RAINWATER MANAGEMENT FOR CULTIVABLE LANDS

Principles

Rainwater Management

- Rainfall is the ultimate source of water for our planet earth.
- Rainwater Management is a concept of conserving and effectively utilising the total precipitation falling in a village / watershed.
- Normally, we allow the falling rainwater to flow down over the land surface finally to the rivers as floodwater and expect the government to bring it back to our fields as irrigation water.
- This running water need to be appropriately conserved as soil water, ground water or surface water to cater to the needs of the humans, animals and crops.

Farmer's Legacy

- Rain falls in every farmer's land.
- Over the past several generations the farmers have developed the infrastructure to do Khariff crop followed by a legume *wherever possible*.
- One cannot say that the people who have performed this feat, apparently without any external help, are either a lazy lot or are devoid of any vision.
- The social, economic and administrative changes that have taken place after independence have somehow taken away the very initiative from them.
- It is time to reignite in people the lost initiative and empower them.

Classification of Land Quality

- Classification of land quality by Revenue Department and recorded in Record of Rights is not based on size, shape or land levels
- It is based on the duration for which moisture is retained in the soil. The land revenue is higher for lands having capacity to support crops of longer duration or for having the capacity to support more than one crop.
- Mere change in plot shape and size by leveling and bunding is not real land development.
- It must also improve the moisture status of the land.

Current Approach

- Uplands are mostly owned by the poor and marginalised section of the society.
- Current approach is found to be inadequate for making use of the runoff generated in the non-arable part of the watershed for the benefit of the unirrigated uplands
- With the prevailing SWC measures, there has been some rise in the ground water table. However, this has not been able to provide a really drought free environment for a *Khariff* crop over the entire rain fed landscape / watershed.

Current Approach

- Conventionally, we have always looked towards surface storage without studying its limitations of (a) storage capacity, (b) recharging capability, (c) evaporation loss (d) subsurface / base flows.
- Attempts are made to recycle drainage water which benefits lowlands and partially medium lands but never uplands.
- There has been no systematic effort (*Ridge to Valley*) to explore the possibility of recharging and using the vast naturally available potential of sub-surface storage in the disintegrated zone lying under the arable part of the watershed.

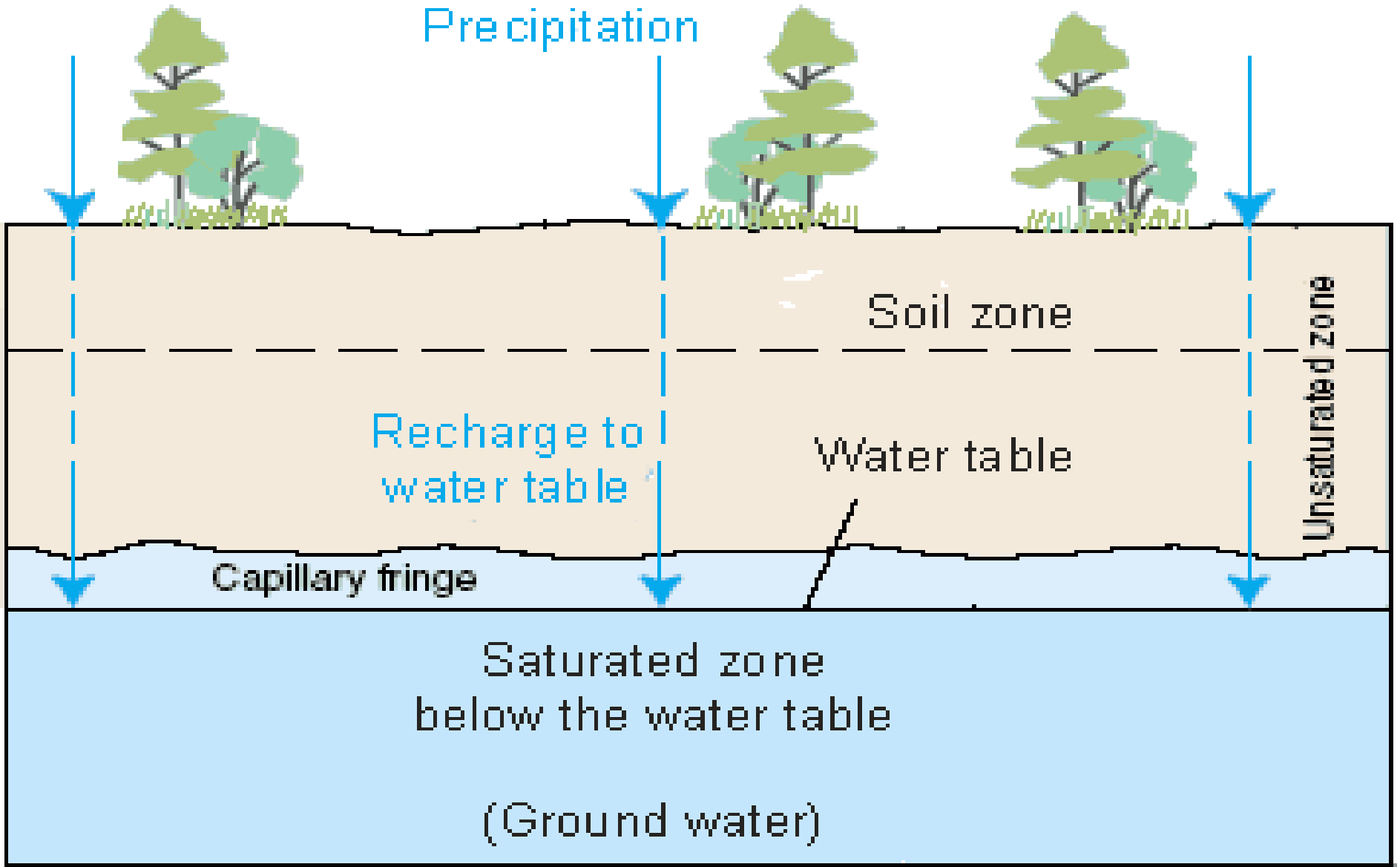
Novel Approach

- A more simple, practical and novel approach on scientific line is required on the flow path of runoff.
- This will make the soil water available naturally throughout the season, for the crops and other vegetation to take care of the *Khariff* dry spells and aspire for a *Rabi* crop without irrigation.
- Major water harvesting surface water storage structures like farm ponds will have limited use for rearing fish, bathing of humans and animals.
- Not a single square meter of farmland will be lost.
- The shape and size of the plots will remain intact.

Scientific Background

- When rain falls on the soil surface, a small portion of it percolates into the soil profile due to gravity.
- It stops at the bedrock or impervious layer.
- Storage of water inside the soil slowly builds up to a level known as Water Table.
- This is the water we see in open dug wells.
- This is known as Saturated or Gravitational water and is used by animals and humans .

Ground Water Storage



Scientific Background

- A part of the water stored as Saturated Water (Ground Water) is pulled up by capillary force of the soil up to the top layer of soil.
- It is retained there as Soil Moisture.
- This is used by the plants and vegetation only through their root network.
- A part of it that comes up to the soil surface evaporates and creates suction to draw more moisture from the Ground Water Table.
- This is Unsaturated / Capillary water or Soil Moisture.

Scientific Background

- The underground has about 50%* (*30% to 60%)* empty porous space which is filled with air and plant roots.
- This space is utilised to store the extra rainwater thus put into the ground.
- It is so large that it can store up to two to three years of total rainfall under Odisha situation.
- Since this is stored inside the ground as Soil Moisture within the plants' root zone, the plants make use of it most efficiently.
- When needed, water is lifted through shallow dug wells as the availability of ground water improves over the seasons.

*USDA, SCS, Section 15, Chapter1,SPWR, Page6

Scientific Background

- Cultivable lands are best suited for *rapid percolation* by managing the rainwater / runoff water.
- They are precisely laid and properly bound.
- Also, the top soil is worked several times to prevents crust formation inducing for rapid recharge.
- In many completed projects, farmers have been using the treated area for growing crops with rainwater only, without any external water source.
- This technology can easily be implemented at field scale through MGNREGA or Watershed programs by building the technical capacities of the field personnel.

Social and Financial Implications

- Farmers do not have to pay water tax for utilisation of the moisture stored under his field.
- He is not required to be on the mercy of any outsider for supply of water for his crops.
- Social conflict for supply and distribution is eliminated.
- Consequently, the dependence on surface storage / farm ponds and conversion of crop field are reduced except for rearing fish.
- A farmer will appreciate and participate in work done in his field or locality.

Storage Potential of Interior Odisha

Consider: Village area of 100 ha.

Soil depth of 3 m.

Void available 50%

Annual Average Rainfall 1200mm.*

Quantity of rainwater available: 100 x 1.2 x 0.62**= 74.4 ham

Volume of storage space: 100 x 3 x 50% = 150 ham

Years of rainfall that can be stored: 150 ÷ 74.4 = 2.02 years

* Average annual Rainfall of Bolangir District for 2018 to 2022 is 1215mm

** Uniformity coefficient for small & micro watersheds

Surface Storage Capabilities

Let us say we muster space as well as funds for constructing 10 WHSs of 1ha av. size and 3m av. depth.

Enhanced storage capacity

10x10,000x 3 = 3,00,000 cum

Ratio of surface storage/Rainfall

(3,00,000/74,40,000)x100=4.03%

Projected Outcome

- Flash flood coming down the hillside and casting sand and debris in crop field is checked.
- Damage to field bunds in lowlands due to flash flood checked.
- The Plants look greener and shining.
- Crop yield increase by 50 to 100%.
- Leaf shedding reduced and delayed. This is prominent in case of *Mahul* tree where the base of the tree remains clean while flowers fall and collected.

Projected Outcome

- In the crop fields, soil surface look dry but plants remain green. In case of bamboo bush, one cannot find dry leaves.
- Climate remains cooler than neighbouring villages.
- Rise in water table observed from open wells and ponds, hence fish farming viable.
- Rise in goat / sheep population.
- In the crop fields, soil clods become soft and break easily.
- Contamination of ground water with bacteria and Fluorides etc. minimised due to dilution.

Constraints

- Needs participatory approach to execute and maintain the project.
- Organic farming will ensure good soil condition and efficient functioning