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Fodder Production with Spate Irrigation and Road Run-Off



Practical Note Spate Irrigation



Spate Irrigation
Network Foundation



Figure 1: *Eragrostis superba* grass in Beer, Somaliland, commercialised in urban centres and the Berbera port

The rising demand for fodder

This Practical Note describes a relatively easy but high-return method of making use of floods; growing fodder extensively by spreading flood water. Pastoral and farming communities have a history of using their innovative capacity to sustain livelihoods in difficult dryland conditions. Selection of resilient and beneficial plant species, and soil moisture replenishment and retention techniques all played a role in this endeavour. In Somaliland, rural communities in the last decades are striving to restore the farming system that was badly damaged during the conflict period. A common practice currently is that farmers inundate their fields along ephemeral rivers during the period of flooding, and subsequently use these fields for fodder production (Nawaz, 2014). This is spate irrigation at its most simple, as it simply diverts spate waters on the floodplain. It does not require any ploughing or other labour-intensive crop husbandry practices and can easily be combined with other livelihoods. Returns are good, especially as not much labour is required. Farmers receive between US\$ 450 - 500 per hectare each year (Nawaz, 2014).

Moreover, the demand for fodder is high and growing. In the rainy season in Somaliland, fresh fodder is transported to nearby towns on a daily basis to be sold to dairy farmers and livestock holders. The majority of the fodder however is cut and dried, and sold to traders who will sell the fodder at the port of Berbera, where 1.5 million animals pass annually on their way to Middle

Eastern markets. The demand is high with e.g. Saudi Arabia having banned its domestic fodder production as a national water saving measure.

Potential of grass species

Efforts to improve drylands' productive capacity tend to focus on reseeding areas with suitable plant seeds, particularly grasses, to strengthen the fodder resource base. However, a large number of range grasses already exists that can be used to produce good quality fodder for the ruminant livestock, particularly cattle. A number of these grasses have been researched and data shows that they can be grown under diverse conditions of farming. Rangeland grasses that have shown to increase the productive potential in semi-arid and arid environments include *Chloris roxburghiana* (Horse Tail), *Cenchrus ciliaris* (Fox Tail), *Eragrostis superba* (Maasai Love grass) and *Enteropogon macrostachys* (Wild Rye grass) (Mganga et al. 2015). Research in Kenya has identified these indigenous grass species as suitable to rehabilitate dryland ecosystems and double the livestock carrying capacity of an area, assuming that germination and growth conditions are ideal (Musimba et al. 2004).

Chloris roxburghiana (Horse tail grass)

Horse tail is a relative of the *Chloris gayana* (Rhodes) grass that is found in high potential areas such as Western Kenya and Western Uganda. The

grass is not very prolific in germination, but a quite satisfactory seeder under good establishment. Once established, it forms a very stalk pasture for both hay and direct grazing. It is resistant to grazing pressure and acceptable for livestock from a nutrition point of view. Horse tail requires good management (e.g. from application of fire) to maintain highly nutritive fodder. Forage yields can be very high, between 3.5 - 4.5 tons per hectare when mature. The grass gives excellent results in Kenya's Kitui District where it has been tested to reseed rangelands.

Cenchrus Ciliaris (Fox tail grass)

Fox tail grass is a tufted semi-arid to arid land grass species that shows remarkable resilience in drylands, where it prefers sandy loam soils to grow. It is called *Ndata Kivumbu* in Ukambani because it grows on dry ant hills. It is very resistant to grazing and is able to cope with very high grazing pressure. When properly managed, fox tail is self-sustaining and produces good quality hay, unless it is subjected to the combined stresses of high grazing pressure and adverse weather patterns. During the dry spell, it offers excellent forage due to green nodal tillers, thus provides highly nutritious forage in spite of the dormancy stage. The limited existing

research shows that it can produce 4 - 5 tons of dry matter per hectare when it is at full maturity. There exists very little information on its production under irrigation except for a brief statement by Pratt and Gywenne (1977) who reported that the grass was tried under water spreading conditions in Turkana while using a tine cultivator.

Eragrostis Superba (Maasai Love grass)

Maasai Love is a tufted grass, which is successfully used in moderate dry areas. It has large seeds that can be easily harvested, unlike the Horse Tail and Fox Tail grasses. It is best used for hay production as it may not withstand intensive grazing for a long time. There is a need to harvest the grass at the optimal time, when the biomass still includes green leaves, as it grows too stemmy during the dry spell. Dry matter yields can be up to 3 tons per hectare in the first two growing seasons under protection. Management will call for allowing seeds to fall during harvest, to sustain plant density and maintain continuous production over time.



Figure 2: *Cenchrus Ciliaris* (African fox-tail)



Figure 3: *Eragrostis* grass



Figure 4: Livestock grazing in Somaliland's dryland ecosystems



Box 1 Invasive species

Despite the many benefits to promote grass species and floodwater use for fodder production, a warning needs to be posed. At the field level in Beer, Somaliland, it was noticeable that the free spreading of flood flows also resulted in the invasion of unwanted vegetation, most notably mesquite, within the fields. Once unwanted species of vegetation are settled into a field, it becomes difficult to eradicate.

***Enteropogon macrostachyus* (Wild Rye grass)**

Wild Rye is a prolific tufted perennial grass that is very well adapted to wooded, shrubby and rocky terrain with only pockets of soil. Wild Rye produces many seeds that are reasonably viable. The seeds will germinate and grow to mature plants in just one growing season. The grass is particularly nutritious when young. Wild Rye requires management to ensure continuous quality feed supply, i.e. harvesting, burning and grazing at appropriate stages (mid-bloom). It is drought tolerant and good for reseeding degraded areas. Dry matter production can be high, and hence it is a candidate for fodder production in semi-arid environments.

Besides the grasses that are indigenous to the Horn of Africa, there is a large variety of often forgotten grass species whose potential and adequacy to restore fodder banks of semi-arid rangelands needs to be researched. One notable example is the *Leptadenia hastata* plant, which in Niger is also known as hanam or yadiya (Kimba & Delmas 2017). This perennial plant is particularly resistant to drought, and very suitable to combat soil erosion, mainly as a result of wind. It grows strongly during the drought season and slows down during the rainy season. As can be seen in figure 5, it grows on the soil, but can also cover the stem of a tree. In Niger, it is used as a forage, when all the other resources are finished. Its tolerance towards

drought, insects and adverse soil conditions is considered excellent. It however should be further tested in Kenya and Somaliland to see whether it can be grown as part of fodder production schemes.

Innovative water harvesting

As climatic variability and desiccation pose a threat to the sustainable production of grass fodder species, it is important to enhance soil moisture replenishment to maximize fodder production. Here the use of spate irrigation and water from road runoff are two viable and low-entry methodologies to boost fodder production in drylands. A high soil moisture content and prolonged plant growth can be ensured in floodplains by better harnessing and spreading of floodwaters, as the case of Somaliland shows. Roadside and floodplain rangelands are used for a variety of purposes, be it grazing, fuelwood collection, biodiversity, collection of medicinal plants and other non-timber forest products such as gum and honey. Additionally, harvesting road water run-off and floods contributes to groundwater recharge, which benefits the whole ecosystem. There is huge potential that remains unutilised to divert both water from roads as well as spate flows from ephemeral rivers.



Figure 5: *Leptadenia hastata* in Niger

Conclusion

As this Practical Note shows based on experiences in Somaliland and Kenya, there are viable ways to expand and intensify fodder production. Drylands are a key source of biodiversity that contributes to rural livelihoods. However, dryland ecosystems are fragile, with land use change and increased climatic variability being major stressors in an environment that was already water-stressed to start with. This has led to serious land degradation and loss of the ecosystem services upon which livelihoods depend. The depletion of semi-arid pastures can partly be attributed to increased land-use pressure within the last fifteen years, due to a number of factors (Mganga et al. 2013). These are notably climate, increase in livestock and human population and the migration of populations from the high potential areas to marginalised areas. Within this overall picture, the loss of the fodder resource base for livestock and its subsequent negative impact on pastoral livelihoods has special importance (ILRI, 2016).

Drylands currently face great challenges in terms of their sustainable management. It has been marked that over 30 percent of drylands in Kenya are seriously degraded (Musimba, 2015), with part of them heading towards desertification. This trend hand-in-hand with the disappearing of indigenous perennial grass species, which occurs at an alarming rate (Mganga et al. 2013). Perennial grass cover is however essential to protect vulnerable lands against run-off and erosion.

By systematically introducing the spreading of short term floods from ephemeral rivers or from road drainage, drylands can be revitalized and a highly productive production system – in terms of return to labour – can be introduced. Growing fodder with flood water has several advantages: (1) it turns a threat (flood water) into an asset; (2) it relieves the pressure on the dry rangelands and creates an economically rewarding production system, and (3) it requires almost no land preparation and hence it can also be applied in areas that are short in skills and labour.

For more information on the potential of fodder grasses, watch TheWaterChannel at:

<http://www.thewaterchannel.tv/media-gallery/6334-the-potential-of-indigenous-fodder-grasses>

<http://www.thewaterchannel.tv/media-gallery/6341-some-fodder-grasses-indigenous-to-kenya>

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This Practical Note is created in collaboration with:

