SHEKHAWATI INST. OF ENG.& TECHNOLOGY COLLEGE
SIKAR , RAJASTHAN
1st MID TERM EXAMINATION 2017-18 (B.TECH 2nd year –AG)
Subject Code & Name: 4AG5 Soil and Water Conservation Engineering
MM: 20 Times: 1.5hrs

MODEL ANSWER PAPER

Q.1. Design the bench terrace.

Bench Terracing

The original bench terrace system consists of a series of flat shelf-like areas that convert a steep slope of 20 to 30 percent to a series of level, or nearly level benches (Fig. 5.2). In other words, bench terracing consists of construction of series of platforms along contours cut into hill slope in a step like formation. These platforms are separated at regular intervals by vertical drop or by steep sided and protected by vegetation and sometimes packed by stone retaining walls. In fact, bench terrace converts the long un-interrupted slope into several small strips and make protected platform available for farming. In several hilly areas bench terraces have been used for the purpose of converting hill slopes to suit agriculture. In some areas where the climatic conditions favour the growing of certain cash crops like potato, coffee etc., the hill slopes are to be bench terraced before the area is put for cultivation of these crops. Bench terraces have also been adopted for converting sloping lands into irrigated fields or for orchard plantations.

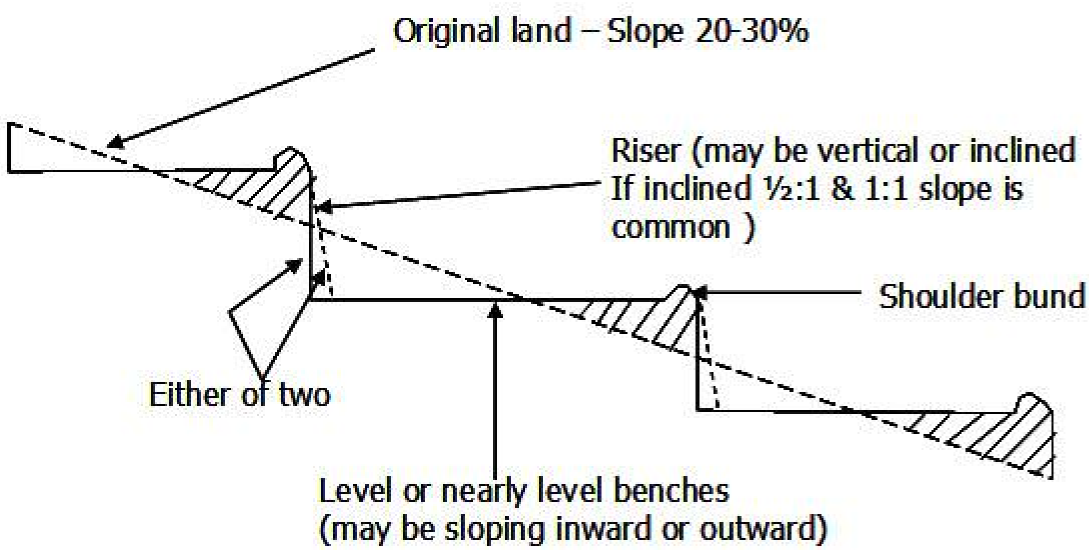


Fig. 5.2. Bench terrace and its different components.

5.3 Types of Bench Terraces

Depending on the purpose for which they are used, bench terraces are also classified as follows:

1. Hill-type bench terraces: used for hilly areas with a grade reversely towards the hill.

2. Irrigated bench terraces: level benches adopted under irrigated conditions.

3. Orchard bench terraces: narrow width terraces for individual trees. These are also referred to as intermittent terraces and step terraces.

The conversion of land into bench terraces over a period of time is referred to as gradual bench terracing. Bench terraces are classified depending upon the slope of benches. The different types are: (i) bench terraces sloping outward; (ii) bench terraces sloping inward and (iii) bench terraces with level top.

Bench terraces with slopes inside are to be adopted in heavy rainfall areas where a major portion of the rainfall is to be drained as surface runoff. In the case of these terraces, a suitable drain at the inward end of each of these terraces is to be provided to drain the runoff. These drains ultimately lead to a suitable outlet. These are also known as hill-type terraces. Bench terraces with level top are suitable for areas of medium rainfall, evenly distributed and having deep and highly permeable soils. Due to the fact that no slope is given to the benches it is expected that the most of the rainfall coming over the area is to be absorbed by the soil and very little water is to go as surface drainage. These types of terraces are also used where irrigation facilities are available and referred to as irrigated bench terraces. Bench terraces sloping outward are to be used in low rainfall areas with permeable soils. For bench terraces sloping outward a shoulder bund is essential even though such a bund is provided in the other two types also for giving stability to the edge of the terrace. In these terraces the rainfall thus conserved will have more time for soaking into the soil. Bench terraces with narrow width (about 1 m) are sometimes constructed for orchards bench terraces. These terraces are referred to as step terraces when a series of step like formations are made.

5.4 Design of Bench Terraces

For the designing of the bench terraces for a particular tract the average rainfall, the soil type, soil depth and the average slope of the area should be known. In addition the purpose for which the terraces are to be constructed should also be known. The design of bench terraces consists of determining the (1) type of the bench terrace, (2) terrace spacing or the depth of the cut, (3) terrace width, and (4) terrace cross section. Selection of the type of bench terrace among the three types, described earlier, depends upon the rainfall and soil conditions.

Terrace spacing is generally expressed as the vertical interval between two terraces. The vertical interval (D) is dependent upon the depth of the cut and since the cut and fill are to be balanced, it is equal to double the depth of cut. The factors that limit the depth of cut are the soil depth in the area and the slope. The depth of cut should not be too high as to expose the bed rock which makes the bench terraces unsuitable for cultivation. In higher slopes greater depth of cuts result in greater heights of embankments which may become unstable.

The width of the bench terraces (W) should be as per the requirement (purpose) for which the terraces are to be put after construction. Once the width of the terrace is decided, the depth of cut required can be calculated using the following formulae.

Case 1: When the terrace cuts are vertical

$$D = \frac{WS}{100} \tag{5.1}$$

S is the land slope in percent; D/2 is the depth of cut and W is the width of terrace.

Case 2: When the batter slope is 1:1

$$\frac{D/2}{W/2 + D/2} = \frac{S}{100}$$
$$D = \frac{WS}{(100 - S)} \tag{5.2}$$

Case 3: When the batter slope is ½: 1

$$\frac{D/2}{W/2 + D/4} = \frac{S}{100}$$
$$D = \frac{2WS}{(200 - S)} \tag{5.3}$$

After deciding the required width, the depth of cut can be calculated from one of the above formulae.

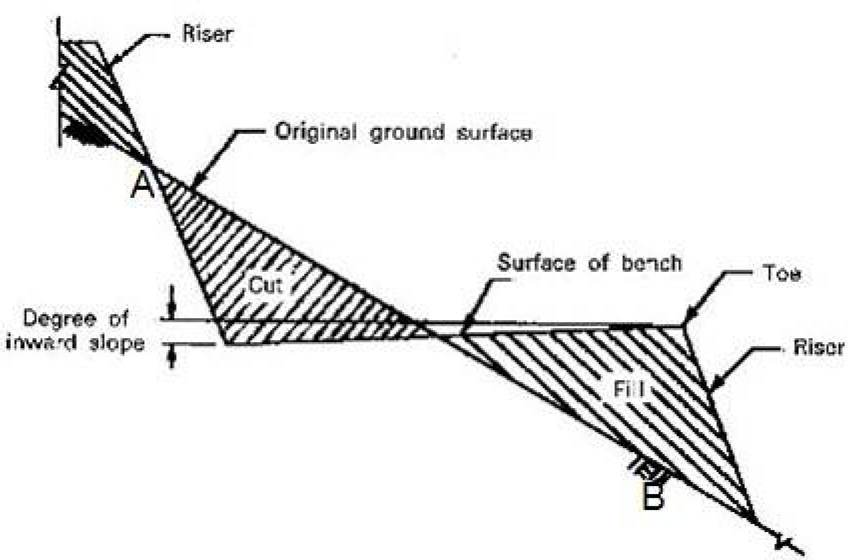


Fig: 5.3 Cross section of bench terraces.

The design of the terrace cross section consists of deciding (1) the batter slope, (2) dimensions of the shoulder bund, (3) inward slope of the terrace and the dimensions of the drainage channel in case of terraces sloping inward, and (4) outward slope in case of terraces sloping outward (Fig. 5.3). The batter slope is mainly for the stability of the fill or the embankment. The flatter the batter slope, the larger the area lost due to bench terracing. Vertical cuts are to be used in very stable soils and when the depth of the cut is small (up to 1 m). Batter slopes of ½: 1 can be used in loose and unstable soils. The size of the shoulder bunds in case of terraces sloping inward is nominal. In case of terraces with flat top and sloping outwards, larger sections of shoulder bunds are required as water stands against these bunds. The bund cross section depends upon the terrace width and soil conditions. The inward slope of the terrace may be from 1 in 50 to 1 in 10 depending upon the soil conditions. For these terraces a drainage channel is to be provided at the inner edge of the terrace to dispose of the runoff.

Q.2. Explain gully and their types in brief.

Gully Erosion

Gully erosion is an advance stage of rill erosion as rill erosion is the advanced stage of sheet erosion. It is the most spectacular form of erosion. Any concentration of surface runoff is a potential source of gully erosion. The Soil Conservation Society of America defines a gully as “a channel or miniature valley cut by concentrated runoff but through which water commonly flows only during and immediately after heavy rains. It may be dendritic or branching or it may be linear, rather long, narrow and of uniform width”. In India, the rate of soil erosion from gullies is 33 t/ha/yr in ravine regions (Shekinah and Saraswathy, 2005). The distinction between ravine, gully and rills is that of size. A gully is too large to be filled by normal tillage practices. A ravine is a deep narrow gorge. It is larger than a gully and is usually worn down by running water. It is estimated that about 4 million ha of land in India are affected by gully erosion (Michael and Ojha, 2012).

7.1 Development of Gullies

The main processes in the development of gullies are waterfall erosion and channel erosion. These two erosions are commonly found in the same gully. The extension of the gully head is usually by waterfall erosion; while the scouring of bottom and sides which enlarges the depth and width of gullies is by channel erosion. Gullies usually start with channel erosion. When an overfall develops at the head of the gully, the gully continues to develop by waterfall erosion. The waterfall erosion at gully head and advancement of the gully towards the upper edge of the watershed is shown in Fig. 7.1.

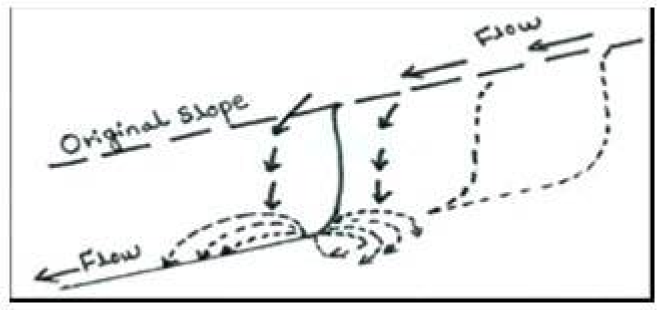


Fig. 7.1. Waterfall erosion at gully head.

The gully development is recognized in four stages:

Formation Stage: Scouring of top soil in the direction of general slope occurs as the runoff water concentrates. It normally proceeds slowly where the top soil is fairly resistant to erosion.

Development Stage: Causes upstream movement of the gully head and enlargement of the gully in width and depth. The gully cuts to the C-horizon of soil, and the parent materials are removed rapidly as water flows.

Healing Stage: Vegetation starts growing in the gully.

Stabilization Stage: Gully reaches a stable gradient, gully walls attain a stable slope and sufficient vegetation cover develops over the gully surface to anchor the soil and permit development of new topsoil.

7.2 Classification of Gullies

Gullies can be classified based on three factors viz. their size, shape (cross section) and formation of branches or continuation. The detailed classification is discussed below.

7.2.1 Based on Size (depth and drainage area)

Gully classification based on the size is presented in Table 7.1.

Table 7.1. Gully classification based on size

Classification	Depth (m)	Drainage area (ha)
Small	< 1	< 2
Medium	1 to 5	2 to 20
Large	> 5	> 20

7.2.2 Based on Shape

The classification of gullies based on shape is shown in Fig 7.2.

U-Shaped: These are formed where both the topsoil and subsoil have the same resistance against erosion. Because the subsoil is eroded as easily as the topsoil, nearly vertical walls are developed on each side of the gully.

V-Shaped: These gullies develop where the subsoil has more resistance than topsoil against erosion. This is the most common form of gully.

Trapezoidal: These gullies are formed where the gully bottom is made of more resistant material than the topsoil. Below the bottom of gully, the subsoil layer has much more resistance to get eroded and thus the development of further depth of gully is restricted.

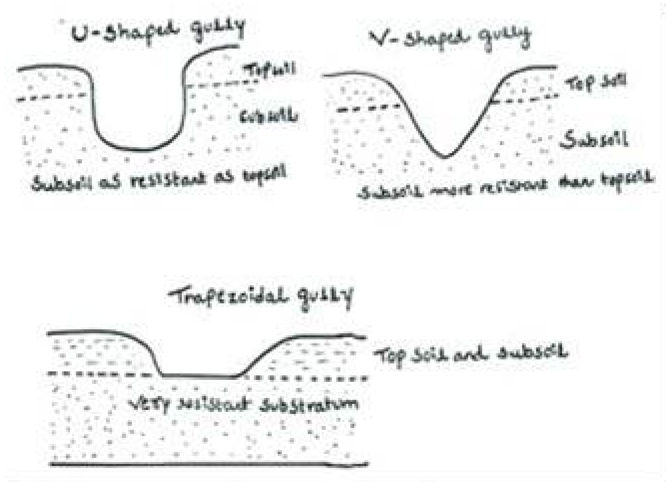


Fig. 7.2. Gully classes based on the shape of gully cross-section.

7.2.3 Based on the Formation of Branches or Continuation

Continuous Gullies: These gullies consist of many branches. A continuous gully has a main gully channel and many mature or immature branch gullies. A gully network is made up of many continuous gullies. A multiple-gully system may be composed of several gully networks.

Discontinuous Gullies: These may develop on hillsides after landslides. They are also called independent gullies. At the beginning of its development, a discontinuous gully does not have a distinct junction with the main gully or stream channel. Flowing water in a discontinuous gully spreads over a nearly flat area. After some time, it reaches the main gully channel or stream. Independent gullies may be scattered between the branches of a continuous gully, or they may occupy a whole area without there being any continuous gullies.

Q.3. Describe soil erosion : Causes, types

The uppermost weathered and disintegrated layer of the earth's crust is referred to as soil. The soil layer is composed of mineral and organic matter and is capable of sustaining plant life. The soil depth is less in some places and more at other places and may vary from practically nil to several metres. The soil layer is continuously exposed to the actions of atmosphere. Wind and water in motion are two main agencies which act on the soil layer and dislodge the soil particles and transport them. The loosening of the soil from its place and its transportation from one place to another is known as soil erosion.

The word erosion has been derived from the Latin word 'erodere' which means eating away or to excavate. The word erosion was first used in geology for describing the term hollow created by water. Erosion actually is a two phase process involving the detachment of individual soil particle from soil mass, transporting it from one place to another (by the action of any one of the agents of erosion, viz; water, wind, ice or gravity) and its deposition. When sufficient energy is not available to transport a particle, a third phase known as deposition occurs. In general, finer soil particles get eroded more easily than coarse particles (silt is more easily eroded than sand). Hence soil erosion is defined as a process of detachment, transportation and deposition of soil particles (sediment). It is evident that sediment is the end product of soil erosion process. Sediment is, therefore, defined as any fragmented material, which is transported or deposited by water, ice, air or any other natural agent. From this, it is inferred that sedimentation is also the process of detachment, transportation and deposition of eroded soil particles. Thus, the natural sequence of the sediment cycle is as follows:

Soil → detachment → Transportation →

Detachment is the dislodging of the soil particle from the soil mass by erosive agents. In case of water erosion, major erosive agents are impacting raindrops and runoff water flowing over the soil surface. Transportation is the entrainment and movement of detached soil particles (sediment) from their original location. Sediments move from the upland sources through the stream system and may eventually reach the ocean. Not all the sediment reaches the ocean; some are deposited at the base of the slopes, in reservoirs and flood plains along the way. Erosion is almost universally recognized as a serious threat to human well being. Erosion reduces the productivity of crop land by removing and washing away of plant nutrients and organic matter. Distribution of global sediment load is presented

Causes of Soil Erosion

No single unique cause can be held responsible for soil erosion or assumed as the main cause for this problem. There are many underlying factors responsible for this process, some induced by nature and others by human being. The main causes of soil erosion can be enumerated as:

(1) Destruction of Natural Protective Cover by

(i) indiscriminate cutting of trees,

(ii) overgrazing of the vegetative cover and

(iii) forest fires.

(2) Improper Use of the Land

(i) keeping the land barren subjecting it to the action of rain and wind,

(ii) growing of crops that accelerate soil erosion,

(iii) removal of organic matter and plant nutrients by injudicious cropping patterns,

(iv) cultivation along the land slope, and

(v) faulty methos of irrigation.

2.2 Types of Soil Erosion

2.2.1 According to Origin: Soil erosion can broadly be categorized into two types i.e. geologic erosion and accelerated erosion.

2.2.2 Geological Erosion: Under natural undisturbed conditions an equilibrium is established between the climate of a place and the vegetative cover that protects the soil layer. Vegetative covers like trees and forests retard the transportation of soil material and act as a check against excessive erosion. A certain amount of erosion, however, does take place even under the natural cover. This erosion, called geologic erosion, is a slow process and is compensated by the formation of soil under the natural weathering process. Its effect are not of much consequence so far as agricultural lands are concerned.

2.2.3 Accelerated Erosion: When land is put under cultivation, the natural balance existing between the soil, its vegetation cover and climate is disturbed. Under such condition, the removal of surface soil due to natural agencies takes places at faster rate than it can be built by the soil formation process. Erosion occurring under these condition is referred to as accelerated erosion. Its rates are higher than geological erosion. Accelerated erosion depletes soil fertility in agricultural land.

Q.4.Explain agents of soil erosion.

Agents of Soil Erosion

Soil erosion is the detachment of soil from its original location and transportation to a new location. Mainly water is responsible for this erosion although in many locations wind, glaciers are also the agents causing soil erosion. Water in the form of rain, flood and runoff badly affects the soil. Soil is in fact a composite of sand, silt and clay. When the rain falls along the mountains and bare soil, the water detaches the soil particles, and takes away the silt and clay particles along with the flowing water. Similarly, when wind blows in the form of storms, its speed becomes too high to lift off the entire soil upper layer and causes soil erosion.

Other factors responsible for soil erosion are human and animal activities. Vegetation is the natural cover of soil. When the animals continuously graze in the pastures, the vegetation is removed due to their walking and grazing. Bare lands left behind are easily affected by soil erosion. Activities of human like forest cutting, increased agriculture, and clearing of land for different purposes are the other agents that cause erosion of the soil. The soil erosion agent can be classified and summarized

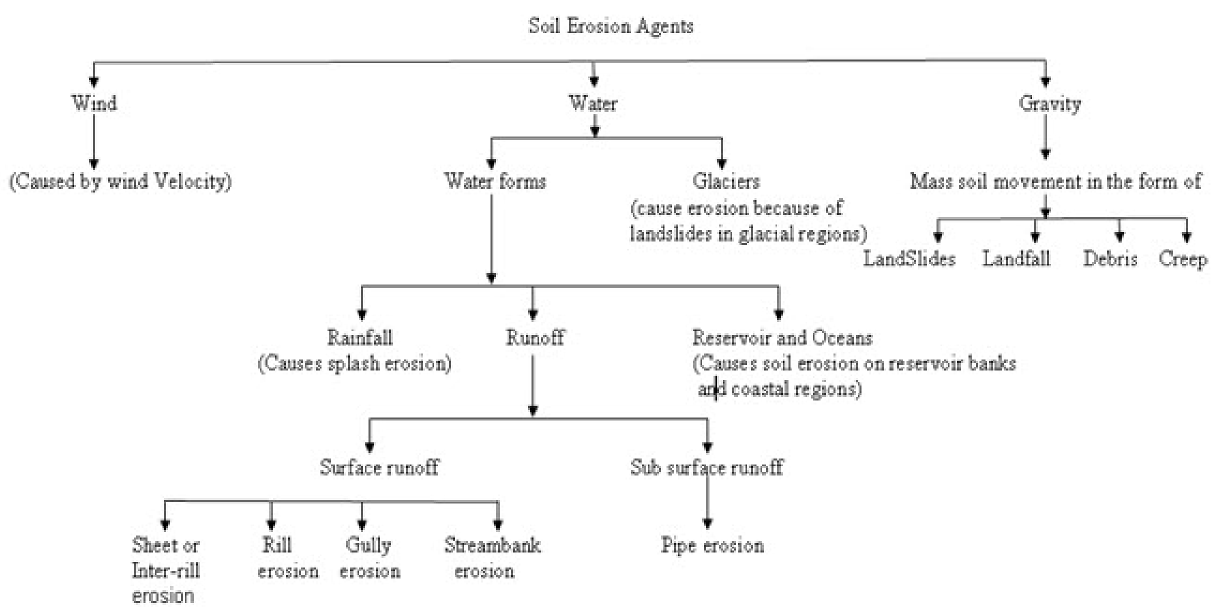
Soil erosion is broadly categorized into different types depending on the agent which triggers the erosion activity. Mentioned below are the four main types of soil erosion.

(1) Water Erosion: Water erosion is seen in many parts of the world. In fact, running water is the most common agent of soil erosion. This includes rivers which erode the river basin, rainwater which erodes various landforms, and the sea waves which erode the coastal areas. Water erodes and transports soil particles from higher altitude and deposits them in low lying areas. Water erosion may further be classified, based on different actions of water responsible for erosion, as : (i) raindrop erosion, (ii) sheet erosion, (iii) rill erosion, (iv) gully erosion, (v) stream bank erosion, and (vi) slip erosion.

(2) Wind Erosion: Wind erosion is most often witnessed in dry areas wherein strong winds brush against various landforms, cutting through them and loosening the soil particles, which are lifted and transported towards the direction in which the wind blows. The best example of wind erosion are sand dunes and mushroom rocks structures, typically found in deserts.

(3) Glacial Erosion: Glacial erosion, also referred to as ice erosion, is common in cold regions at high altitudes. When soil comes in contact with large moving glaciers, it sticks to the base of these glaciers. This is eventually transported with the glaciers, and as they start melting it is deposited in the course of the moving chunks of ice.

(4) Gravitational Erosion: Although gravitational erosion is not as common a phenomenon as water erosion, it can cause huge damage to natural, as well as man-made structures. It is basically the mass movement of soil due to gravitational force. The best examples of this are landslides and slumps. While landslides and slumps happen within seconds, phenomena such as soil creep take a longer period for occurrence



Q.5. what do you mean by Agronomical measures to control erosion.

Agronomical Measures for Water Erosion Control

4.2 Agronomical Measures of Water Erosion Control

Soil conservation is a preservation technique, in which deterioration of soil and its losses are eliminated or minimized by using it within its capabilities and applying conservation techniques for protection as well as improvement of soil. In soil and water conservation, the agronomical measure is a more economical, long lasting and effective technique. Agronomic conservation measures function by reducing the impact of raindrops through interception and thus reducing soil erosion. They also increase infiltration rates and thereby reduce surface runoff. Widely used agronomic measures for water erosion control are listed below.

4.2.1 Contour Cropping

Contour Cropping is a conservation farming method that is used on slopes to control soil losses due to water erosion. Contour cropping involves planting crops across the slope instead of up and down the slope (Fig. 4.1). Use of contour cropping protects the valuable top soil by reducing the velocity of runoff water and inducing more infiltration. On long and smooth slope, contour cropping is more effective as the velocity of flow is high under such situation and contour cropping shortens the slope length to reduce the flow velocity. Contour cropping is most effective on slopes between 2 and 10 percent.

Fig. 4.1. Contour cropping. (Source: www.studyblue.com)

4.2.2 Strip Cropping

Strip cropping is the practice of growing strip of crops having poor potential for erosion control, such as root crop (intertilled crops), cereals, etc., alternated with strips of crops having good potentials for erosion control, such as fodder crops, grasses, etc., which are close growing crops (Fig. 4.2). Strip cropping is a more intensive farming practice than contour farming. The farming practices that are included in this type of farming are contour strip farming, cover cropping, farming with conservation tillage and suitable crop rotation. A crop rotation with a combination of intertilled and close growing crops, farmed on contours, provides food, fodder and conserves soil moisture. Close growing crops act as barriers to flow and reduce the runoff velocity generated from the strips of intertilled crops, and eventually reduce soil erosion. Strip cropping is laid out by using the following three methods:

Fig. 4.2. Strip cropping. (Source: www.milford.nserl.purdue.edu)

i) **Contour strip cropping:** In contour strip cropping, alternate strips of crop are sown more or less following the contours, similar to contouring. Suitable rotation of crops and tillage operations are followed during the farming operations.

ii) **Field strip cropping:** In a field layout of strip cropping, strip of uniform width are laid out across the prevailing slope, while protecting the soil from erosion by water. To protect the soil from erosion by wind, strips are laid out across the prevailing direction of wind. Such practices are generally followed in areas where the topography is very irregular, and the contour lines are too curvy for strict contour farming.

iii) **Buffer strip cropping:** Buffer strip cropping is practiced where uniform strip of crops are required to be laid out for smooth operations of the farm machinery, while farming on a contour strip cropping layout. Buffer strip of legumes, grasses and similar other crops are laid out between the contour strips as correction strips. Buffer strips provide very good protection and effective control of soil erosion.

4.2.3 Mulching

Mulches are used to minimize rain splash, reduce evaporation, control weeds, reduce temperature of soil in hot climates, and moderate the temperature to a level conducive to microbial activity. Mulches help in breaking the energy of raindrops, prevent splash and dissipation of soil structure, obstruct the flow of runoff to reduce their velocity and prevent sheet and rill erosion (Fig. 4.3). They also help in improving the infiltration capacity by maintaining a conductive soil structure at the top surface of land.

Fig. 4.3. Mulching of cropped field. (Source: www.fao.org)

4.2.3.1 Types of mulching material: To protect the land from erosion different types of materials are used as listed below.

1. Cut grasses or foliage
2. Straw materials
3. Wood chips
4. Saw dusts
5. Papers
6. Stones
7. Glass wools
8. Metal foils
9. Cellophanes
10. Plastics

The mulches may be broadly classified into the following five types:

1. **Synthetic mulch:** It includes organic and inorganic liquids that are sprayed on the soil surface to form a thin film for controlling the various atmospheric agents acting on the soil surface. The different synthetic mulching materials are: resins, asphalt emulsions, latex and cut back asphalt, canvas etc.
2. **Petroleum mulch:** The petroleum mulches are easier to apply and also less expensive. These mulches are available in the form of emulsions of asphalt in water, which can be sprayed on the soil surface at ambient temperature to form a thin film in continuous form that clings to soil, but does not penetrate deep inside the soil. The mulch film promotes uniform and rapid seed germination and also plays a significant role for vigorous growth of seedling. An ideal surface film is also stable against erosion, sufficiently porous to allow water into the soil, yet insoluble in water and resistant enough to the forces of weather, causing it to last as long as necessary for vegetation to become established.
3. **Conventional mulch:** The mulches such as hay or straw are more effective than the petroleum mulches. These mulches not only conserve the moisture and reduce the fluctuation of soil temperature, but also protect the soil from rain drop impacts and

hold the excess surface water in contact with the soil, so as to increase the infiltration rate and thereby reduce the runoff and soil erosion. In addition, during day hours these mulches also absorb as much insolation as bare soil does, but little energy is conducted downward. This causes the surface of the mulch to become hot and the underlying soil to remain cool. On the other hand, during night hours, the mulch cools down permitting the soil to remain warm. The paper mulches also counted under conventional mulch are reported to produce remarkable results. Paper mulches are observed to increase the soil temperature, especially of the surface soil layers. There are several evidences to show that paper mulching gives better performance in improvement of soil condition, besides promoting the earthworm activity. But at the same time, caution has to be taken against the toxic elements of chemicals leached out of the paper. The bituminized treated papers have toxic effects on the plants.

4. **Stone mulch:** It involves the spreading of stone pieces on the ground surface to conserve the moisture and also to reduce the wind erosion. It is a very old practice, followed in arid zones. Soil under the stones tends to be in moist condition, but the temperature of that soil becomes slightly higher. The soils lying below the stones, harbor small animals and involve high nitrification. The stone mulching is also used for trapping the dew, particularly in those locations where significant dew fall takes place. Central arid zone research h institute Jodhpur, has reported the use of rubble mulch, which is simply combination of small fragments of stones and bricks. This mulch provides better results on moisture conservation compared to the stone mulching, synthetic mulching and mulching made by straw materials.
5. **Organic mulch:** The tree branches, twigs, leaves, leaf litter, grasses, weeds etc. are used as organic mulch to cover the soil surface. The organic mulches are found superior to the artificial mulches in respect of conservation of moisture, reduction in evaporation and runoff. Use of this mulch controls the evaporation more effectively, particularly when rainfall takes place at frequent intervals, but it is not very effective when the numbers of rains are few and scattered. In other words, organic mulch does not conserve the moisture available due to infrequent rains and small showers, but these mulches may be quite effective for large rains lasting for several days which results in a wet surface with the availability of excess surface water for deep percolation. Further, the light mulches are almost ineffective for controlling the evaporation, because moisture conserving efficiency of mulch is inversely related to their capacity to absorb water or to extract it from the soil by capillary action. Resistant mulches do not decay shortly but last for a long time. As a result they are more effective for conserving the soil moisture.

Q.6.write down about water erosion - forms of water erosion and Mechanics of erosion.

4.1 Mechanics of Water Erosion Control

The different geological actions generated by the flowing water over the land surface by which soil erosion take place may be described as below.

(a) Hydraulic Action: when water runs over the soil surface then it compresses the soil, as a result the air present in the voids exerts a pressure on the soil particles, which leads to the soil detachment. The pressure exerted by the air present in the voids is known as hydraulic pressure. The soil particles detached in this process from their places, are scoured by the running water. The hydraulic action is more effective, especially when soil is in loose condition.

(b) Abrasion: In this geologic action, the soil particles mixed the running water, create an abrasive power in the water by which the capacity of flowing water to scour the soil particles get increased. Due to this effect greater soil particles are eroded by flowing water. The river bank erosion and erosion from bottom of the valley are results of abrasion action of running water.

(c) Attrition: This action includes the mechanical breakdown of loads running along the moving water due to collision of particles with each other. It can be expressed in other way that when big size rock fragments, boulders or pebbles are present in the moving water of streams or river, then they are broken due to striking actions with each other. The broken particles are moved along with the flowing water. They generate abrasion effects on the bottom and banks of the water course. This effect pronounces the water erosion.

(d) Solution: This process is associated with the chemical action between the running water and soil/rocks. Occurrence of this type of erosion is observed in those areas, where existing rocks/soil are easily dissolved in the water. Actually due to this action, the soil or rock materials are dissolved in the running water due to chemical action and are carried away along the water flow.

(e) Transportation: It is the process by which soil particles which are dissolved in the running water are carried away from one place to another. The transportation of particles depends upon the velocity of running water load present in the water, impediments/obstacles present in flow path of water and carrying capacity of running water. During water erosion, the process of soil transportation by running water is completed under the following forms:

i) **Solution**: The water soluble contents present in the water are transported by the water in solution form. Normally, certain dissolved chemicals such as calcium carbonate etc. derived from rocks are transported in solution form by the running water.

ii) **Suspension:** Suspension process involves the transportation of finer soil particles present in suspension form in the flowing water.

iii) **Saltation and Surface Creep:** The saltation mechanism is responsible to transport the medium size soil particles which can not be carried in suspension form due to their large sizes, but are mixed in water and flow over the stream bed in the form of mud. The saltation and surface creep share a major part of sediment load, transported by running water. The transportation of soil particles by the surface creep action takes place for the coarser soil particles activated through the actions of jumping, collision and creeping.

(f) Deposition: The deposition of load mixed in the running water take place under following conditions:

i) The force acting in the direction of water flow and responsible for transport of the load becomes very less compared to the resisting force acting in the opposite direction, then the materials get deposited on the bed.

ii) Presence of surface obstruction such as trees, shrubs etc. in the flow path of running water tends to reduce the velocity of running water and as a result the soil load mixed in the water gets deposited.

Whenever there is meandering of the river or the stream, the velocity of flow on the concave side of the river reduces drastically and deposition of the load occurs on that side.

SHEKHAWATI INST. OF ENG.& TECHNOLOGY COLLEGE

SIKAR , RAJASTHAN

1st MID TERM EXAMINATION 2017-18 (B.TECH 2nd year -AG)

Subject Code & Name: 4AG6 Heat and Mass Transfer

MM: 20 Times: 1.5hrs

MODEL ANSWER PAPER
