

Managing rangelands: promoting sustainable rangeland management practices

Shrub planting: contributing to ecological sustainability while aiming towards livelihood improvement



Large scale rangeland rehabilitation using *Atriplex halimus*, Aleppo Badia, Syria

BACKGROUND

The degradation of rangelands is induced by overgrazing, over-gathering of firewood, and conversion of the best rangelands into cropping land. Over-exploitation results in negative effects leading to soil erosion and the reduction of forage biomass for livestock. To alleviate the spread of rangeland degradation, planting shrubs provides a large amount of fodder for livestock, combats desertification, and plays a key role in natural resource conservation.

Importance of shrubs/trees

Shrubs reduce solar radiation and soil temperature, conserve moisture, and enrich the soil nutrient content. In providing ecosystem goods (especially forage for livestock and carbon sequestration), shrubs in arid zones boost poverty alleviation strategies and contribute to reducing food insecurity. The integration of shrubs through alley cropping has the potential to improve both the sustainability and profitability of utilizing a piece of land, thus improving the livelihoods of smallholder farmers.

Species and site selection

Select shrubs well-adapted to conditions of individual planting sites. The choice of species will depend on the annual rainfall amount, soil, topography, runoff, water harvesting potential of the site, and the likelihood of environmental stresses such as drought, salinity, and cold. Species selection is also guided by rangeland development objectives, such as fodder production, wood production, dune fixation, or erosion control.

Shrub planting bene its:

- Able to valorize marginal water not usable for conventional crops
- Facilitative effect for establishment of understory vegetation
- Supply of ecosystem services
- Halophytic shrub species such as saltbush can improve salt affected soils
- Excellent for feeding livestock during drought and a source of firewood for farmers
- Tall shrubs and trees provide shade for livestock.

Ideal species for arid environments

In arid and semi-arid areas, common fodder shrubs include *Atriplex halimus* (Mediterranean saltbush), *A. leucoclada* (Orache), *A. nummularia* (old man saltbush), *Bassia prostrata* (desert bush), *Salsola vermiculata* (Mediterranean saltwort), and *Haloxylon aphyllum* (saxaul). *Ceratonia siliqua* L. (carob tree), a long-living evergreen tree native to the Mediterranean, is commonly used to provide shade for livestock during hot summers. Certain shrubs/trees contain anti-nutritional factors (secondary chemical compounds or toxins) which reduce the overall digestibility and palatability of their forage quality. Care must be taken to select highly adaptable species suited to the low rainfall and salt conditions of arid environments.

Challenges during shrub planting

The high cost related with the establishment and the maintenance of shrubs presents the main challenge for smallholder farmers with low incomes. Another common issue faced by most shrub planting programs is the availability of suitable species for the target ecosystem at the appropriate time. In most cases, supplementary irrigation is needed right after planting to secure strong roots and soil contact. Alternative feed resources to supplement livestock are most often in high demand in dry areas. This increases the risk of predation on transplanted shrubs as animals prefer the young succulent seedlings to the older and more mature plants.



Atriplex halimus planted along contour lines, Majidiya, Jordan



Atriplex halimus seedlings production in Sabha nursery, Mafrak, Jordan

Establishment and management

Shrub establishment and growth often suffer heavy plant losses due to intense lack of soil moisture. Several techniques are used to aid seed germination, such as seed pretreatment through scarification, or soaking in hot water. To improve overall productivity once established, rotational browsing/grazing of the rangeland will aid in reducing soil erosion, depletion of soil nutrients, prevalence of weeds/invasive species, and more uniform soil fertility levels. Before establishment, shrubs should not be browsed as this reduces their growth and survival potential.

Combining shrub planting with water harvesting techniques

When seedlings are planted on steep slopes, water harvesting techniques, which enhance efficient use of soil moisture, should be implemented first. When combined with water harvesting techniques such as semi-circle structures or intermittent contours, shrub planting improves erosion control, forage quality and availability, and plant and animal micro-habitat conditions.

Effective establishment and maintenance:

- Select suitable sites for introduction of new shrubs when perception is usually higher than 250 mm
- In low rainfall areas, rainwater harvesting such as intermittent bunds or semicircular bunds is needed
- Transport seedlings to site of transplanting with extra care
- Harden young seedlings by gradually introducing them to their new environment
- Right after transplantation, irrigate seedling to assure good root contact with soil
- Avoid browsing during the establishment phase
- Allow enough recovery time after browsing/harvesting
- Replace missing and/or dead seedlings during the following season
- Prune shrubs every other year to induce regeneration of new growth.



Sheep resting in an improved rangeland site with *Haloxylon aphyllum*, Sogd, Tajikistan

SUMMARY

Planting shrubs is beneficial in reducing the effects of degradation such as soil erosion and also in creating microhabitats for vertebrate and invertebrate fauna. The establishment and management of shrubs requires that they receive a long enough period for them to recover lost biomass after a browsing and pruning event.

Citations

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