

Key points

- Need to know what is the watershed boundary in order to design practices
- Need to know the soils, rainfall, etc
- Need to determine activities that can be done in about 18 months
- Need to have criteria for site selection and then select the sites
- Once we know the area could subdivide based on climate, etc, as well as objectives of stakeholders.

Key points

- Suggest to select sites based on boundaries and then define catchments within
- Suggest offices to work within the project area
- Traditional practices - try to follow or improve as much as possible
- practices in which the material is known and less expensive and readily available (more sustainable)
- Practices need to “fit the landscape” = need to fit each situation
- Use satellite imagery to aid in planning; put info into GIS
- Basic data for watershed – climatic, soils, streamflow, etc. -
historical hydrological data, flood history– put in a national database
- Consider impacts of climate change
- Establish watershed or catchment association – national or regional
- Enhance capacity of local communities to implement and maintain these practices
- Provide training opportunities in technologically advanced countries

Categories for interventions

- Rod kahi/spate irrigation
- Soil erosion control/flood control
- Soil Moisture conservation
- Spring development (wells, pumps, etc.)
- Improve on-farm water management
- Early flood-warning system
- Groundwater assessment (review existing studies, mapping, quality)

Soil erosion control

- Check dams (large and small)
 - Small and in series, in upper watersheds as well as in-field applications.
 - large control structure
 - all supported by appropriate conservation practices such as mulching, etc. re-vegetation or plantation
 - Stop -Wash barriers
 - Half-moon terraces
 - Hillside ditches

Soil erosion control, etc.

- Micro catchments
 - Placement of micro catchments along contour on hillsides
- **Soil bioengineering** – streamside stabilization
- Rotational grazing
- Check and discourage deforestation
- **Look to build structures that not only control flooding but also create water supply**
- Establish nurseries to provide planting stock, seeds, and other plant materials.

Soil erosion control, etc.

- Forest plantations, multi- crop systems, reestablishment of indigenous species, such as *Pinus gerardiana* for pine nuts, etc.
- Dryland reforestation
- Constructed wetlands (facultative)

Soil Moisture conservation

- **Mulching (crop residues)**
- Drip irrigation – sub-surface – micro or very small
 - Water sources to be defined. Targeting fruit trees.
- **Supplemental (rather than continuous) irrigation**
- Appropriate tillage
- Green manure
- Soil improvements (gypsum, biological agents such as fungi, etc)(gypsum effectiveness and application to be discussed further.
- **Water harvesting**
- Deep plowing (on plain)
- Improve conservation through crop rotation and cropping pattern

Rod kohi/spate irrigation

- Diversions
- Water control structure
- Water carrying channels to field
- Small water storage ponds
- Small and mini dams
- Sediment retention ponds
- Stable water outlets on farms
- Help establish water user associations
- Review existing water use rights and empower communities to develop and exercise water rights
- Use bioengineering in rod kohi structures

Community and farm water source development (spring developments, wells, pumps, etc.)

- Map showing areas of potential spring development
- Land classification/zoning
- Water storage structures with evaporation control designs (e.g. water storage tanks, lined ponds, etc.)
- Spring boxes
- Innovative pump energy sources for wells

Improve on-farm water management

- Land leveling (an option but expensive)
- **Barrier around boundary of field (e.g., diversions)**
- Lining of channels or use of pipes
- Gypsum layer for soil moisture conservation
- Provide machinery to water user association
- Encourage water use at times to reduce evaporative loss (such as at night)
- **Water control structures to enable better water management**

Improve on-farm water management (continued)

- Improve irrigation scheduling to reduce quantity and increase frequency
- Select low-pressure irrigation systems
- Micro-irrigation, drip, sprinkler