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## ADVANCES IN ENVIRONMENTAL SCIENCE: A REVIEW OF IJE PAPERS (VOL. 3, ISS. 1 & 2)

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This paper provides the review of the papers published in Volume 3, Issues 1 & 2 of “*International Journal Environment*”. The genesis of this paper came from a request to Dr. Naveen Punati by the Editor-in-Chief, **Govinda Bhandari**, in reviewing IJE Issues. As the two issues contained a grand total of fifty one (51) papers, Dr. Punati requested the approval of using a colleague, Dr. Ajith Rao, for help in completing the reviews. Mr. Bhandari reviewed Dr. Rao’s CV, and approved the completion of the review jointly. Dr. Punati and Dr. Rao spent five weeks on reviewing and summarizing the papers individually. The entire process was an enriching experience for both Dr. Punati and Dr. Rao, and served to describe the breadth of the excellent work contained in these issues of the journal.

Both issues 1 & 2 begin with a note from Mr. Bhandari, reaffirming his commitment to publish high-quality articles related to the environment, and encouraging submissions from national and international researchers. The papers in this issue reflect Mr. Bhandari’s vision, and demonstrate cutting-edge work and important insights on critical issues in different regions across the world.

The following is a brief review of some of the articles selected indiscriminately as follows:

*Volume-3, Issue-1, Dec 2013 - Feb 2014* contains 18 articles.

*Volume-3, Issue-2, Mar - May 2014* contains 33 articles.

Abbas et al. (2014) carried out a study, at General Commission for Scientific Agricultural Research (GCSAR), Syria, at Der EzZour Agricultural Research Center, from 2008-2010, to examine the effect of salt conditions on some growth attributes and chlorophyll fluorescence in 10 Sugar Beet genotypes. Sugar beet plants were irrigated with saline water, with different levels of conductivity. Results indicated that all the studied growth attributes such as leaf area, leaf number, relative growth rate, and net assimilation rate were decreased in salinity stress conditions. The findings indicated that salinity caused a decrement of light utilization through increased values of fluorescence origin, decreased values of fluorescence maximum, and maximum yield of quantum in photosystem-II. Genotypes exhibited different behavior

for the studied attributes except the leaf number. Under salt conditions, Brigitta achieved an increase in net assimilation rate, while Kawimera achieved the lowest decrement in quantum yield in photosystem-II. Authors have also indicated that further studies are necessary to correlate the yield with yield components under similar conditions to determine the most tolerant genotype.

Abdel-Aziz (2014) applied a Distributed Hydrological Model (DHM) and the data simulated by modified general circulation model (GCM) to study the hydrology of the Blue Nile Basin. The overall performance of the DHM model using observed precipitation showed acceptable agreement with observed river discharge. Future river discharge patterns are predicted forcing the DHM model using two modified GCMs. The results indicate that the mean highest peak discharge might increase within the future seven year groups. In addition, the higher flood peaks seems to be more concentrated in August in the simulated basin. Author claimed that more appropriate bias correction of the GCM output to the river basin is necessary to project future hydrology. Author also suggested that the long-term comparisons of in situ data and this models' output are essential. Author concluded that such information will be helpful for watershed management in Blue Nile Basin by controlling dams according to the knowledge of higher and lower Peaks and mean flow in the future groups.

Nunoo et al. (2014) performed statistical analysis, on the cross-sectional data collected, to identify the factors influencing the fertilizer use among cocoa farmers in the Sefwi Wiawso district in the Western Region, Ghana. Authors collected data from 200 cocoa farmers, descriptive statistics and ordinary least square regression analysis were utilized to perform the analysis. Several interesting observations were made and some recommendations were provided. Authors identified through descriptive analysis of the socio economic characteristic of respondents that most of the cocoa farmers in Sefwi Wiawso are old and as such there is an urgent need to encourage youth into cocoa production. Authors revealed that 74.5 percent farmers do not use fertilizer and farm size and price of fertilizer were significant factors affecting fertilizer use among cocoa farmers. Authors made recommendations to the policy makers such as to promote the use of fertilizers and complement the price risk; promote the adult literacy programs to adapt the technology and provide access to credit market for the farmers.

Radhouane et al. (2014) investigated, under laboratory condition, the allelopathic effect of mixed crops, which interacted positively or negatively when cultivated together in the same field. Authors considered two plant species for the study and the effect of their aqueous extract on germination and growth of each other (pepper and pearl millet). The results indicated that aqueous extracts from shoots and roots significantly inhibited germination and seedling growth and the inhibitory effects were increased proportionally with the extract concentration. The shoot and root aqueous extract also exhibited intraspecific and interspecific allelopathy. Authors observed that roots were more toxic than shoots. Authors

claim that for root extract, the highest inhibition percentage was gained from the effect of pearl millet on pepper (40%) and highest autotoxicity from pearl millet (36%). Authors also claim that the effect of shoot extract on germination indicated that the highest reduction (55%) was obtained from pepper shoot extract on pearl millet and highest autotoxicity was observed from pepper which reached (45%). It is also observed that in most cases autotoxicity appeared to be more severe than teletotoxicity, on seed germination of the two intercropped plant species. Authors recommended that further studies are required to see the two plant species allelopathic behavior under field condition against others species and to identify the toxic principle, their quantification and their efficacy in the soil.

Patel et al. (2014) conducted experiments to determine the deleterious and differential effects of fluoranthene on the photosynthetic pigments, metabolic and enzymatic activities of microalgae. The photosynthetic pigments, biochemical and enzymatic activities in two freshwater microalgal species, *Chlorella vulgaris* and *Desmodesmus subspicatus* at different fluoranthene concentrations were compared with the control conditions. Authors claim that during the 16-days of incubation period when treated with fluoranthene, both microalgal species exhibited variable amount of photosynthetic pigment, biochemical compounds and enzymatic activities. Results indicated that the addition of fluoranthene at concentrations ranged from 1.5 mg/l to 10 mg/l to microalgal cultures led to changes in all different metabolites but the patterns varied from species to species. Authors observed that among the two species tested, pigment, biochemical and enzymatic contents were remarkably declined from 7 % to 95% in *C. vulgaris*. Moreover, all metabolites in *D. subspicatus* also diminishing significantly by 3% to 88% of fluoranthene doses (10ppm). The studies revealed that the *Desmodesmus subspicatus* was the most susceptible organism to fluoranthene studied. Authors claim that the order of PAH tolerance of each organism towards the Fluoranthene can be attributed to *D. subspicatus* being more tolerant than *C. vulgaris*. The authors also conclude that pigments, metabolites and enzymes are positively correlated with each other but not with phenolic content of both the microalgae.

Michael (2014) conducted two bioassay experiments using wheat plants (*Triticum sp.*) to investigate the potential causes of a significant environmental problem experienced in a farmland. The objective is to study the disturbance of acid sulfate soils which contain high amounts of sulfuric acid or have the potential to form it, resulting in pollution of the environment due to mobilization of toxic metals into soil and water systems. Two plant species (*Triglochin* and *Samphire*) from different locations were considered for the study. Author through data from the controlled experiments demonstrated that the availability of excessive amounts of Fe in the rhizosphere and formation of Fe-complex plagues, either acted as barriers to nutrient uptake or enhanced uptake of potentially toxic metals in excessive amounts; coupled with the presence of toxic levels of Al killed the vegetation on the farmland.

Augustine, et al. (2014) conducted a preliminary investigation exploring the nutrient dynamics of selected tropical aquatic systems in order to correlate the arrival of migratory birds at those locations. Authors collected water samples from coastal region of Aleppey, Purakkad and Koonthankulam Bird Sancturay. The latter two sites are the important destination of many migratory water birds including Pallus Gull, Heuglins Gull, Bar-headed goose, Comb Duck and Spot Billed Pelican. Chemical analysis performed on the samples to trace the nutrient compositions and the related chemical parameters such as temperature, pH, conductivity, primary productivity, chloride, salinity, turbidity, nitrate, phosphate, dissolved oxygen and biochemical oxygen demand. Remarkable differences are observed mainly in the composition of phosphate, organic matter content and salinity. Finally, authors attempted to correlate the biodiversity of these locations with the chemical parameters and the prevailing nutrient compositions.

Durai, Kalavathy et al. (2014) conducted an investigation to map the wetlands, with a size smaller than 50 hectares, in the Tiruchirappalli district, situated in the state of Tamil Nadu, India. Potential wetlands are identified through geo-spatial technology (GIS & RS). Authors utilized remote sensing data to demarcate the wetland from 1973. Authors identified a total of 2399 wetlands of various size categories.

Pradhan (2014) in this paper further investigated the three new records viz. *Jungermannia exertifolia* Steph., *J. infusca* (Mitt.) Steph. and *J. pumila* With., which were recorded in the year 2010 and 2011 at different elevations (150 to 1300 m) in Chitwan district of central Nepal. Author reports that these species were observed mostly in the mesic habitats of Sal (*Shorea robusta*) forest with other tree species like *Dalbergia sisoo* and *Acacia catechue*. Author also indicated that *Jungermannia pumila* was recorded in broad leaved deciduous forest at 1275 m of elevation.

Kamble (2014) presented a case study reporting how the water was utilized at a mountainous area in a sustainable way. Author carried out an investigation in to the water management practices adopted by Jardhar villagers in Chamba block of Utrkhand. Author reports the overall process flowchart as follows: collection of rain water during rainy season in the mountainous tanks on top of mountains; percolation of the collected water through mountains and formation of number of small streams; collection of water in a small metal tank at the end of stream in the mountain; diversion of the water using a steel pipe and collection of water into a cement tank at an elevated location at the entrance of the village. Author reports that from this elevated water reservoir water was distributed at various locations in the village through public stand posts. Author also claims that such practices paved the way for availability of water throughout the year and thus can sustain the population in such a topographic region.

Gupta (2014) conducted a study to evaluate capability of aquatic macrophyte *Eichhornia crassipes* plants to combat oxidative stress caused by tannery effluent treatment. For this purpose, author collected tannery effluent from “Up flow Anaerobic Sludge Blanket” Jajmau, Kanpur and plants of *Eichhornia crassipes* were exposed to various concentrations of tannery effluent for 2 and 7 days durations. Author found that plants accumulated significant amount of Cr in a concentration duration dependent manner. Author attributes the increased levels of MDA content to the induced oxidative stress of Tannery effluent. Author claims that to combat oxidative stress, plants showed alleviated level of antioxidants as its defense mechanism. Also reported that among enzymatic antioxidants, superoxide dismutase, catalase and peroxidase activity increased over to control up to 2 days of treatment however on exposure of long duration i.e. 7 days these antioxidants declined in correspond to various treatments. Author also claims that similar non enzymatic antioxidants which scavenged free radicals efficiently also show elevation at all concentrations up to 2 days exposure over unstressed plants, thereafter responded in decreasing manner due to ill effects of treatments. Author concludes that, *E. crassipes* can be utilized as a biomonitoring as well as phytoremedial tool using aforesaid biomarkers for pollution caused by tannery effluent.

Soni et al. (2014) comprehensively discussed the results from a study conducted to represent the zooplankton composition of Sacred Palustrine Habitat (SPH), Anand District, Central Gujarat, India. Authors collected zooplanktons from three permanent sampling stations at fortnight intervals over one year period covering three consecutive seasons from June 2012 to May 2013. Authors report that the zooplankton population was represented by a total of 29 genera and 31 species bestowed by 12 species of Ciliophora, followed by Rhizopoda (6), Zooflagellata (5), Rotifera (4), Cladocera (2), Copepoda and Ostracoda (1) each. Authors also report that of the total 31 species of zooplanktons, nine species were abundant, 11 were common, and 12 were rare. Authors extensively discussed the population profile of zooplanktons in waters of SPH with suggested conservation and management strategies.

Chaudhary et al. (2014) conducted a study in the Katerniaghat Wildlife Sanctuary (KWS) area to assess tree diversity, their phenology and economic values as the trees are the major constituent of any forest and more fascinating among all plant groups. Authors report that the sanctuary consists of tropical moist deciduous type of vegetation and situated along the Indo-Nepal boarder in Bahraich district of Uttar Pradesh, India. After, thorough assessment of the area, authors identified, a list of 141 tree species belonging to 101 genera and 38 families have been prepared. Authors report that the family Fabaceae exhibits highest generic and species diversity with 14 genera and 23 species and also the genus *Ficus* of Moraceae has been found the largest with 11 species. Authors also report that maximum trees with about 51 species have been found to flower in post winter season (February to March) in the forest; about 62 trees are used as medicinal for various purposes, 50 as ornamental & avenue trees, 37 as timber wood, 36 as edible, 16 as fire wood and 12 as fodder. Since the sanctuary area

has been surrounded by several villages and facing anthropogenic pressure, authors recommend that the public awareness program related with biodiversity conservation and sustainable uses is highly needed to protect the forest covers.

Kamble (2014) reported the eccentric observations made while estimating the total hardness of groundwater sample from Lohara village using EDTA complexometric titration. Author reported that the metal-EBT complex which imparts wine red colour could not be formed and instead of it blue colour was formed. This observation was observed at repeated titration and for all three sampling seasons. Author postulates that first time that such an observation was reported in the scientific literature. Author has also obtained the CaCO<sub>3</sub> for all the seasons and reported it as 84 ppm and concluded the presence of some unusually chemicals/substances in the water from Lohara village which interferes with the divalent metal ions and does not allow it to react with EBT to form a wine red colour.

Harun-ur-Rashid et al. (2014) aimed a study at inventorying of threatened plant species of Bangladesh to determine their status of occurrence for emphasizing the setting-up of national conservation strategies and sustainable management. Authors built complete inventory of two families, the Apocynaceae and Vitaceae, and recognized 28 threatened species facing environmental threats, and need sustainable conservation management. The study was based on long-term field investigation, survey of relevant floristic literature and examination of herbarium specimens. Authors prepared an enumeration of threatened taxa is prepared with updated field data on conservation status to include into Red Data Book of Bangladesh.

Soni et al. (2014) focused on evaluating the surface water quality index of tropical sacred wetland viz. Dakor Pilgrimage Wetland, Central Gujarat, India. Authors investigated various water quality parameters to draw-out the water quality index for an assessment of a tropical aquatic body. Authors on monthly basis, characterized the pH, Dissolved Oxygen, Total Suspended Solids, Total Dissolved Solids, Total alkalinity, Total Hardness, Calcium Hardness, Magnesium Hardness, Chloride, Sulphate, Phosphate, Sodium, and Potassium, were analyzed to compute water quality index. The results indicated that WQI at site 1 was maximum (161.74), followed by D2 (159.96), and minimum at site 3 (D3) (157.19). Authors conclude based on the quality index, that quality of the water is completely unfit for human consumption unless and until strict and mandatory steps are taken to rejuvenate it. The suggestive measures to improve the overall health of an aquatic body is also discussed, by the authors, along with conservation measures and management strategies.

Kumar (2014) recorded an overall 545 species belonging to 90 families and 307 genera from the Papagini river basin, Andhra Pradesh. Author reports that the recorded species richness from river basin, was fully depends on extent of area, availability of micro habitats, and auspicious environment. Family dominance is also discussed and showed Poaceae with 62

species, followed Fabaceae - 41, Euphorbiaceae - 28, Acanthaceae - 23 and Asteraceae - 20 species. Author also discussed about the inspection of the ecosystem functions and predictions were made on future existence of river ecosystems based on present human interventions. Author concludes with postulating the possibilities of loss of native vegetation, which impede the river functions and destabilization of ecosystem.

The Rainfall and temperature regulates the agricultural yield in the Nepal and in this work Bhandari attempted to study the effect of rainfall on the growth of the cereals (2014). Author collected rainfall and yield of major cereals data from Department of Hydrology and Meteorology (DHM) and Ministry of Agriculture, Nepal (MOA) respectively for the period of 1974 to 2000 and performed analysis using Microsoft Excel software tool and SPSS version 19 to establish correlation between the rainfall and cereal yield. The analysis indicated that in 1986 and 1987 the rice, wheat and maize yield was considerably affected and the data is well correlated with the reduced rainfall. Several other similar observations were also made for other years and author finally recommended to study the meteorological and socioeconomic parameters besides rainfall to analyze the yield of cereals in Darchula.

Water harvesting techniques have been successfully embraced by prior generations as an important land management practice for increase water availability for agricultural purposes. These techniques were especially important for growing crops in arid or semi-arid regions. However, over time, these techniques have been losing traction in their use. Soil erosion is a critical problem that destroys production ability, and creates runoff leads to loss of organic matter and the entire content of soil. Hamdan, et al. (2014) describe a mathematical model to determine the effects of water harvesting on soil erosion. The mathematical model that they used was the Universal Soil Loss Equation or USLE. The authors use the USLE to determine the effectiveness of semi-circular bunds of different diameters to reduce soil erosion. Testing was carried out on three differing slopes. Their models show was that the amount of soil erosion increased with increasing slope, and that the water harvesting bunds reduced erosion significantly—up to 65% in the case of the 8% sloped bund. This work reinforces the need for a renewed focus on the use of water harvesting and its benefits in preventing soil erosion.

Gupta (2014) describes a study for biomonitoring the toxicity of lead in the water hyacinth (*Eichhornia Crassipes*) plants. Lead pollution is a critical problem facing various regions of the world today. There is an increased interest in the use of aquatic plants as indicators of pollution levels in industrial waters. Gupta's experiments show the phytotoxic effects of lead on *E. Crassipes* plants. Testing was conducted using a growth chamber, and chlorophyll content was measured in the study at different concentrations of lead. The results showed that the chlorophyll content decreased with increase in concentration and duration of lead treatment. It is presumed that this decrease may either be due to inhibition of chlorophyll

synthesis or its destruction or replacement of Mg ions. The results show the the *E. Crassipes* species can be used as an effective biomonitoring tool in industrial waters.

In India alone, over two hundred million people do not have access to safe drinking water. In many cases, water is usually drawn from aquifers through wells, and has traditionally been considered safe for use. Vishnu, et al. (2014) describe how the dynamic balance of an aquatic system can be seriously affected by human activities. They analyze the water quality from a rural area of the state of Kerala in India for different physiochemical properties, and evaluate them against existing water quality parameters and standards. Ten different locations were sampled in this study. Their testing uncovered two exceptional cases with high amounts of dissolved oxygen, turbidity and total coliforms. Efforts for undertaking treatment methods were suggested as a result of this study.

The next paper focuses on a similar theme, in a different region of India. Sreenivasulu, et al. (2014) examine the physico-chemical characteristics of water from the Nellore Tank, which is located in the state of Andhra Pradesh in India. The Nellore tank is an important tourist attraction, and the authors analyzed the water during the pre-monsoon, monsoon and post-monsoon periods of the year. A range of parameters were evaluated against the Bureau of Indian Standards specifications for potable water. The findings showed that in some seasons the pH, Dissolved Oxygen, Biochemical Oxygen Demand and Turbidity increased beyond permissible limits, strongly indicating the effects of anthropogenic activities in the area, as well as the influx of nutrients through runoff from agricultural fields.

Switching focus, the next paper in the journal travels across the world to the country of Nigeria. Allamin, Ijah et al. (2014) describe the occurrence of hydrocarbon degrading bacteria in soil samples from the Kukawa region in Nigeria. Hydrocarbon pollution in soils is especially prevalent in oil producing regions, and the authors state that this influences the biodiversity, distribution and population of microorganisms in a soil environment. The Kukawa region has been identified as a petroleum production region, and oil exploration activities in the region have been underway. The soils samples were collected from five different sites of oil exploration, over an area of approximately five square kilometers. They were obtained at two different depths of 10 centimeters and 20 centimeters, at three different periods of time. Bacterial isolates were characterized and identified, and their hydrocarbon degrading abilities were tested using the turbidity method. The results showed that these bacteria were abundant and widely distributed, were mostly gram positive species, and were more concentrated on the surface layer. This study is an important step forward in indentifying specific bacterial species that could be used in oil spill bioremediation.

In the next paper, Kabir (2014) analyzes the breeding biology of the Eurasian Collared Dove (*Streptopelia Decaocto*). In his work, he observed two pairs, one pair a homozygous albino,

and the other a wild type and an albino. Four pairs of doves were produced from these two pairs, and out of the total six pairs, a total of 114 squabs were produced during the research period. It was seen that three albino pairs produced 100% albino squab and different coloured male and female produced different colours which were 50% each. The conclusions of this research suggested that the colour patterns produced first were the wild type, then the rosy type and finally albino.

With huge jumps in human population worldwide, and increased exploitation of natural resources to meet human demands, deforestation is a critical issue facing our times. The next paper by Pathak (2014) looks at a research study examining the Myrsine Capitellata dominated forest areas of the Paiyunpata village of Nepal. The Myrsine forest is regularly exploited for firewood, and faces the dire threat of extinction with the current trends. This study involved an extensive data collection exercise which included a vegetation survey, a social survey and plant species classification. The vegetation data was analyzed for density and frequency. The results underscored the importance of this tree species, and the authors suggest the steps that need to be taken to support conservation efforts.

Parallel to the efforts by Allamin et al in a prior paper, Ismailet al. (2014) investigate the biodegradation of spent engine oil (SEO) by bacteria isolated from the rhizosphere of *Cajanus Cajan* and *Lablab Purpureus*. The authors point out that illegal dumping of motor oil is a serious environmental hazard which radically alters soil biochemistry. Current physical and chemical technologies available to remediate contaminated soils can be expensive, and in some cases, only partly effective. Therefore bioremediation is an attractive option that needs to be pursued further. For this study, the two plant species were grown in the contaminated soil. Physicochemical analysis of the soil was carried out to determine soil pH, soil particle size, temperature, moisture and electrical conductivity. Bacterial isolates were identified based on their colonial, morphological and biochemical characteristics. These isolates were screened for ability to utilize the SEO, by determining the rate of degradation via gravimetric analysis. Chromatography-Mass spectroscopic analysis was also used to determine the extent of bacterial degradation. The results showed that the *Pseudomonas Putrefaciens* CR33 bacterial species was the potent SEO degrader, and when associated with the plants species, could efficiently cleanup contaminated environments.

Poultry waste, although highly biodegradable in nature, contains high amounts of nitrogen and phosphorus, and can be a source of environmental pollution if it is allowed to enter water bodies. The next paper by Sunkavalli, Rao et al. (2014) look at how it could be subject to biomethanation to produce valuable biogas and bio-manure as byproducts. Through their experiments, they characterize the litter, and tested them in batch digesters where they were diluted to different concentrations. Changes in pH and alkalinity were tracked over time.

Their work is an important step in creating sustainable solutions for the use of poultry litter in the light of a rapidly growing industry.

Umar et al. (2014) describe a study to determine the bacterial load of date fruits in Katsina metropolis region of Nigeria. The bacteriological analysis process involved growing the colonies using nutrient agar, and calculating the mean total aerobic and mean total coliform bacterial counts for the samples that were analyzed. The results indicated high bacterial counts, and the authors speculate that this maybe through washing, sorting and exposure to environmental contaminants. A need for more hygienic processing is suggested.

In a parallel effort, Umar et al. (2014) describe a study assessing the bacteriological quality of Kunun aya or Tigernut juice, a popular non-alcoholic drinks consumed within Umaru Musa Yar'adua University campus in Nigeria. Tigernut is a tuber that is widely grown in Nigeria, and its juice is prepared for public consumption. Total bacterial counts were assessed on samples collected from local sellers of the juice in the campus area. The results showed high counts of coliform bacteria, indicating contamination by human and animal waste during preparation of the drinks, and could pose severe health risks. The authors make several recommendations based on the findings of the study, to mitigate bacterial contamination of the drinks.

Shrestha (2014) explores morphological variations in maize inbred lines in the next paper. As the author describes, the characterization of morphological variability serves as a useful tool to identify desirable characteristics such as earliness, disease resistance, or improved ear trait. This study analyzed one hundred and five inbred lines during summer season of 2010. Data was recorded on plant traits such as days to 50% tasseling, days to 50% silking, anthesis silking interval, plant height, ear height, plant aspect, ear aspect, tassel length and tassel branches number, and a cluster analysis carried out. The results from this study showed that tassel branches number had the greatest variation, followed by plant aspect and ear aspect. This study will be an important step in the development of hybrids and synthetic varieties for maize.

Anup K.C. et al. (2014) address the important issue of the interrelationships between global warming and forest resource use in the next paper. Their paper describes a study conducted in the study in Gwangkhola Sapaude Babiyabhir Community Forest of Nepal. The goal of this study was to examine how the socio-economic conditions of forest users affect forest management, determine opportunity cost and willingness to pay; and the effect of carbon trading mechanism and discounting on the cost-benefit ratio. The study group was classified into three classes on the basis of wealth—rich, medium and poor. An economic valuation of the community forest was determined, and a survey was used to assess the household contribution to forest management and the willingness to pay for ecosystem services

provided by forest. The results showed that among the three economic classes, the poor were affected the most in terms of opportunity cost. The benefit associated with community forest was shown to be much higher than the cost involved in conservation and management. The benefit-cost ratio without using discounting was calculated to be 2.97, and the author's state that it can increase based on the rate per ton of CO<sub>2</sub>.

Umar et al. (2014) describe research conducted to evaluate the physico-chemical and bacteriological quality of Tomas dam, located in the Kano State of Nigeria. As part of this research, 240 water samples were collected from 5 sampling stations over a period of eight months, and analyzed for a range of physico-chemical parameters. The results revealed that dissolved oxygen, turbidity, nitrates and bacteria were present in relatively higher concentrations in the samples. In general, the high Coliform counts and presence of *Escherichia coli* was observed, indicating that the water may be contaminated with pathogenic bacteria and could pose a possible public health risk. The authors recommend suitable treatments such as filtration, chlorination, alum treatment, etc. to minimize contamination and make it fit for drinking.

Dahal (2014) also addresses the critical problem of water pollution in developing countries in the next paper. His study assesses the perception and behavior farmers towards the use of treated water in their farmlands, from the Dhulikhel Hospital wastewater treatment plant, located in the Dhulikhel municipality in Nepal. A total of 107 farmers were interviewed using a semi-structured questionnaire. All the respondents were seen to use the treated water to supplement their irrigation requirements; however, their perception regarding the reuse of water was seen to be unsatisfactory, as they believed it was detrimental to health and also believed that it decreased agricultural productivity. This study is an important step in gauging perceptions to water reuse, as the perceived problems were seen to outweigh perceived benefits.

Energy supply is probably the most critical issue facing the current and future generations. Biofuels have received increasing popularity in the light of oil prices, the need for energy security, and for tackling climate change. Elbadawi et al. (2014) describe a study where recycled edible oils from food production were used to produce biodiesel in order to help address fuel shortages and assist energy conservation efforts. The waste oils were collected and treated with either methanol, ethanol, sodium hydroxide or potassium hydroxide, or a combination of these to produce four different types of biodiesels. The optical characteristics of the produced biodiesels were analyzed and discussed. The results showed that the findings were showed the properties of the prepared biodiesel samples were similar to those of fossil diesel.

Switching tracks to an interesting topic, Bairagya (2014) describes environmental conditions in the Borra cave, which is located in the Andhra Pradesh state of India. The results of a direct field observation study from October 2013 are described. The geology of the cave is explained in detail, along with the physiography. He goes into detail on the biology of the cave environment, with a particular emphasis on the microorganisms present. This work will greatly help in conservation efforts for an important natural resource.

Rare earth elements have received increased attention in the past few years, due to their importance in modern technological applications. Afanasyeva et al. (2014) describe a study for the distribution of total content and mobile forms of Lanthanum (La) in the humic psammozem profile and in soil-root layer microzones of maize in Transbaikalia, Russia. Soil samples were taken from the rhizosphere, the soil-root surface and the soil in general. The root system of maize was released from the soil, and the roots were then separated from the shoots and dried. La was extracted sequentially by using bidistilled water and an ammonium acetate buffer, and then measured. The results showed that total amount of La decreases with the increase of the humic psammozem profile depth, and that mobile forms of La compounds in the root zone was higher than in the rest of the soil mass.

Soni et al. (2014) describe a detailed study on the associative dependence among plankton and macrophytes in a tropic lentic environ in the state of Gujarat in India. Planktons were collected from three pre-decided fixed sampling stations at monthly intervals over one year from June 2012 to May 2013. The plankton were characterized and ranked using the Palmer Index Score, and a Nygaard Index was generated as well. A correlation matrix was created to assess intra-dependence between plankton samples. From this study, the authors conclude that among plankton, members of the Chlorophycean taxa are more dependent on zooplankton. The authors hypothesize that this could be probably due to rich fatty acid composition harbored by Chlorophycean members. Pollution indicator species such as the Euglena, Navicula, Cyclops, etc. were found to dominate the hydric regime, suggesting the eutrophic state of the study area.

Ekwere et al. (2014) examine the effects of agricultural credit facilities on agricultural production and rural development in the next paper. The authors identify lack of capital as one of the critical constraints faced by small scale farmers. Their study analyzes data collected from structured questionnaires sent to 136 farmers, selected using random sampling techniques. All the farmers were located in the Etinan area of Nigeria. The survey lasted for a period of three years from 2010 to 2012. Using linear regression and production function analysis techniques, the authors tested different hypothesis exploring the relationships between credit and agricultural production. Their key finding was that agricultural credit enhances productivity and promotes higher standard of living among small scale farmers. The authors outline a series of recommendations based on their findings.

In the next paper, Kimambo et al. (2014) describe a study looking at the burgeoning area of waste to fuel. In many regions of the developing world, proper management of waste represents a significant and continued challenge. The authors describe a study on the production of energy efficient Refuse Derived Fuel (RDF) from municipal solid waste rejects that was carried out between August 2012 and April 2013 in the city of Coimbatore in India. As part of this study, municipal solid wastes rejects were collected from waste dump yard of Coimbatore. The waste material was mixed with 20% sawdust, coir dust, water hyacinth and rice husk and ground. After grinding, cassava starch was used as a binder to produce RDF briquettes. The physical, chemical and thermal characteristics of the RDF were studied to assess their potential use as fuel. This data was compared to known fuel data from Energy Centre for the Netherlands. The results showed that with the exception of moisture, fixed carbon and hydrogen which showed no significant difference, other parameters had significant lower or higher differences. This work is an important step in the establishing a cradle to cradle approach to transition from waste to energy.

Salah Eldeen et al. (2014) examine the histopathological alterations in the small intestine of the Rabbit fish (*Siganus Rivulatus*) that has been infected by the Helminth parasite (*Sclerocollum* Sp). The fish were caught off the red sea coast in Sudan. A total of 237 fish were caught and analyzed for the purpose of this study. The results showed a prevalence of infection in 38% of fishes. A microscopic comparison was carried out on the intestines of healthy fish with the infected fish. The infected fish were seen to suffer direct damage by *Sclerocollum* sp that included destruction of villi, hemorrhage, erosion of submucosa along parasites capsule and separation of submucosa from mucosa, among other observations.

Bhadkariya et al. (2014) also examine the area of bioremediation, focusing on the removal of Cadmium (Cd), a toxic material, from the soil. As the authors state, Cd is a heavy metal, and is considered a serious soil and environment pollutant due to its potential toxicity at low concentrations. It is difficult to remove heavy metals from polluted soils, because they are non-degradable and generally strongly retained in the soil. Phytoextraction is an emerging technology with low implementation costs and environmental benefits that aims to extract metals in soils. This study explores the use of the *Brassica Juncea* plant as a potential phytoextraction species for the remediation of Cd from contaminated soils. For the experimental setup, *B. Juncea* seeds were germinated on filter paper in petri dishes, then transferred into a pot with untreated soil (serving as control) and treated soil to which Cd as Cadmium Nitrate was applied with different concentrations. The plants were harvested after 60 days, and analyzed for Cd uptake, and the phytoextraction coefficient and transport factor were determined. The results showed that *Brassica Juncea* is an effective plant for phytoextraction of Cd from contaminated soils.

In the next paper, Prasad et al. (2014) study the effect of Naphthalene Acetic Acid (NAA) along with chelated Zinc and Iron on the availability of micronutrients in the Mentha Piperrita cultivar Kukrail during the winter season. The NAA with chelated zinc was applied in the first year of the trial and NAA with chelated iron in the second year of the trial. The treatments were replicated thrice in both the years. The micronutrients (Mn, Zn, Fe and Cu) in the menthe plants were determined using an atomic spectrometer, and the results tabulated and analyzed. The authors conclude that the treatments played an important role in increasing micronutrients in the plants.

Annang et al. (2014) outline studies on the composition and abundance of the phytoplankton in River Densu and two of its tributaries, Rivers Adeiso and Nsikir, located in Nigeria. The methodology involved collecting samples from ten different locations every month from January to December 2006. Phytoplankton density was measured in each of the samples. The results showed that Chlorophyta (green algae) dominated the flora, with 23 genera identified. As the study focused only on population density of the phytoplankton, the authors state that seasonal occurrence is not determined by a single factor, and further work is required to evaluate the effects of each environmental factor separately.

Pesticides cause pollution in the environment through run-off, and also negatively affect the soil quality. In the next paper, Abdelgadir et al. (2014) describe an experiment carried out to determine the toxicity of high uses of pendimethalin. Pendimethalin is an herbicide used to control annual grasses and certain broadleaf weeds, and has been designated as a systemic toxicant by the U.S. EPA. In Sudan, pendimethalin is used widely in the Kenana sugar industry. The experiment studied 28 rats that were divided into 4 equal groups. Group one served as control, group two was treated drained water from the sugar industry which is polluted by pendimethalin used as a herbicide, groups three and four were treated with pendimethalin at rate of 375 and 750 mg/kg body weight, respectively. Serobiochemical analysis was carried out, and the livers were analyzed as well. The results showed that serum ALP level proportionally increased with increasing the dose of pendimethalin. In addition, histopathological changes were clearly observed as well.

In the next paper, Alam (2014) describes a study dealing with the morphotaxonomy of three extremely infrequent terricolous taxa of order Jungermanniales: *Gottschelia schizopleura* (Spruce) Grolle, *Lethocolea javanica* (Schiffn.) Grolle and *Jackiella javanica* var. *cordifolia* Schiffn, occurring in the Nilgiri hills of Southern India. The author notes that Jungermanniales is the largest order in Hepaticae and comprises 82-85% of the total hepatic vegetation on earth. The study was carried out from January 2001 to June 2009. Several collections and field observations were made during this period. The results show an infrequent occurrence of these three taxa. The author states that habitat destruction through

expanding human population is the main threat to their diversity, and that serious efforts are required to save this valuable gene pool for future.

Daneshi et al. (2014) describe a study to evaluate head loss, sediment value and copper removal in sand media, in the next paper. Man made copper can be an important source of pollution, due to its ubiquitous nature. Copper pollution in soil is toxic to some micro-organisms, and toxic effects on fish and other aquatic organisms have also been observed as well. The authors studied the capabilities of rapid sand filters, a low cost approach for water and wastewater treatment. They carried out an analysis using a combination of Carman-Kozeny, Rose and Gregory models in different discharges of rapid sand filters. The results showed that if high concentrations of copper exist, a series of rapid sand filters must be used. The authors state that this method has a relatively establishing and reclamation compared to other methods, and it is recommended for copper removal from water and wastewater. They also state that the results can be used to create better rapid sand filter designs.

Tree barks have long been pursued for their medicinal properties. However, this has led to large scale debarking of trees, posing a danger on the growth and survival of young trees. Fasola et al. (2014) carry out a study to help address this problem. This study involved examining the correlations between bark thickness and Diameter at Breast Height (DBH) with their various uses. Measurements of bark thickness at breast height and DBH of 69 medicinal tree species belonging to nineteen different families were carried out in various locations in the University of Ibadan campus in Nigeria. The results showed positive correlations between the thickness of tree barks and tree girth at breast height. The authors state that this knowledge would be critical in determining if the barks sold in major markets for medicinal purposes are harvested from older or younger trees.

Air pollution is a critical problem facing both developed and developing countries around the world. The atmospheric mixing layer, which is the air layer adjacent to the ground, is one of the most important micrometeorological parameters, and has a direct influence on dilution of air pollutants. In the next paper, Kamble (2014) describes a study in which mixing height observations were recorded in Nagothane village in Western India by using the minisonde technique. These measurements were carried out in the winter season from December 2003-February 2004. The minisonde system employs a small light weight sonde, which can be used for measurement of vertical temperature profiles up to 4 km height in the atmosphere by attaching it as payload to a 15 cm balloon filled with hydrogen gas. The author graphs the results of the temperature measurements with height, at different times, and provides an analysis for the results. It is seen from this study that the daytime mixing height from the study area was recorded as 903 m above ground level. This indicated that a sufficient volume of air was available for dilution, dispersion and transportation of air pollutants into the lower atmosphere.

Paudel et al. (2014) explore the promise of genetic engineering tools in combination with organisms to produce precursors for the production of biofuels in the next paper. They describe numerous efforts, specially focusing on the genetic manipulation of lignin, which is a barrier for the breakdown of the carbohydrate polymers cellulose and hemicellulose, to smaller and fermentable subunits required for fuel production. They conclude that these genetic tools are a promising platform for the production of alternatives source of energy for example starch derived alcohols, alkanes, bio-hydrogen and biodiesel.

In the last paper, Rahman (2014) analyzes the problems and prospects of biodiversity and plant taxonomic researches conducted in Bangladesh over the last two decades. He chronicles the excellent efforts that have taken place over time including establishment of institutions, productions of books and other publications, among others. He notes that Bangladesh is currently experiencing serious crisis and difficulties in the development of taxonomic research in all groups of plants due to various factors ranging from a lack of trained and experienced taxonomists to a lack of interest and job facilities. He applauds the dedications and contributions of two pioneers, M. Salar Khan and A.K.M. Nurul Islam, who have been critical in the development of taxonomic research in the country.

Finally, Boolaky et al. (2014) wrap up a successful issue with stellar papers with a review of the first two volumes of the journal.

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