to technology at grass root level, climate change and credit facility are the prominent constraints of freshwater aquaculture development in India. Responsible aquaculture and prevention and management of aquatic diseases, organic farming and induced breeding are some of the other challenges to be addressed in this sector for improving productivity.
ajay Singh
Reema Maddhesiya
36 others
Ravi Kant Upadhyay
People
Mute all
Add people
Search for people
IN THE MEETING
Raised hands
Reema Maddhesiya
Contributors
Ravi Kant Upadhyay (You)
Meeting host
ajay Singh
11:23 AM | Value Added Course on "Role of Aquaculture


12:35
vzm-nnyn-yyc
WATER QUALITY MANAGEMENT IN AQUACULTURE
PROF. VEENA BATRA KUSHWAHA
DEPARTMENT OF ZOOLOGY
DDU GORAKHPUR UNIVERSITY, GORAKHPUR
Stop sharing
Veena is presenting
Nasimuddin Siddiqui and Reema Maddhesiya have raised their hands
Show


DEVELOPMENT OF FISH FEED USING
NON-CONVENTIONAL INGREDIENTS FOR
SUSTAINABLE AQUACULTURE
RINA CHAKRABARTI
AQUA RESEARCH LAB
DEPARTMENT OF ZOOLOGY
UNIVERSITY OF DELHI, DELHI – 110 007
Vijay Pandey
ASTUTI TIWARI
33 others
Ravi Kant Upadhyay

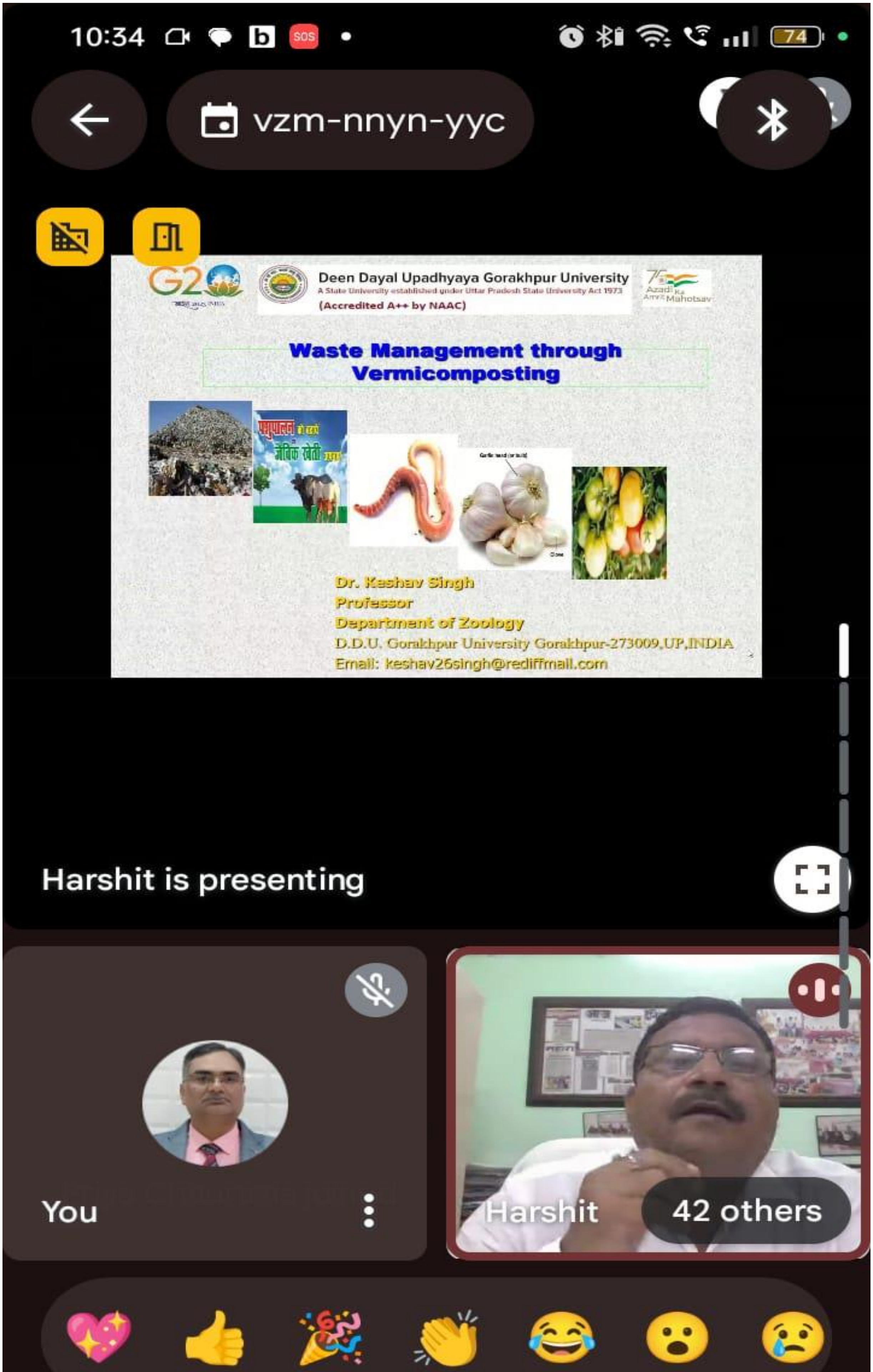

12:12
Background
"You can't build a peaceful world on empty stomachs and human misery".
- Dr. Norman Ernest Borlaug
- The Father of Green Revolution in The World
- Received Nobel Peace Prize (1970)
The study of World Health Organization (WHO), UN gives the alarming picture.
Rina
Rina is presenting
You
36 others

Day 3 26-06-25

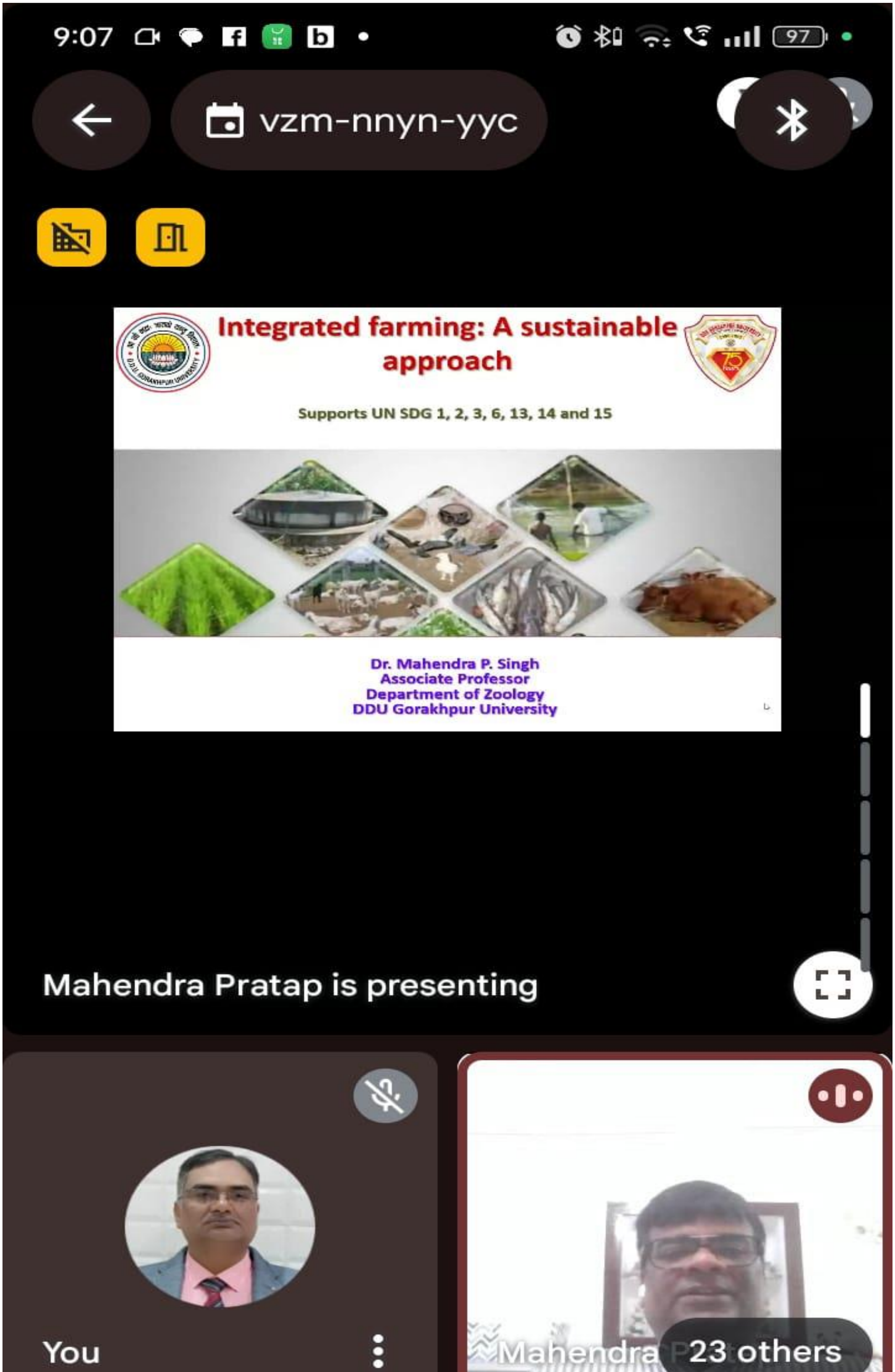


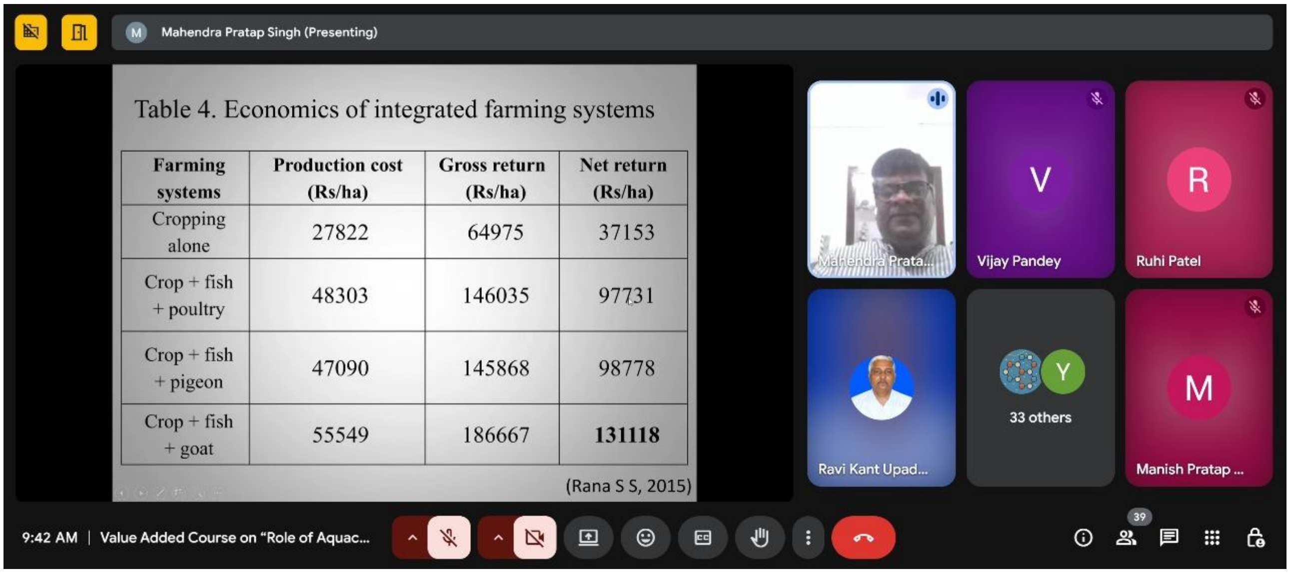
12:04
vzm-nnyn-yyc
WATER MANAGEMENT
Efficient Water Management Methods and Techniques
Technology and Innovation
Water Conservation
Water Pricing and Incentives
Recycling and Reuse
Watershed Management
Rainwater Harvesting
Efficient Irrigation
Click to add notes
Prof. Jaigopal is presenting
You
Prof. Jaigo
27 others

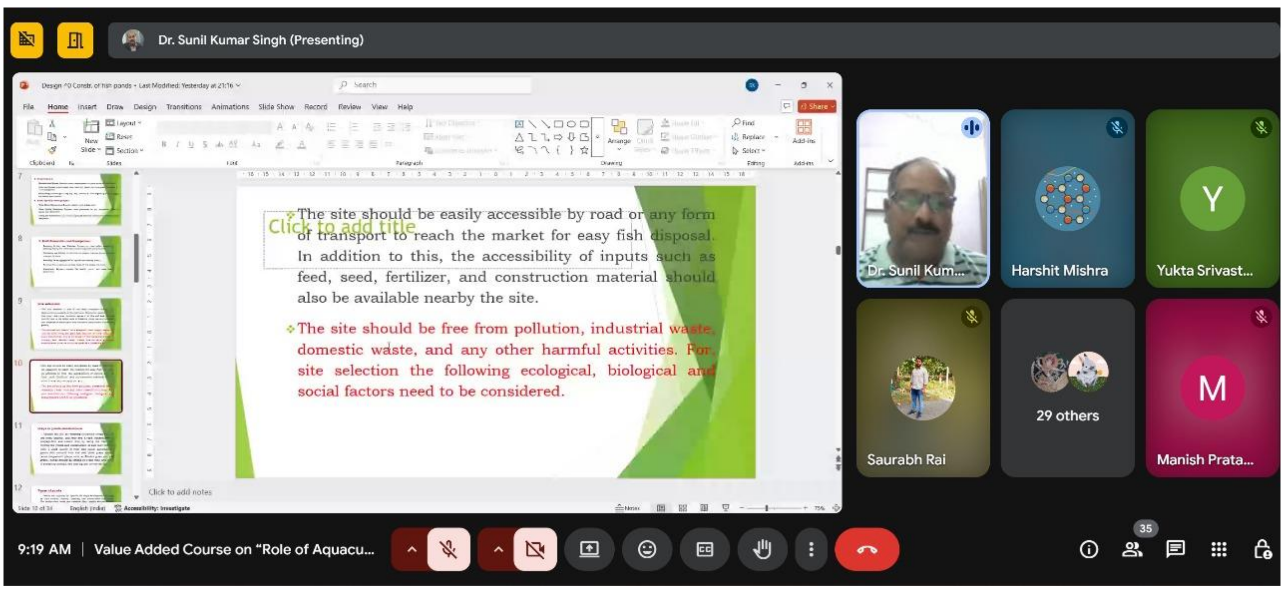

Ravi Kant Upadhyay (Presenting)
The fish immune system in improving fish health and aquaculture production
Prof. Ravi Kant Upadhyay
Department of Zoology
D D U Gorakhpur University
Abhay Chaurasi...
Ravi Kant Upad...
Priya Chaurasia
Krishna Chandr...
31 others
Manish Pratap ...
9:15 AM
Value Added Course on "Role of Aquacu...
37


10:34
vzm-nnyn-yyc
Deen Dayal Upadhyaya Gorakhpur University
A State University established under Uttar Pradesh State University Act 1973
(Accredited A++ by NAAC)
Waste Management through Vermicomposting
Dr. Keshav Singh
Professor
Department of Zoology
D.D.U. Gorakhpur University Gorakhpur-273009,UP,INDIA
Email: keshav26singh@rediffmail.com
Harshit is presenting
You
Harshit
42 others

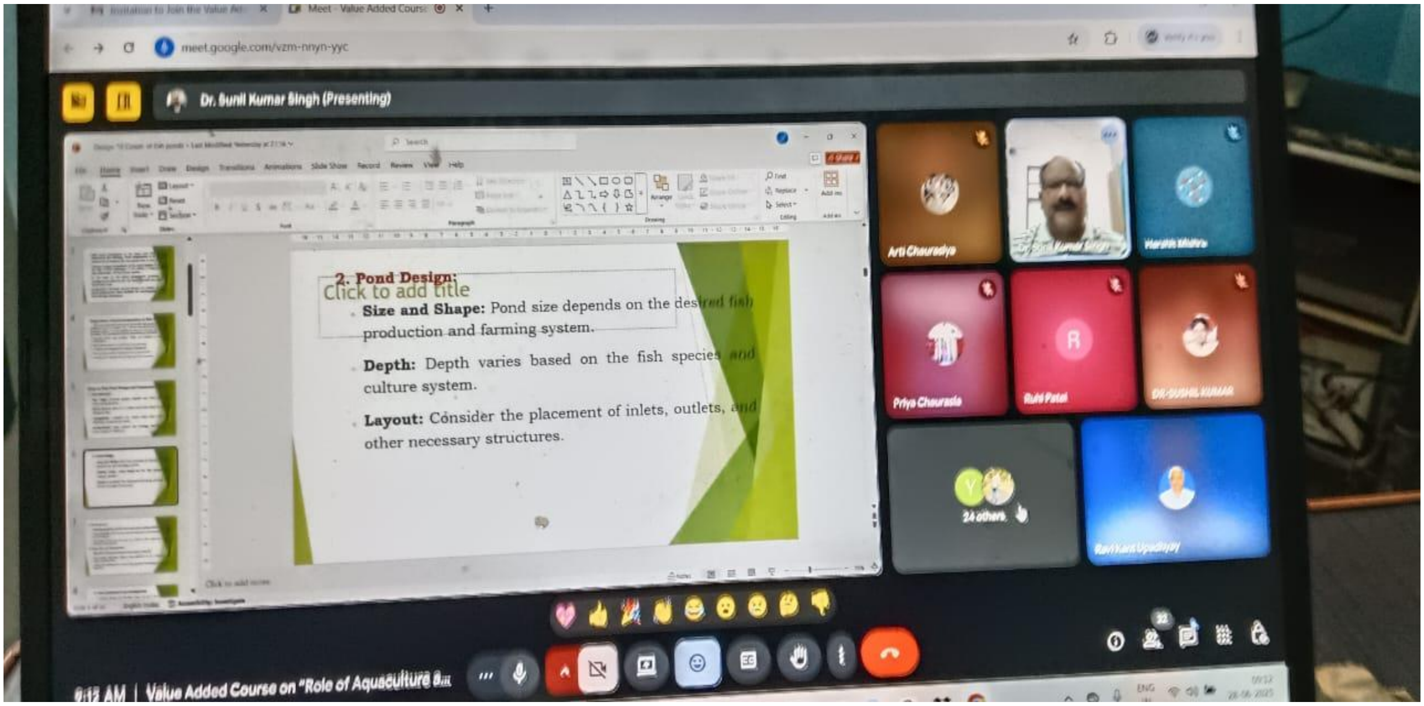
Day 4 27-06-25

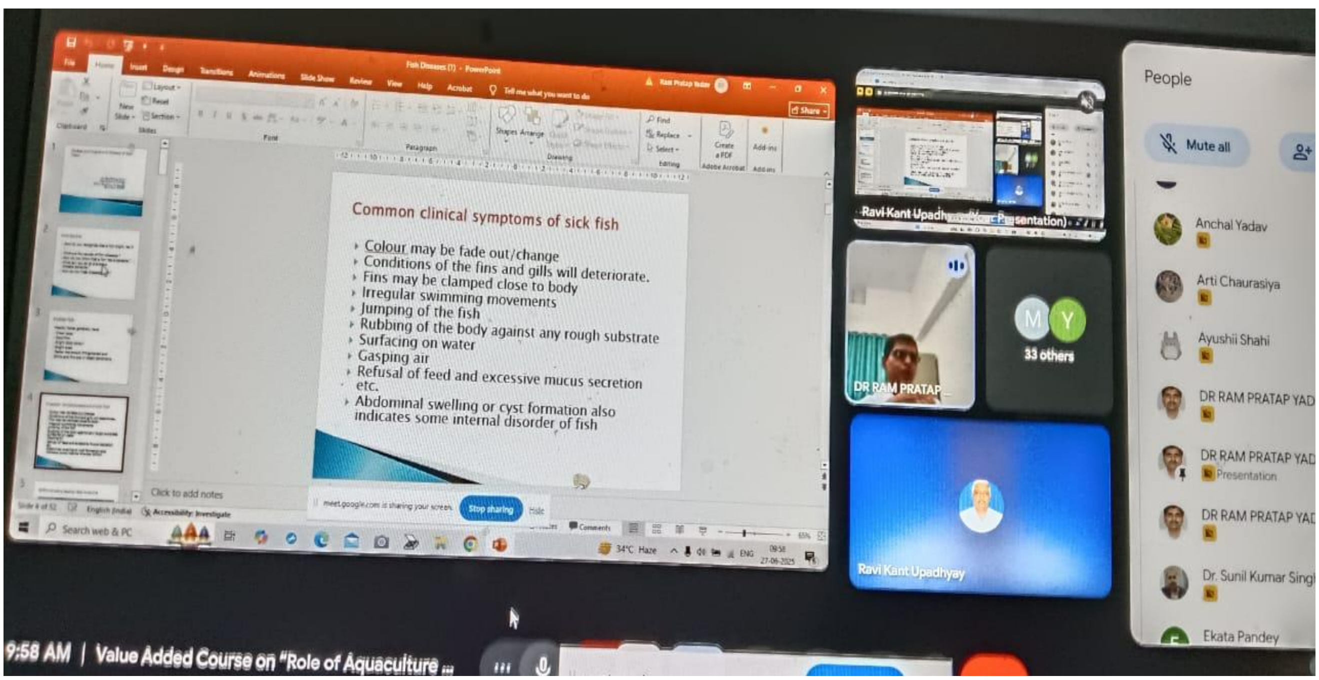

9:07
vzm-nnyn-yyc
Integrated farming: A sustainable approach
Supports UN SDG 1, 2, 3, 6, 13, 14 and 15
Dr. Mahendra P. Singh
Associate Professor
Department of Zoology
DDU Gorakhpur University
Mahendra Pratap is presenting
You
23 others

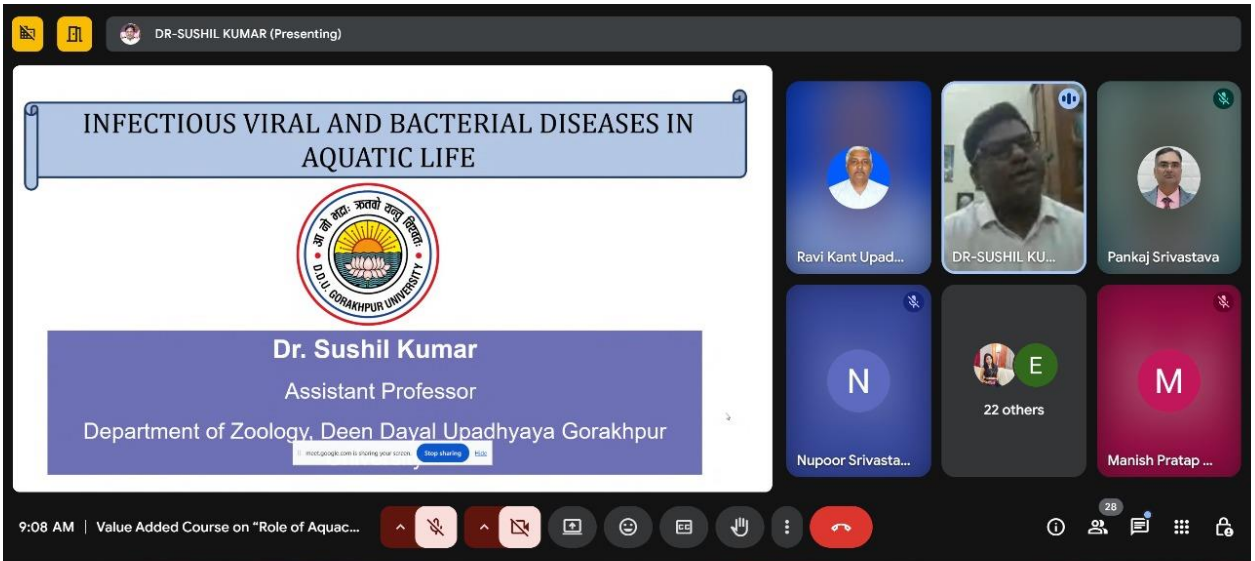

Mahendra Pratap Singh (Presenting)
Table 4. Economics of integrated farming systems
Farming systems
Production cost (Rs/ha)
Gross return (Rs/ha)
Net return (Rs/ha)
Cropping alone
27822
64975
37153
Crop + fish + poultry
48303
146035
97731
Crop + fish + pigeon
47090
145868
98778
Crop + fish + goat
55549
186667
131118
(Rana S S, 2015)
Vijay Pandey
Ruhi Patel
Ravi Kant Upad...
33 others
Manish Pratap ...
9:42 AM | Value Added Course on "Role of Aquac...

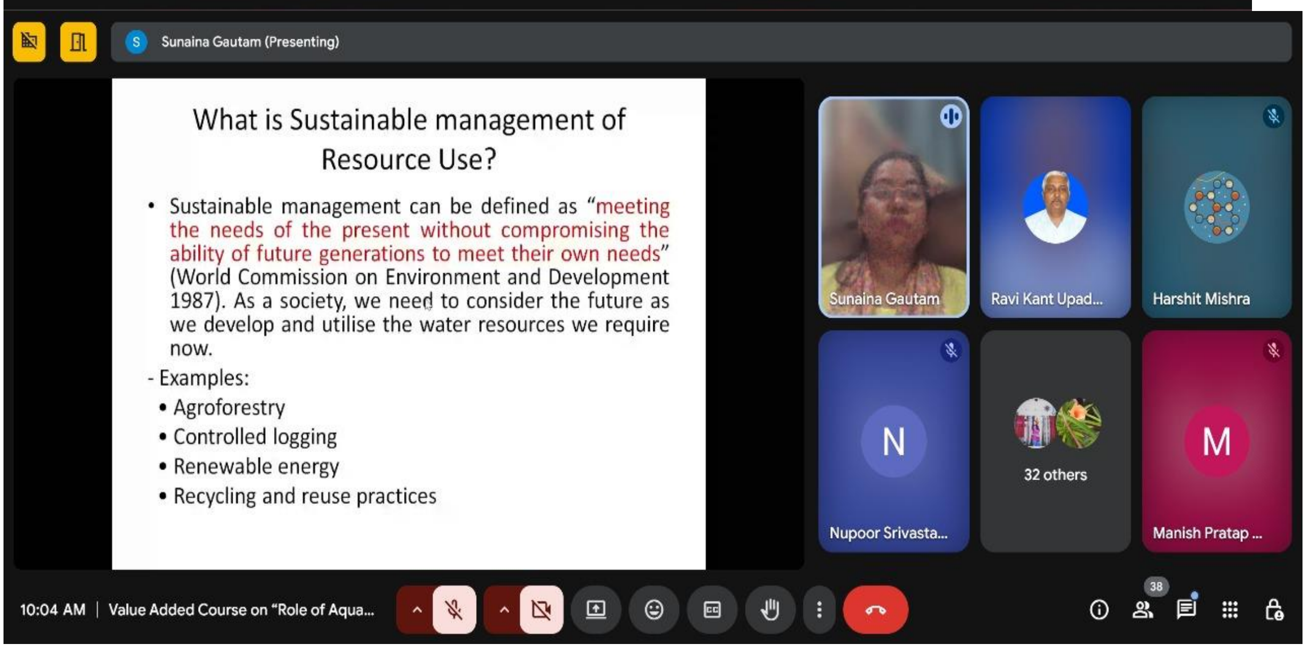

Dr. Sunil Kumar Singh (Presenting)
Click to add title
The site should be easily accessible by road or any form of transport to reach the market for easy fish disposal. In addition to this, the accessibility of inputs such as feed, seed, fertilizer, and construction material should also be available nearby the site.
The site should be free from pollution, industrial waste, domestic waste, and any other harmful activities. For site selection the following ecological, biological and social factors need to be considered.
Dr. Sunil Kum...
Harshit Mishra
Yukta Srivast...
Saurabh Rai
29 others
Manish Prata...
9:19 AM | Value Added Course on "Role of Aquacu...

Day 5 28-06-25

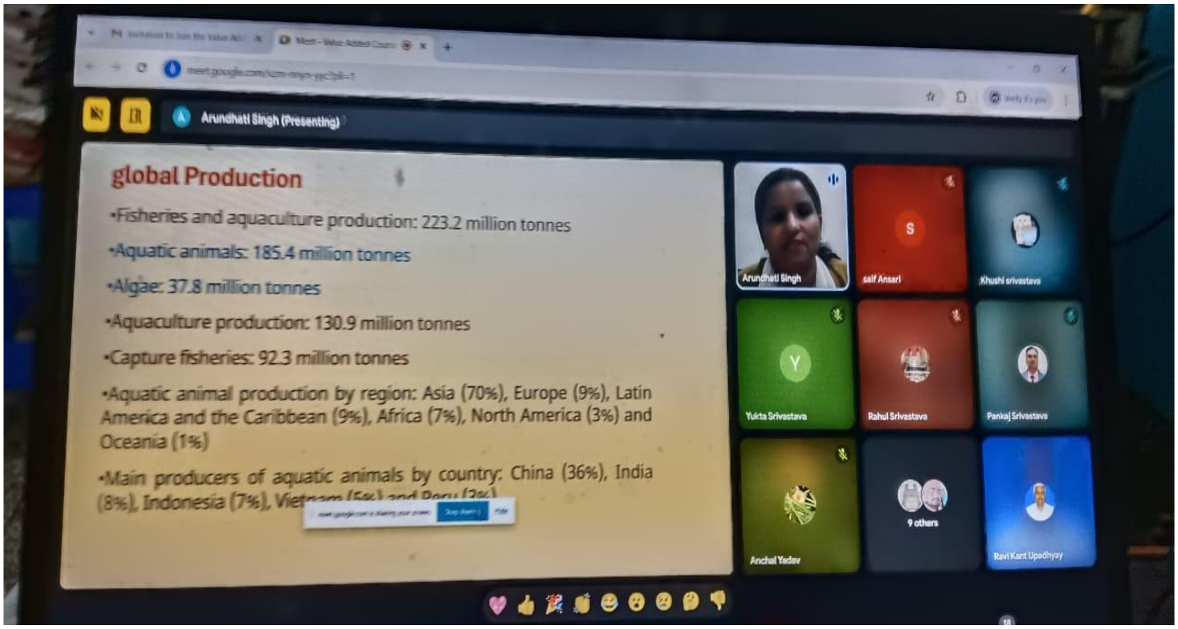

Dr. Sunil Kumar Singh (Presenting)
2. Pond Design:
Click to add title
Size and Shape: Pond size depends on the desired fish production and farming system.
Depth: Depth varies based on the fish species and culture system.
Layout: Consider the placement of inlets, outlets, and other necessary structures.
Arti Chaurasiya
Priya Chaurasia
Ruhi Patel
24 others
Ravi Kant Upadhyay
9:12 AM | Value Added Course on "Role of Aquaculture a...

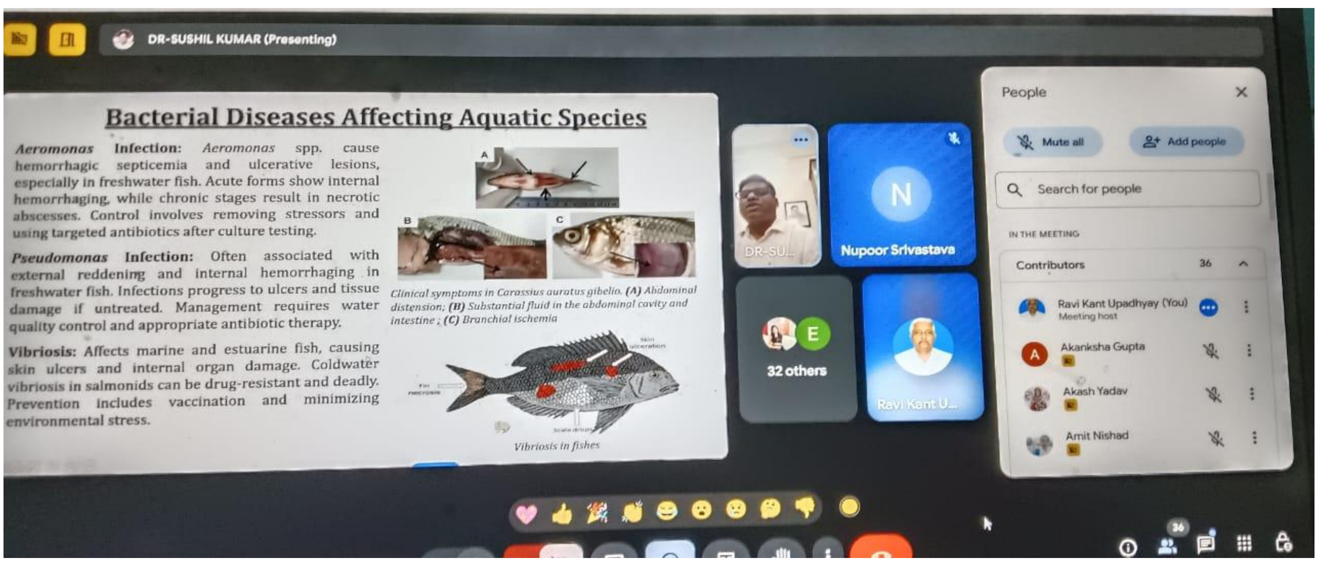

Common clinical symptoms of sick fish
Colour may be fade out/change
Conditions of the fins and gills will deteriorate.
Fins may be clamped close to body
Irregular swimming movements
Jumping of the fish
Rubbing of the body against any rough substrate
Surfacing on water
Gasping air
Refusal of feed and excessive mucus secretion etc.
Abdominal swelling or cyst formation also indicates some internal disorder of fish
People
Mute all
Anchal Yadav
Arti Chaurasiya
Ayushii Shahi
DR RAM PRATAP YAD
Presentation
Dr. Sunil Kumar Singh
Ekata Pandey
DR RAM PRATAP
33 others
Ravi Kant Upadhyay
Stop sharing
9:58 AM | Value Added Course on "Role of Aquaculture ...


DR-SUSHIL KUMAR (Presenting)
INFECTIOUS VIRAL AND BACTERIAL DISEASES IN AQUATIC LIFE
D.D.U. GORAKHPUR UNIVERSITY
Dr. Sushil Kumar
Assistant Professor
Department of Zoology, Deen Dayal Upadhyaya Gorakhpur
Ravi Kant Upad...
DR-SUSHIL KU...
Pankaj Srivastava
Nupoor Srivasta...
22 others
Manish Pratap ...
9:08 AM | Value Added Course on "Role of Aquac...

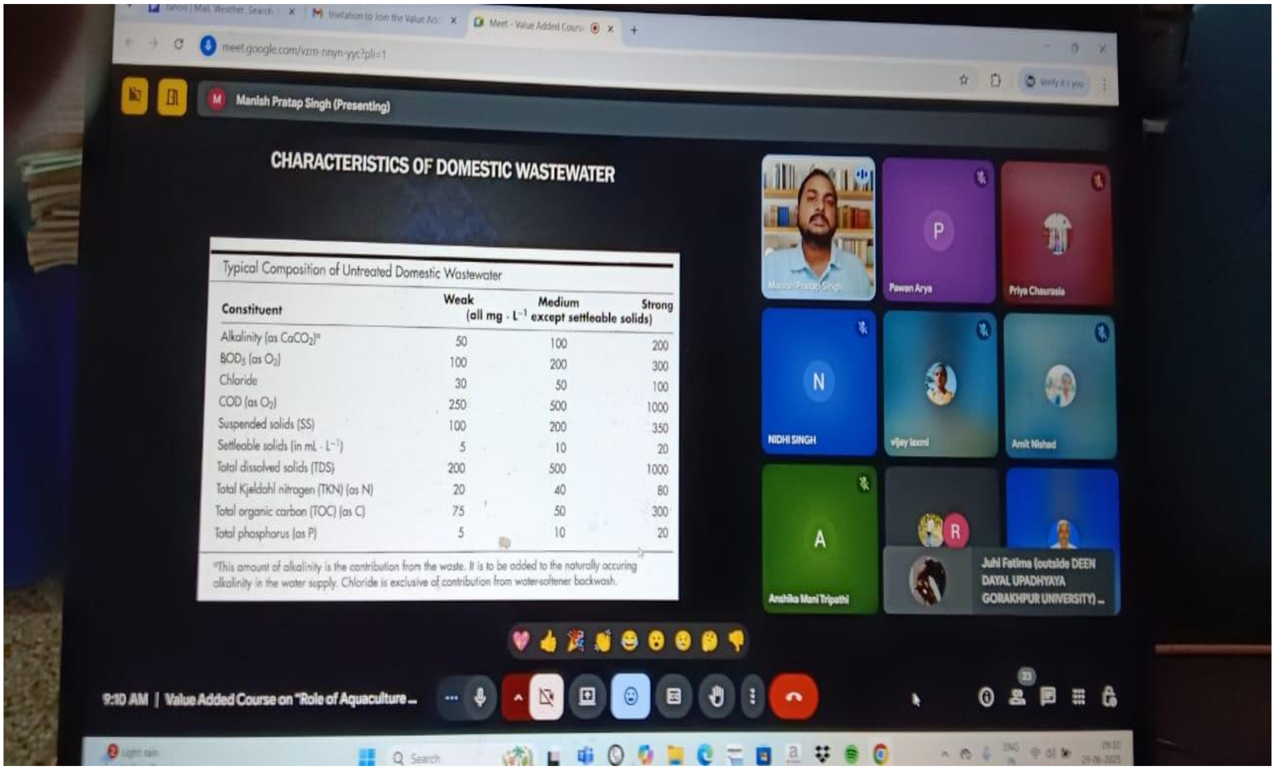

Sunaina Gautam (Presenting)
What is Sustainable management of Resource Use?
• Sustainable management can be defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). As a society, we need to consider the future as we develop and utilise the water resources we require now.
- Examples:
• Agroforestry
• Controlled logging
• Renewable energy
• Recycling and reuse practices
Sunaina Gautam
Ravi Kant Upad...
Harshit Mishra
Nupoor Srivasta...
32 others
Manish Pratap ...
10:04 AM | Value Added Course on "Role of Aqua...

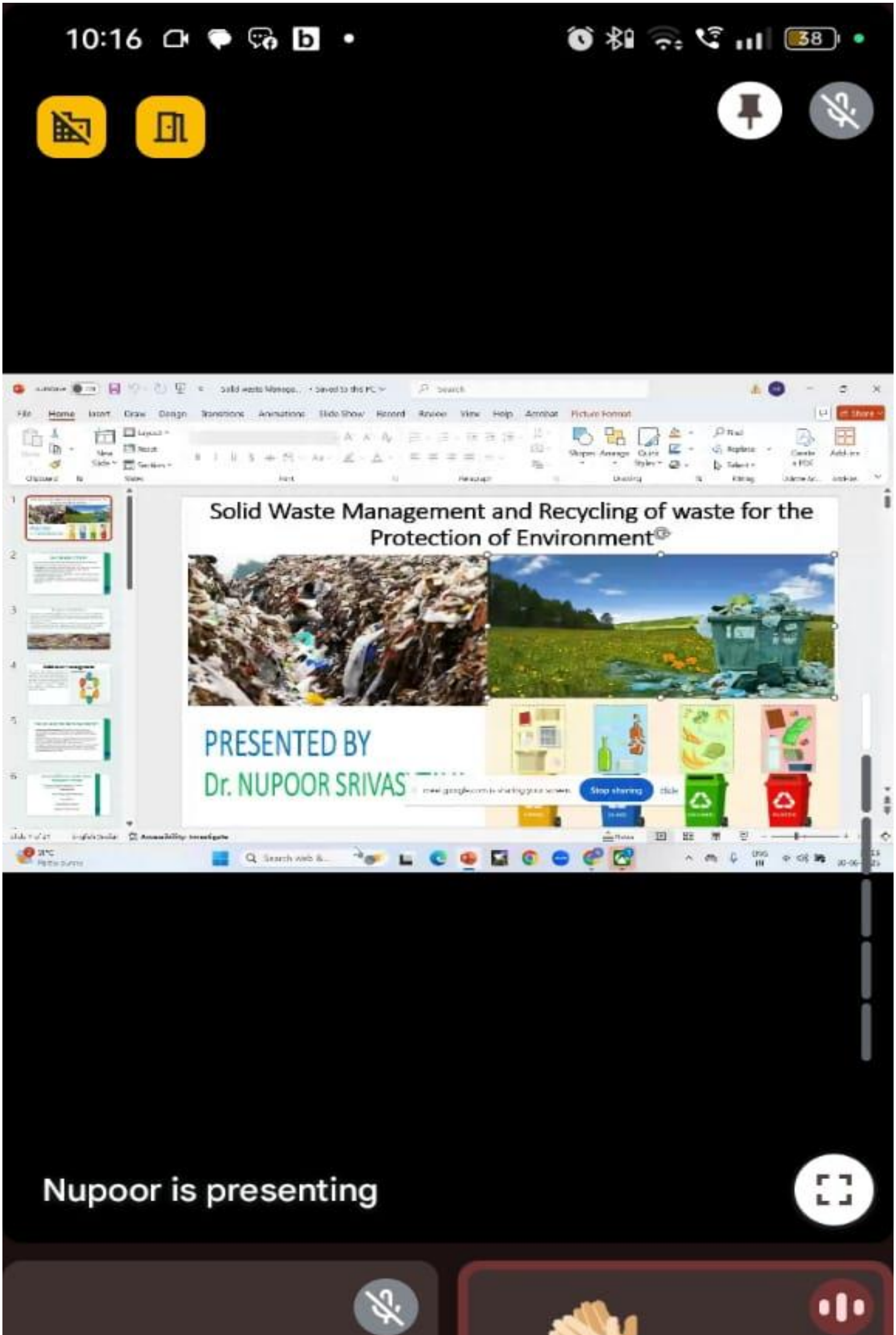
Day 29-06-25


Arundhati Singh (Presenting)
global Production
•Fisheries and aquaculture production: 223.2 million tonnes
•Aquatic animals: 185.4 million tonnes
•Algae: 37.8 million tonnes
•Aquaculture production: 130.9 million tonnes
•Capture fisheries: 92.3 million tonnes
•Aquatic animal production by region: Asia (70%), Europe (9%), Latin America and the Caribbean (9%), Africa (7%), North America (3%) and Oceania (1%)
•Main producers of aquatic animals by country: China (36%), India (8%), Indonesia (7%), Viet
Arundhati Singh
saif Ansari
Khushi srivastava
Yukta Srivastava
Rahul Srivastava
Pankaj Srivastava
Anchal Yadav
9 others
Ravi Kant Upadhyay

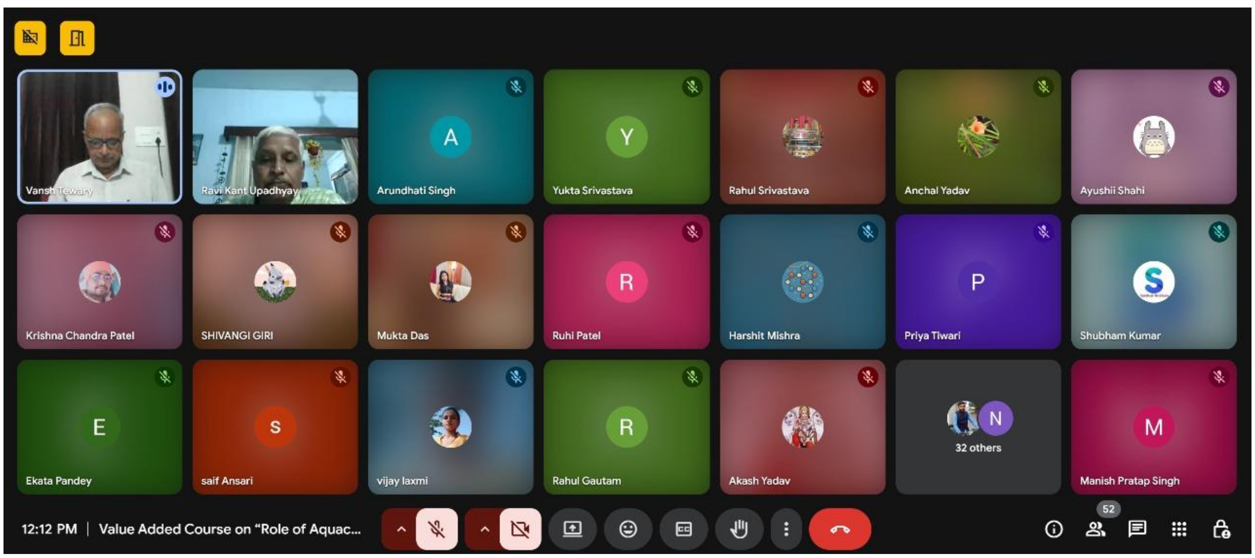

DR-SUSHIL KUMAR (Presenting)
Bacterial Diseases Affecting Aquatic Species
Aeromonas Infection: Aeromonas spp. cause hemorrhagic septicemia and ulcerative lesions, especially in freshwater fish. Acute forms show internal hemorrhaging, while chronic stages result in necrotic abscesses. Control involves removing stressors and using targeted antibiotics after culture testing.
Pseudomonas Infection: Often associated with external reddening and internal hemorrhaging in freshwater fish. Infections progress to ulcers and tissue damage if untreated. Management requires water quality control and appropriate antibiotic therapy.
Vibriosis: Affects marine and estuarine fish, causing skin ulcers and internal organ damage. Coldwater vibriosis in salmonids can be drug-resistant and deadly. Prevention includes vaccination and minimizing environmental stress.
Clinical symptoms in Carassius auratus gibelio. (A) Abdominal distension; (B) Substantial fluid in the abdominal cavity and intestine ; (C) Branchial ischemia
Vibriosis in fishes
Nupoor Srivastava
32 others
Ravi Kant U...
People
Mute all
Add people
Search for people
IN THE MEETING
Contributors 36
Ravi Kant Upadhyay (You)
Meeting host
Akanksha Gupta
Akash Yadav
Amit Nishad

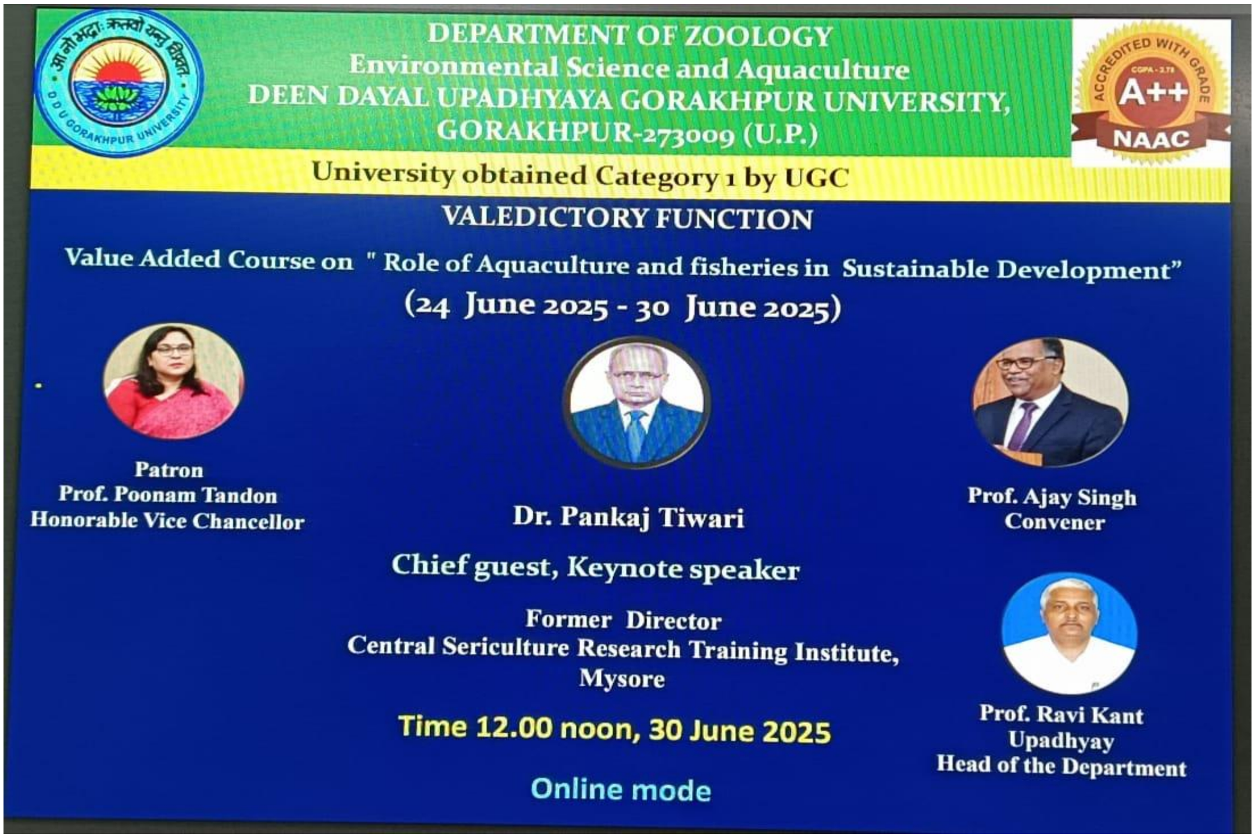
Day 30-06-25


Manish Pratap Singh (Presenting)
CHARACTERISTICS OF DOMESTIC WASTEWATER
Typical Composition of Untreated Domestic Wastewater
Constituent | Weak | Medium | Strong (all mg · L⁻¹ except settleable solids)
Alkalinity (as CaCO3)* 50 100 200
BOD5 (as O2) 100 200 300
Chloride 30 50 100
COD (as O2) 250 500 1000
Suspended solids (SS) 100 200 350
Settleable solids (in mL · L⁻¹) 5 10 20
Total dissolved solids (TDS) 200 500 1000
Total Kjeldahl nitrogen (TKN) (as N) 20 40 80
Total organic carbon (TOC) (as C) 75 50 300
Total phosphorus (as P) 5 10 20
*This amount of alkalinity is the contribution from the waste. It is to be added to the naturally occuring alkalinity in the water supply. Chloride is exclusive of contribution from water-softener backwash.
Pawan Arya
Priya Chaurasia
NIDHI SINGH
vijay laxmi
Amit Nishad
Anshika Mani Tripathi
Juhi Fatima (outside DEEN DAYAL UPADHYAYA GORAKHPUR UNIVERSITY)
9:10 AM | Value Added Course on "Role of Aquaculture ...


10:16
Solid Waste Management and Recycling of waste for the Protection of Environment
PRESENTED BY
Dr. NUPOOR SRIVAS
Stop sharing
Nupoor is presenting

Valedictory function: Key note speaker: Dr Pankaj Teware, Former Director: Central Sericulture Research Training Institute, Mysore





Attendance of participants

1. Prof. Ravi Kant Upadhyay
2. Prof. Manas Das
3. Prof. Ajay Singh
4. Manish Pratap Singh
5. Prof. Veena B Kushwaha
6. Aditi Singh
7. Akash Yadav
8. Amit Nishad
9. Anchal Yadav
10. Anjali Singh
11. ankita pandey

12. Apoorva Dubey
13. Arti Chaurasiya
14. Arundhati Singh
15. Ashwini Rao
16. DR RAM PRATAP
17. DR-SUSHIL KUMAR
18. Dr. Sunil Kumar Singh
19. Harshit Mishra
20. Juhi Fatima
21. Keshav Singh
22. Khan Arya
23. Krinta Devi
24. Krishna Chandra
25. Dr. Mahendra Pratap Singh
26. Nainika Rosy
27. Namrata Mall
28. Nasimuddin Siddiqui
29. Neda Fatma
30. NIDHI SINGH
31. Nikhil Yadav
32. Niranjana yadav
33. Ojesh Singh
34. Pankaj Srivastava
35. Pawan Arya
36. Priya Chaurasia

37. Priya Sah
38. Priya Tiwari
39. Purnima Shahi
40. Rahul Gautam
41. Rani Gupta
42. Saru Kushwaha
43. Saurabh Rai
44. Shilpa Kumari
45. Spiritual Shubham
46. Dr. Simta Singh
47. UTKARSH KUMAR
48. Yukta Srivastav

COURSE STRUCTURE

DEPARTMENT OF ZOOLOGY
(Environmental Science and Aquaculture)
DEEN DAYAL UPADHYAYA GORAKHPUR UNIVERSITY, GORAKHPUR-273009 (U.P.)
Value Added Course on "Role of Aquaculture and fisheries in sustainable Development"
(24 June 2025 - 30 June 2025)

Time Duration 30 hours

Who can apply?**:**All students of B. Sc., Biology, M. Sc. Zoology, M. Sc. Life Science and Ph. D. students can apply.

Fee: Free of cost

Course objectives:

1. To provide value added courses on aquaculture to the students through teaching and learning process.
2. Understand Basic Principles of Aquaculture
3. Capacity building among students through exchanging knowledge and skills.
4. Educating students about broodstock management in aquaculture
5. To educate students about aquaculture business management.
6. To impart knowledge to students about aquaculture administration and planning.
7. To educate students on management of sustainable aquaculture development.

Course Outcomes:
1. Capacity building and skill development.
2. Entrepreneurship and Job Creation in different applied sectors of Zoology
3. Increased fish production in rural areas
4. Addressing food security among poor village people.
5. Rural Development and Livelihoods through Aquaculture

***Note**
- **The course will be conducted through Zoom App**
- **Registered participants will be given e-certificates after the successful completion and evaluation of their performance in the course.**
- **Grade: 90 and above – O; 70 to 89 – A; 50 to 69 – B; 40 to 49 – C; Below 40**

COURSE STRUCTURE

Total Teaching Hours- 30 hrs

1. SUSTAINABILITY OF AQUACULTURE 4 Hrs
Present scenario and problems: Trends in global and Indian aquaculture; different farming systems; environmental degradation and disease outbreaks.

2. ENVIRONMENTAL ISSUES: 4 Hrs
Exotic species introduction; escapement; over exploitation of wild stocks; mangrove deforestation, Sustainable Resource Use, regeneration of fresh water sources, Pollution Control, Waste Management and Recycling, Environmental Impact Assessments, disaster management and flood control.

3. STRATEGIES FOR SUSTAINABILITY: 6 Hrs
Organic farming; Integrated farming; Sustainable use of antibiotics.Non-food aquacultureAquarium keeping. Design and construction of tanks; heating, lighting, aeration and filtration arrangements; decorations used, feed, health and water quality management.

4. SOIL AND WATER QUALITY MANAGEMENT: 4 Hrs
Water treatment, water filtration devices, aeration, chlorination, Algal bloom control, eutrophication, Aquatic weed management, Waste water treatment practices, Water quality management in hatcheries.

5. Feed Resources: 4 Hrs
Nutritional value of feed ingredients and live feed, Contribution from natural food to nutrient requirements of fish, Commercial feed manufacture, Feed storage.
Larval stages, quality requirements or natural larval feeds and its importance in aquaculture, biofilm/periphylon and its use, culture of single cell proteins and their nutritional quality, formulation and preparation of artificial feeds for larval rearing, microparticulate diets. Culture of important microalga, rotifers, anemia, cladoccrans, copepods, oligochactes, nematodes and insect larvae.

6. FISH HEALTH MANAGEMENT: **4 Hrs**
Parasitic and mycotie diseases, Infectious bacterial and viral diseases,General characteristics, Epizootiology, Diagnosis, Prevention and treatment. Non-infectious Diseases: Nutritional diseases,

7. INDUCED SPAWNING: 4 Hrs
Methods of natural and artificial fertilization, use of different synthetic hormones and analogues for induced spawning, Egg staging, Stripping and fertilization.Hatchery technology for different species viz. Indian major and minor carps, Exotic carps, Catfishes, Tilapia, etc.

Name of resource persons who have delivered their lectures

Name of faculty	Date	Time slot (9.0 AM-1PM)	Topic of lecture
Dr. M. Sinha Ex-Director retired, Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India	24-6-24	Inaugural session 9.00 AM -10.30 Slot 1	Future of Inland Fisheries in India,
Dr. M K Das, Former HOD & Principal Scientist, ICAR, Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India	24-6-24	Slot 2 (10.30-12.00 noon)	Impact of climate Change on inland fisheries and aquaculture
Dr S C Rai, Former Dean, College of Fisheries Dr Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India	25-6-25	Slot 1 (9.00AM - 10.0 AM)	Advances in Fish Nutrition and Feed Technology
Dr. Ajay Singh	25-6-24	Slot 2 (10.0AM-11. AM)	Sustainable aquaculture: A promising path to livelihood.
Prof Sunil Kumar Srivastava	25-6-24	Slot 3 11.0-12.0 AM)	Prawn culture
Prof. Rina Chakrbarti	25-6-24	Slot 3 12.0-1.0 PM)	Effect of stress, climate and nutrition in fish health
Dr. Veena B Kushwaha	25-6-24	Slot 4 (1.0 PM-2.0 PM)	Water quality management in aquaculture
Prof. Jai Gopal Sharma Professor Ex-Head of Department of Biotechnology Delhi Technological University Bawana Road, Delhi-110042, India	26-6-24	Slot 1 (9.00AM - 10.30 AM)	Fish feed for sustainable aquaculture
Dr. Ravi Kant Upadhyay	26-6-24	Slot 2 10.30 AM -12 AM)	Immunity and disease resistance against pathogens and parasites
Dr. Keshav Singh	26-6-24	Slot 3 (12.00 noon-1 PM)	Biological waste management through vermicomposting

Dr. Mahendra P Singh	**27-6-24**	**Slot 1 (9.00AM - 10AM)**	**Integrated farming: a sustainable approach**
Dr. Ram Pratap Yadav	**27-6-24**	**Slot 2 10.00AM - 11AM)**	**Fish pathology and diseases**
Dr. Sushil Kumar	**27-6-24**	**Slot 3 (11.00AM - 12.00 AM)**	**Infectious bacterial and viral diseases of aquatic life**
Dr. Sunil Kumar Singh	**28-6-24**	**Slot 1 (9.00AM - 10AM)**	**Water quality management in hatcheries**
Dr. Sunil Kumar Singh	**28-6-24**	**Slot 2 (10.00AM - 11.00 AM)**	**Design and construction of fish ponds**
Dr. Smita Singh	**28-6-24**	**Slot 23 (11.00AM-12.00 noon)**	**Application of transgenic fish in aquaculture**
Dr. Arundhati Singh	**29-6-24**	**Slot 1 (9.00AM - 10AM)**	**Present Scenario of Aquaculture in India**
Dr. Sunaina Gautam	**29-6-24**	**Slot 2 10.00AM - 11AM)**	**Sustainable resource use and regeneration of freshwater sources**
Dr. Manish Pratap Singh	**29-6-24**	**Slot 3 11.00AM - 12 noon)**	**Waste water treatment practices**
Dr. Sushil Kumar	**30-6-24**	**Slot 1 (9.00AM - 10AM)**	**Infectious bacterial and viral diseases of aquatic life**
Dr. Noopur Srivstav	**30-6-24**	**Slot 1 (9.00AM - 10.00 AM)**	**Recycling of Waste and its Management**
Dr. Pankaj Srivastav	**30-6-24**	**Slots 2& 3 (10 AM-12 PM)**	**Carp culture technology, trends and transformations** **Biofilm and its role in aquaculture**
Valedictory function	**30-6-24**	**1 PM -2 PM**	**Conclusion**

Certificate of participation

DEPARTMENT OF ZOOLOGY
(Environmental Science and Aquaculture)
DEEN DAYAL UPADHYAYA GORAKHPUR UNIVERSITY,
GORAKHPUR-273009 (U.P.)

This is to certify that Mr./Ms./Mrs.. ....Zoology, has been participated and successfully completed the Value Added Course on "Role of Aquaculture and fisheries in sustainable Development" from 24 June 2025 - 30 June 2025

Prof. Ravi Kant Upadhyay
HOD

Prof. Ajay Singh
Convener

Prof. Shantanu Rastogi
Dean, Faculty of Science