

Crop Management Strategies

Crop and Variety Selection – choosing crops that are adapted to an arid climate and are drought-resistant. Certain varieties of crops may have a shorter life cycle that germinate, grow, and produce in a very short period of available moisture. They may also have deep, extensive root systems that can gather water over a large area, and leaves that store and release water slowly so that they survive periods of drought.

Soil Preparation – plowing the soil destroys weeds, breaks hardpan soil, and promotes bacterial activity which all help to maintain soil nutrient and water levels. It also enables seedling roots to grow and spread toward soil moisture. However, farmers must plow with little damage to soil structure and at appropriate times so that soil erosion is minimized.

Plant Population and Spatial Arrangements – sowing seeds in less favorable environments (low soil nutrients and water availability) requires a wider spacing so that plants do not compete with each other. Also, it is essential for plants to be sown in rows to facilitate weeding and harvesting.

Crop Rotation – a different crop is planted in a field each successive year, preferably the following crop using nutrients not greatly used up by the preceding crop. This serves to conserve moisture and soil nutrients while also controlling erosion and the spread of diseases and pests.

Fallows – land where crops residues are turned over into the soil and no crops are

grown for at least one season. This allows for water storage and nutrient accumulation to improve future yields. It is possible to store up to 75% of the following season's water requirements within one year².

Risk Management – A farmer must decide how much risk to take on in any given planting season. He may choose to plant many different types of crops, especially ones that are more resistant to drought conditions, so that he is at least guaranteed a minimum harvest.



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¹ Agroforestry in Dryland Regions (D. Rocheleau, F. Weber, A. Field-Juma. 1988 ICRAF)

² Dryland Farming: Crops and Techniques for Arid Regions (Randy Creswell and Dr. Franklin W. Martin, 1993 ECHO Technical Note)



Agricultural Techniques in Dryland Regions

Combating Desertification and Improving Agricultural Production in Dryland Regions

Verbree International principally works with people living in semi-arid or "dryland" regions of the world. For farmers and herders in these regions, life can be a constant struggle to meet their daily needs. Many of them have successfully adapted their life and work to cope with the environmental constraints of low rainfall, frequent droughts, and poor soil. But in recent times, population increase and the subsequent overuse of water and land resources have led to a general degradation of land to the point that it fails to support any agricultural production whether for crops or herds. This process where land literally becomes "desert" is known as *desertification*.

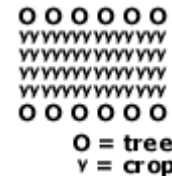
Although desertification is certainly linked with the general lack of rain and the occurrence of droughts, there is little evidence to suggest that these are the predominate factors. Rather, scientists see evidence that human factors play the largest role in the desertification process. Dryland areas have a limited carrying capacity, but often increasing population densities in these areas lead to over-cultivation and over-grazing of the land which directly causes soil nutrient depletion, increased soil and water erosion, and the destruction of vegetation.

People can stop the desertification process and successfully rehabilitate degraded land by changing the ways in which they manage soil, water, and vegetation resources. Soil and crop scientists have developed a variety of techniques that help to control and reverse desertification. By selectively applying these techniques, people can make the land productive once again.

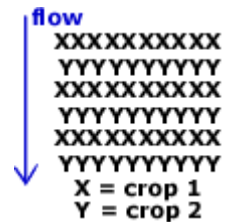
This brochure briefly explains some of the techniques that Verbree International will teach in dryland areas. The techniques and strategies center on the basic idea of managing agricultural activities for the maintenance of soil nutrients and water, prevention of soil erosion by wind and water, and the reduction of risk to minimize the affects of drought.

Soil and Water Management Techniques

Alley cropping – growing crops in-between rows of trees. This helps control soil erosion, and the shade and windbreak reduce evaporation. Trees also provide organic matter and nutrients for the crops and are a source of mulch, fuel wood, building poles, food, medicine, fodder, and other useful products.



Contour strip cropping – planting a crop in parallel bands following the contours of the slope. This ultimately decreases soil erosion and the loss of soil nutrients. Also, planting an erosion-resistant crop in alternating rows with an erosion-susceptible crop helps the erosion-susceptible crop grow better.

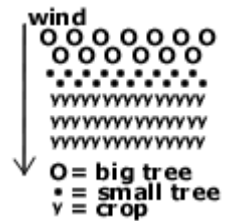


Dispersed trees in cropland – trees dispersed throughout a cropland can often increase yields as much as 60% by adding organic matter, nitrogen, or other nutrients to the soil¹. Trees also help to conserve soil moisture by providing shade and leaf litter that reduces evaporation.

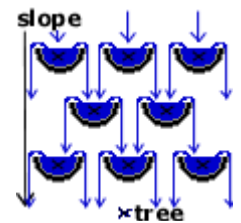
Mulching – covering the soil surface with organic matter such as leaves, sticks, and crop residue. This adds additional nutrients to the soil and protects the soil from wind and water erosion during fallow periods.

Windbreaks – planting rows of trees, shrubs, or hedges on the windward side of a

cropland to stop the wind. They reduce evaporation and soil erosion. Windbreaks also aid in preventing the spread of plant diseases.



Earthwork structures and micro catchments – structures built by cutting and filling the soil to create barriers, bunds, or traps for rainwater collection and erosion control. These can be used to increase water infiltration (especially for crusted surfaces) and decrease water run-off and soil erosion. They also help provide additional water for new plantings and water storage for small livestock or other farm needs.



Nitrogen-Fixing Trees – growing specific species of trees that incorporate nitrogen from the air into their leaves and tissues. This is accomplished by the soil bacterium rhizobia present in the tree's roots. Nitrogen is an important nutrient for tree and plant growth. When the tree loses its leaves, they form mulch on cropland, adding both organic matter and nutrients to the soil.

Zai – digging numerous small pits throughout cropland for the purpose of trapping water and nutrients. These pits collect leaves, twigs, and fine sand carried by the wind. Farmers also place manure in the pits to attract termites which dig underground tunnels that facilitate deep infiltration of rainwater and bring nutrients from the deeper layers of soil to surface horizons.