Government Women Polytechnic College, Bikaner
Model Answers
Subject-EVS (II year)
CD/TD-202

Q.1 Explain biotic and abiotic components of ecosystem along with its main principles.

Answer: The biotic and abiotic components of ecosystem are as follows:
The abiotic components of ecosystem refer to the physical environment and its several interacting variables which can be divided into four folds:

(i) Lithosphere which means the solid mineral matter on the earth and the land form.
(ii) Hydrosphere, i.e. the water in oceans, lakes, river, ice-caps, etc.
(iii) Atmosphere, the gaseous mixture in the air.
(iv) The radiant solar energy.

The energy interacts with rocks, water and gases to produce a complex environment with a large number of identifiable variables such as heat, light, rain, wind, snow, fog, dust, storm, fire.
The biotic factors are divided into two categories,

(i) Autotrophs
(ii) Heterotrophs.

The autotrophs can produce their own food. They are the green plants with chlorophyll and certain types of bacteria—chemosynthetic and photosynthetic. The heterotrophs depend directly or indirectly on the autotrophs for their food.
The main principles of ecology are

1. Liebig's law of minimum: This concept was originally applied to plant or crop growth, where it was found that increasing the amount of plentiful nutrients did not increase plant growth. Only by increasing the amount of the limiting nutrient was the growth of a plant or crop improved.
2. Shelford's law of tolerance: It states that an organism's success is based on a complex set of conditions and that each organism has a certain minimum, maximum, and optimum environmental factor or combination of factors that determine success.
3. Law of limiting factors: This was proposed by Blackman, according to him the rate of physiological or biological process depends upon the the avilability of limiting factor and unless the amount of limiting factor is not increased the rate of bilogical process wil not increase.

Q.2 Write comments on the following

(i) Bio-diversity

(ii)Wind energy

(iii)Gobar Gas Plant

Answer:-

(i) Biodiversity is defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems." Biodiversity includes all ecosystems unmanaged such as wild lands, nature preserves, or national parks or managed systems—be they plantations, farms, croplands, aquaculture sites, rangelands, or even urban parks and urban ecosystems—have their own biodiversity. Biodiversity is essential for ecosystem services and hence for human well-being. Recycling and storage of nutrients, combating pollution, and stabilizing climate, protecting water resources, forming and protecting soil and maintaining eco-balance. Provision of medicines and pharmaceuticals, food for the human population and animals, ornamental plants, wood products, breeding stock and diversity of species, ecosystems and genes. Recreation and tourism, cultural value and education and research.

(ii) Wind Energy is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. This wind flow, or motion energy, when "harvested" is used to generate electricity. Thus, the terms "wind energy" or "wind power" describe the process by which the wind is used to generate mechanical power or electricity to power homes, businesses, schools, and the like. It is a Renewable Non-Polluting Resource Wind energy is also a source of clean, non-polluting, electricity and wind energy costs are much more competitive with other generating technologies because there is no fuel to purchase and minimal operating expenses and no environmental issues.

(iii) Gobar gas plant is a clean unpolluted and cheap source of energy in rural areas. It consists of 55-70% methane which is inflammable. Bio gas is produced from cattle dung in a bio gas plant commonly known as gobar gas plant through a process called digestion. This plant provides fuel for cooking purposes and organic manure to rural households through family type Bio Gas Plants and mitigate drudgery of rural women, reduce pressure on forests and accentuate social benefits and also improve sanitation in villages by linking sanitary toilets with bio gas plants

Components required for Bio gas plant

(i) Mixing tank and inlet
(ii) Digester
(iii) Gas holder or gas storage dome
(iv) Outlet and compost pits and
(v) Gas main outlet and valve, pipeline, water fittings, gas stoves, large cattle population in the countryside ensuring steady source of supply of the raw material required for running the gas plant.

Advantages of Gobar gas Plant

(a) Helps in reducing the deforestation as it arrests for cutting of trees for firewood.
(b) Helps in maintaining ecological balance.
(c) Helps in rural sanitation
(d) Lower capital cost and almost cost free maintenance.
(e) Removes drudgery of women

Q.3 Explain the rural environmental issues and their remedial measures

Answer: The following are qualitative descriptions of the most pressing environmental concerns facing most rural areas.

(i)Domestic Waste*:* The most widespread environmental problem is the safe disposal of liquid domestic wastes, particularly human wastes and urban sewage. There is serious water pollution both of fresh water supplies like wells, springs, rivers, groundwater and even rainwater catchments and of coastal waters. This pollution presents grave risks to human health and can be avoided by proper sanitation facilities and general awareness among rural population.

(ii)Forest cover: Forests are logged for local use or export; shifting cultivation and clearing for agriculture are constant pressures on the forest resource; and frequent uncontrolled fires. This not only represents the loss of a significant productive resource, but contributes to many subsidiary problems such as water shortages, soil erosion, and loss of habitat for endangered species. This issues can be resolved by strict laws and social and legal monitoring by all concerned people.

(iii)Human Habitat and Infrastructure: There are also problems of the human habitat in most rural areas, particularly involving housing and sanitation. This affects the general living quality of people and can be improved by proper by infra structure in rural areas.

(iv)Soil Loss: The soil resource, essential for agriculture, is the fundamental basis of rural prosperity. Places where soils were poor to begin with, or with irregular topography, geological instability, heavy rainfall or large areas of cleared land, all face increased susceptibility to erosion. Adequate plantation in rural areas can solved this issue.

(v)Water Shortage: Since most rural areas have little water storage capacity, dry periods can result in serious water shortages which hamper development, and can create serious public health problems. Canal system and revival of old water bodies can improve water availability in villages.

(vi)Solid Waste Disposal: There is a growing problem with solid waste disposal in rural areas. Collection and disposal of wastes are expensive on a small scale, so that wastes are either not collected, or the disposal sites are improperly managed, with resulting health and pollution problems. General awareness for cleanliness and management by the Municipal Corporation and local bodies can solve this issue.

Q.4 Describe the various water harvesting techniques

Answer: The various techniques are for water harvesting

Ground water recharge in rural areas

(i)Gully plug: Gully plugs are built using local stones, clay and bushes across small gullies and streams running down the hill slopes carrying drainage to tiny catchments during rainy season. Gully Plugs help in conservation of soil and moisture

(ii)Contour bund: These are suitable in low rain fall areas where monsoon run off can be impounded by constructing bunds on the sloping ground all along the contour of equal elevation. Flowing water is intercepted before it attains the erosive velocity by keeping suitable spacing between bunds.

(iii)Gabion structure: This is a kind of check dam commonly constructed across small streams to conserve stream flows with practically no submergence beyond stream course.A small bund across the stream is made by putting locally available boulders in a mesh of steel wires and anchored to the stream banks.

(iv)Percolation tank: Percolation tank is an artificially created surface water body, submerging in its reservoir a highly permeable land, so that surface runoff is made to percolate and recharge the ground water storage.Percolation tank should be constructed preferably on second to third order steams, located on highly fractured and weathered rocks, which have lateral continuity down stream.

(v)Check dams / cement plugs / nala bunds: Check dams are constructed across small streams having gentle slope. The site selected should have sufficient thickness of permeable bed or weathered formation to facilitate recharge of stored water within short span of time.The water stored in these structures is mostly confined to stream course and the height is normally less than 2 m and excess water is allowed to flow over the wall. In order to avoid scouring from excess run off, water cushions are provided at downstream side.

(vi)Recharge shaft: This is the most efficient and cost effective technique to recharge unconfined aquifer overlain by poorly permeable strata. Recharge shaft may be dug

manually if the strata are of non-caving nature. The diameter of shaft is normally more than 2 m. The shaft should end in more permeable strata below the top impermeable strata.

(vii)Dugwell recharge: Existing and abandoned dug wells may be utilized as recharge structure after cleaning and desilting the same. The recharge water is guided through a pipe from desilting chamber to the bottom of well or below the water level to avoid scouring of bottom and entrapment of air bubbles in the aquifer.

(viii) Ground water dams or sub-surface dykes: Sub surface dyke or under-ground dam is a subsurface barrier across stream which retards the base flow and stores water upstream below ground surface. By doing so, the water levels in upstream part of ground water dam rises saturating otherwise dry part of aquifer.

Ground water recharge in urban areas:

(i)Recharge pit: In alluvial areas where permeable rocks are exposed on the land surface or are located at very shallow depth, rain water harvesting can be done through recharge pits.The technique is suitable for buildings having a roof area of 100 sq.m. These are constructed for recharging the shallow aquifers.

(ii)Recharge trench: Recharge trenches are suitable for buildings having roof area of 200-300 sq. m. and where permeable strata is available at shallow depths.Trench may be 0.5 to 1 m wide, 1 to 1.5m. deep and 10 to 20 m. long depending upon availability of water to be recharge.

(iii)Tube wells: In areas where the shallow aquifers have dried up and existing tubewells are tapping deeper aquifer, rain water harvesting through existing tubewell can be adopted to recharge the deeper aquifers.

(iv)Trench with recharge well: In areas where the surface soil is impervious and large quantities of roof water or surface runoff is available within a very short period of heavy rainfall, the use of trench/ pits is made to store the water in a filter media and subsequently recharge to ground water through specially constructed recharge wells.This techniques is ideally suited for area where permeable horizon is within 3m below ground level.