Cost Effective Management of Water Eroded Areas on Sustainable Basis and Insitu Rain Water Conservation

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Extent of Land Degradation (m.ha)



Water Erosion



Source: Shah and Arshad (2006)

Present Practices for Controlling Water Erosion

- Plantation of trees
- Development of water resources such as small dam, min dams, ponds and dug wells.
- Use of earth moving machinery for land levelling and terracing.
- Construction of masonry structures

Piece meal efforts Lack System approach-[IWM] Sustainable, Economical and affordable technologies required to implement system approach.

Technologies being developed/ standardized by SAWCRI

- 1. Farm Water/Runoff Control Structures for improvement of rainfed terraced systems.
- 2. Green manuring and gypsum for insitu moisture conservation & crop productivity enhancement.
- 3. Profitable use of gullied areas without levelling.
- 4. Profitable use of stored rainwater for high value crops.
- 5. Grasses screened under rainfed conditions.
- 6. Evaluation of the integrated effect of all above technologies at sub-water scale.

1. Farm Water/Runoff Control Structures for improvement of rainfed terraced systems.

Safe disposal of surplus runoff

Insitu rainwater conservation

Reduced Erosion Enhanced Productivity

Farm Water/Runoff Control Structures

ISSUES

Damage to terraces with high intensity rainstorms Loss of soil and water

<u>CONSEQUENCES</u>

- Reduced moisture for crops.
- Reduced soil productivity.
- Additional expenses to repair embankments & minor leveling (Av. Repair cost Rs. 1500-2500/acre)
- Gully development at downstream





Existing technology

Masonry structures

Concerns

- Borrowed technology
- Highly expensive due to use of concrete, bricks etc
 - Rs.25,000 to 2 Lac/structure
- No input-output rationale
- Rodent damage requires repair by skilled masons so repair cost high.

<u>CONSEQUENCES</u>

- Not affordable by end users.
- Little adoption.



SAWCRI technology

Farm water/runoff control structures

- Indigenous knowledge integrated with latest scientific development.
- Involvement of stakeholders ensured at planning & evaluation stages.
- International collaboration with ICARDA
- Long-term meteorological *data* used in designing on scientific basis.
- Different types evaluated at farmers' fields with their *participation* under different rainfall zones and variable land forms.

More than 150 structures perfectly given output at farmers' fields in different agro-ecologies.













Cost & Benefits

- Simplified designing procedure.
- Extremely Low-cost (<5000 Rs.), No cement or concrete, only dry stones.</p>
- Natural grass acts as cementing material.
- Flexible. Automatic stone settlement on rodent burrows.
- Negligible repair cost.
- Safe disposal of runoff from higher to lower fields.
- □ Soil erosion minimized by >90%.
- □ Insitu rainwater conservation.
- **Crop productivity increase 20-25%.**
- Pay back period 3-5 years.
- More than 150 structures evaluated on farmers' fields.

Farm water/runoff control structures





2. Green manuring and gypsum for insitu rainwater conservation

Insitu rainwater conservation under drought

Soil health improvement

Enhanced Productivity

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Moisture Conservation & Crop Productivity Enhancement

Main Issue

Minimum soil moisture at sowing of Wheat.



Wheat grain yield (t/ha) Vs Rabi Rainfall (Research Farm)



Economic benefit of use of gypsum on wheat Rs-ha⁻¹ at farmers' fields (at fixed price of wheat) on one year impact basis

Gypsum Dose t-ha ⁻¹	Net benefit over no gypsum Rs-ha ⁻¹		
Number of farmers	11	17	10
	2002-03	2003-04	2004-05
1.25	-	2780	2728
2.50	2865	5305	9415
5.00	3488	1405	4800
7.50	-	-3010	698

Wheat Grain price @ Rs 415/40 kg; Wheat straw price @ Rs 50/40kg; Gypsum @ Rs40/50 kg bag

Gypsum Technology-Summary

- Standardized dose for fallow-wheat system i.e. @
 1 Tone/acre application before monsoon.
- On average, 22% percent increase in wheat yield at farmers field
- study under various cropping patterns in progress.
- Initial results show about 10-15% increase in various crops at farmers' fields i.e. Groundnut, Brassica, Mung, Sorghum fodder.
- Beneficial impact of gypsum application available for at least three years.

Green Manuring

- Two green manures i.e.
 cowpeas & guar (from 12)
 crops found most effective for
 insitu rainfall conservation
 and increasing wheat yield.
- Cowpeas for medium and high rainfall areas.
- **Guar for low rainfall areas.**
- Wheat productivity increase at farmers fields 20%





Incorporation of Green Manures

Rotavator is not available in area. Results of three years study proved that Mouldboard plough is equally good for incorporation in rainfed areas.



3. Profitable use of gullied areas without leveling.

Growing of fruit plants

Vegetative erosion control measures

Reduced Erosion Enhanced Productivity

Land leveling

takes centu

Economical Prancipulation hours

Top fertile soil buried

·Rate of soll-formation: (

-Soil profile development

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- More prone to erosion
- Huge expenditure

450 plants of blood red variety of citrus were planted in 1996-97

Eyebrow terraces with plantation in staggered arrangement



Stop wash barriers





Cucurbits were grown with same water and nutrients



200 peach & Apple plants were planted in 1998-99





Soil & water losses monitoring

Soil loss at different catchments at Dhaku





Conclusion

- Soil erosion minimized and gullies formation averted.
- Standardized the technology for control of soil and water losses from small catchments through stop wash barriers, staggered plantation and providing ground cover etc.
- The research studies proved that gullied lands can be made productive on sustainable basis without the intervention of leveling by bulldozer through growing of fruit plants using stored rainwater.
- However, survival rate differed amongst various fruit species in relation to water stress, temperature, rodent attack and other soil factors.
- Ensures proper utilization of marginal lands, where growing of other fruit crops not only provides sustained economy but help in improving the environment.

6. Evaluating the performance of technologies/measures at sub-water scale.

Selecting subwatershed with communities Testing the technologies/measur es in an integrated manner

Provision of sustainable livelihood





WATERSHED ACTIVITIES

Dhoke Mohri Community

- Rainfed terraced sub-Watersheds.
 - Gypsum
 - Structures

Ratta Community

- Weather station
- Runoff and water quality monitoring

Rehna Sadaat Community

- Soil loss monitoring system
 - Six catchments with wiers
- Rainfed terraced sub-watershed systems
 - Gyspum for Wheat
 - Runoff harvesting Structures.
- Rehabilitation of wastelland/gullied areas
 - Mot Grass in gullies

Chak Khushi Community

Rainfed terraced sub-watershed syste
Runoff harvesting Structures.
Rehabilitation of wasteland
Mot grass in gullies

Khokharbala Community

• Gully Farming

- Rehabilitation of wasteland
 - Mot grass in gullies

