

SOIL CONSERVATION: PAPER- I

1. **Soil:** 12
 - 1.1 Introduction of Soil and Soil Science
 - 1.2 Importance of Soil and its conservation
 - 1.3 Components of Soil, soil minerals, organic components, soil air soil water, soil organism, soil temperature.
 - 1.4 Rocks and its types - Igneous rocks, sedimentary rocks and metamorphic rocks
 - 1.5 Minerals - Primary and secondary minerals
 - 1.6 Soil formation - soil forming minerals
 - 1.7 Soil weathering - physical weathering, chemical weathering, biological weathering, humification.

2. **Soil structure and properties:** 12
 - 2.1 Soil profile
 - 2.2 Soil structure - Classification according to shape and size of soil particles, importance of soil structure and texture.
 - 2.3 Physical properties - colour, texture, pore space, density, infiltration, moisture content, soil weight and soil temperature.
 - 2.4 Chemical properties - P^H, buffer capacity, salinity, ion-exchange capacity, base saturation.
 - 2.5 Biological properties - soil organisms, bacteria, fungi, algae, protozoa, nematodes, earthworms.
 - 2.6 Soil organic matter - total organic matter, humus, effect of organic matter on physical and chemical properties of soil.

3. **Soil of Maharashtra :** 11
 - 3.1 Types of soil based on colour and its characteristics
 - 3.2 Types of soil based on texture and its characteristics
 - 3.3 Types of soil based on agroclimatic zones and its characteristics

4. **Nutrients and their management :** 11
- 4.1 Importance of soil in relation to nutrient availability
 - 4.2 Essential plant nutrients and their source availability
 - 4.3 Defficiency symptoms of essential plant nutrients and method of correcting.
5. **Soil fertility and plant productivity :** 12
- 5.1 Concept of soil fertility and plant productivity
 - 5.2 Causes of soil fertility and infertility
 - 5.3 Factors affecting soil fertility and plant productivity
 - 5.4 Soil fertility evaluation and fertilizer recommendation
 - 5.5 Methods of improvement of soil fertility and plant productivity
6. **Soil erosion and soil conservation :** 12
- 6.1 Concept of soil erosion
 - 6.2 Types of soil erosion, erosion by water, erosion by wind.
 - 6.3 Factors causing soil erosion - water, soil structure sort type, soil vegetation, wind and animals.
 - 6.4 Methods to stop soil erosion
 - 6.5 Concept of soil conservation
 - 6.6 Methods of soil conservation - contour bunding, nala bunding, graded bunding, strip sowing, contour cultivation, terracing - channel terrace, irrigation terrace, orchard terrace, Bench terrace

SOIL CONSERVATION PAPER – I PRACTICALS

1. Collection and visual examination of different types of soils and samples.
2. Demonstration of different horizons of local soil profile
3. To study the soil texture and find out the percentage of sand, silt and clay content of soil.

4. To determine the soil PH by PH paper method, by using universal indicator and by using P^H meter.
5. To determine water holding capacity of soil
6. To determine moisture percentage of soil
7. To find out porosity (% pore space) of given soil sample
8. To find out bulk density of given soil sample
9. To determine electrical conductivity of given soil sample
10. Determination of available phosphorus in soil
11. Determination of available potassium in soil
12. Determination to total nitrogen content of soil
13. Determination of organic content of soil
14. Determination of Amonia and nitrate nitrogen of soil
15. Observations of various types of macro and micro organisms in soil

PAPER – II :WATER MANAGEMENT-I

1. Water:

- 1.1 Water as a resource material
- 1.2 Drinking water, Cooling water, irrigation water, fishing water, industrial water, recreation water and cultural water.
- 1.3 Soil water plant relationship
- 1.4 Role of water in plant development growth
- 1.5 Importance of irrigation
- 1.6 History and development of irrigation in India
- 1.7 Need of scientific water management

2. Hydrology:

- 2.1 Introduction to hydrology
- 2.2 Precipitation, infiltration, evaporation and transpiration, run off and hydrological cycle.
- 2.3 Surface water hydrology - run off process estimation of run off and hydrograph
- 2.4 Ground water hydrology - aquifers, ground water hydraulics, safe yield, ground water collection system.
- 2.5 Collection of hydrological data, rainfall, evaporation measurement, stream gauging, use of remote sensing in data collection.

3. Ground water:

- 3.1 Introduction
- 3.2 Hygroscopic water, capillary water, drainage water or gravity water
- 3.3 Water holding capacity of soil - maximum water holding capacity moisture at sticky point, moisture equivalent, moisture at wilting point, soil moisture percentage.
- 3.4 Useful and unuseful water for crops
- 3.5 Relationship between soil texture and water holding capacity

4. Monsoon in India:

- 4.1 Nature and types of rain fall
- 4.2 Convectional rain, relief rain, cyclonic rain and measurement of rain
- 4.3 Types of monsoon in India
- 4.4 Origin and characteristics of monsoon in India
- 4.5 Indian Monsoon and Economics

5 Irrigation water:

- 5.1 Consumptive use of water for crops
- 5.2 Determination of irrigation requirements

Methods of Irrigation - surface, subsurface, sprinkler, micro sprinkler, drip

- 5.3 Principles and practices of Irrigation, water management, problems of irrigated agriculture in Maharashtra, identification of resources, selection of land for irrigation, planning for irrigation with reference to soil and cropping system.
- 5.4 Irrigation efficiency, water use efficiency and factors affecting them.
- 5.5 Increasing water use efficiency by soil and crop management techniques
- 5.6 Quality and characteristics of irrigation water

6. Irrigation methods:

- 6.1 Surface method - surface ditches, underground pipe, portable pipe, devices to control waterflow, flooding, graded boarders, level boarders, furrow.
- 6.2 Sub surface method or sub irrigation method
- 6.3 Sprinkler method, sprinkler system, components types, evaporation losses, systems for environmental control, system for fertilizer, chemical or west applications.
- 6.4 Drip irrigation or trickle irrigation method
- 6.5 Advantages and disadvantages of each system
- 6.6 Irrigation management under limited water supply

WATER MANAGEMENT – I: PRACTICALS

- 1. Collection and visual examination of water samples: e.g. surface water, well water, waste water etc.
- 2. Measurement of rain water by rain gauge
- 3. Determination of P^H and conductivity of irrigation water
- 4. Determination of suspended and dissolved solid context of water
- 5,6,7,8 Analysis of irrigation water for chloride, calcium, magnesium, sulphate, carbonate, bicarbonate and interpretation of data.
- 9. Demonstration of drainage layout in the field.

- 10.11 Layout of different irrigation methods - surface, subsurface, sprinkler, micro sprinkler and drip.
- 12,13. Study of equipments required for irrigation system - tentio meter, sprinkler, micro sprinkler, drip, surface irrigation, V-notch, water meter.
- 14.15 Visit to the area having different irrigation system. A report should be submitted at the time of practical.

S.Y.B.A. PAPER-I-SOIL CONSERVATION -II

(VOCATIONAL COURSE)

- Objectives:** - 1. To develop the awareness of soil conservation among Students.
2. To upgrade the knowledge of land utilisation.
3. To educate the learners about soil loss through erosion.
4. To educate the Students about soil pollution.

SYLLABUS:-

1. SOIL CONSERVATION - Defination, importance, scope and components of soil conservation, prerequisites for soil conservation, physiography, soils vegetative cover, present land use, nature and distribution of rain fall, prediction of peak rainfall, flood, droughts.

(3)

2. Soil erosion - Extent of soilerosion types of erosion - geological, acclerated. Water erosion-sheet erosion, rill erosion, gully erosion, Ravine's erosion, land slides, stream bank erosion. Factors affecting water erosion-rain fall, soil topography, soil surface cover and biotic interference. Losses due to water erosion.

(3)

3. Wind erosion - Mechanism of wind erosion-saltation, suspension, surface creep, factors affecting wind erosion-soil clodiness, surface roughness, water stable aggregates and surface crust.

4. Soil moisture - field length, vegetative cover, organic matter, topography and soil losses due to soil erosion, control of wind erosion - stubble mulching, minimum tillage, crop cover, strip cropping, crop rotation, wind breaker, shelter belts.

(2)

5. Soil conservation Measures - Water erosion controls, maintenance of soil infiltration capacity, soil protection from rainfall, control of surface runoff & safe disposal of runoff. (2)

6. Agronomic Measures -Choice of crops, land preparation, contour cultivation, strip cropping, mulching & organic manuers and fertilisers, copping system.

(2)

7. Mechanical measures - bund/terraces, contour bunding, bench terracing, graded bunding, contour trenching, gully control, vegetative barriers. Forestry

Measures - plantation of perennial tree species, grasses and legumes. (4)

8. Measurement of soil loss - USLE (Universal soil loss equation) (2)

9. Rain water management - Measures and advantages. (2)

10. Water shed - definition, concept and characteristics, waste land management-dimension, causes, soil survey, classification, Need of water shed management, establishment of vegetation. (3)

11. Land capacity: classification, land use planning.

12. Soils and chemical pollution: - pesticides, fertilisers, toxic inorganic compounds, sewages, sludge, agro industrial wastes, fertilisers, disposal of organic wastes and green house effects.

Soil Conservation – II Practicals

1. Estimation of soil loss from the field.
2. Measurement of runoff by Rational method/Cook's method / hydrologic soil cover complex method.
- 3 & 4 Designing of measures of soil conservation, contour bunding/cropping system/graded bunding.
5. Designing of live bunding and perennial trees for erosion control.
- 6 & 7. Study of soil profile and site characteristics, slope, drainage erosion and water logging
8. Determination of land compatibility.
- 9 & 10. Field visit to observe agronomic and mechanical measures.

- BOOKS RECOMMENDED -

- 1) Principles of agronomy - S.R. Reddy
- 2) Principles of soil conservation and water management - H.R. Arakeri and Roy
- 3) Land and water management - Murthy
- 4) Diagnosis and improvement of saline and alkali soil - USDA Handbook - 60.
- 5) Manual of conservation of soil and water - USDS Handbook - 61

S.Y.B.A. PAPER-II - WATER MANAGEMENT -II

1. Water resources (India and Maharashtra) - Rainfall, river, well, ground water and its utilisation. (2)

2. Soil - Water - Plant relationship, soil properties --texture, structure, porosity, density, capillary water, evapotranspiration, field capacity, permanent wilting point, consumptive use, soil water potential, matrix potential, pressure potential, gravitational potential. Volume-mass relationship of soil. (4)

3. Soil moisture measurement - Gravimetric method, volumetric method, Tentiometer, gypsum block, pressure plate apparatus and Neutron probe. (5)

4. Crop water requirement - different approaches for scheduling of irrigation, effective rainfall and its different methods of measurement. (4)

5. Measurement of irrigation water - units, methods - volumetric, velocity-area, water meter, weirs-orifice, 90 'V' notch, rectangular weir and partial flume. (4)

6. Advance irrigation methods - Drip irrigation - components and their functions. Lay out and design, estimation of water requirement, sprinkler irrigation, subsurface irrigation and surge irrigation. (4)

7. Fustigation :- Advantages and disadvantages, types of fertilizers, different devices-ventury, fertilizer tank, injector pump. (2)

8. Planting techniques in drip irrigation - paired row planting, skip row planting, triangular planting, crops - sugarcane, cotton, banana, brinjal, tomato and chilly. (2)

9. Use of saline water through drip - classification of saline water, salt distribution pattern, conjunctive use of irrigation water, salt tolerant crops, effect of saline water on soil.

10. Rain water management - land treatment, land levelling and smoothening, bunding, tillage, mulching, fallowing, contour cultivation, inter terrace management practices.

a) Flat on grade b) Flat on grade and later forming ridges with intercultivation.

- c) narrow ridge and furrow system. d) graded border strips e) broad bed furrows
f) dead furrows g) compartment bunding

Intercultivation and runoff farming, interplot water harvesting, water harvesting in farm ponds.

11. Drainage - advantages, types of drainage-surface drainage, subsurface / pipe drainage, tubewell drainage, biodrainage. Preventive measures - Planning of distribution system on farm water management, maintenance of surface drainage system.

PRACTICALS

WATER MANAGEMENT-II

- 1) Determination of Permanent wilting point/field capacity/consumptive use of water.
- 2) Determination of soil moisture by gravimetric / tensiometer / pressure plate apparatus.
- 3) Measurement of effective rainfall.
- 4) Measurement of irrigation water by orifice / 90 'V' notch/rectangular weir/partial flume.
- 5) Lay out and design of drip / sprinkler irrigation.
- 6) Calculation of nutrient requirement in fertigation.
- 7) Field lay outs in drip irrigation for sugarcane / cotton / banana
- 8) Measurement of salt distribution pattern in drip irrigation.
- 9) Estimation of reference crop evapotranspiration (ET_o) by different methods-class A pan evaporation method / radiation method / temperature method / Blaney Criddle method.

BOOKS RECOMMENDED

- 1) Principles of agronomy - T.Yellamanda Reddy, G.H. Shankara Reddi.
- 2) Principles of agronomy - S.R. Reddy
- 3) Manual on irrigation agronomy - Ahmed and R.D. Mishra
- 4) Crop water requirement - Monogram No. 4 LARI New Delhi
- 5) Irrigation theory and practice - A.M. Micheal
- 6) Irrigation of food crops - Principles and practices - Prihar S.S. and Sandhu B.S.
- 7) Soil and water conservation research in India - V.V. Dhruvanarayana ICAR New Delhi.

Annexure-II

Structure/ Pattern of Syllabus must be as follows:

- 1) Title of the Course: **Soil Conservation and Water Management (Vocational)**
- 2) Introduction: **Pattern Annual**
- 3) Eligibility: **Should have offered Soil Conservation and Water Management F.Y.B.A. and Passed F.Y.B.A. as per Pune University Rules**
- 4) Examination
 - A) Pattern of examination
 - i) **80:20** (University semester examination of 80 Marks & Internal assessment of 20 Marks) Details as per the syllabus
 - ii) Pattern of the question paper: **As per the specimen given**
 - B) Standard of Passing : **As per Pune University norms**
 - C) ATKT Rules : **As per Pune University norms**
 - D) Award of Class : **As per Pune University norms**
 - E) External Students : **As per Pune University norms**
 - F) Setting of Question paper/ Pattern of Question paper: **As per Pune University norms**
 - G) Verification of Revaluation : **As per Pune University norms**
- 5) Structure of the Course :
 - i) Optional
 - ii) Medium of instruction : **English**
- 6) Equivalence subject/ papers & Transitory Provision: **Soil Conservation and Water Management (Vocational)**
- 7) University terms : **As per Pune University Norms**
- 8) Subject wise Detail Syllabus : **Attached**
- 9) Recommended books : **Mentioned in syllabus**