POLICY BRIEF

UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES LAHORE

November, 2018

A goat herders in Potohar prunning Acasia Modesta pods during dry autumn

INDIGENOUS FODDER TREES TO BOOST LIVESTOCK ECONOMY AND TACKLE CLIMATE HAZARDS

Policy Message

Indigenous fodder trees (IFT) can

- Save starving livestock during cli mate hazards
- Contribute to livestock feed during scarcity periods
- Harness herders as stewards of trees rather than blamed eradicators
- Reduce methane emission from rum nation due to higher tannin contents
- Rehabilitate degraded hill slopes, control soil erosion and reduce flash floods
- Sequester carbon, and helpsin improving land/spurstabilization in riparian areas
- Helps reducing the Humans and livestock competition for food and feed resources.

Herders are mostly blamed for preventing regeneration of trees and degradation of hill slopes, rangelands and riparian areas due to overgrazing.It may be partly true in some situations, however, not for fodder trees and shrubs, for which they always work to thrive, as a necessity for survival during scarcity seasons and drought disasters. During floods, when the crops are submerged, tree foliage help to rescue feed the threatened livestock. They also contribute to reduced competition of land for food and feed. As the changing climate will increase the intensity of floods and drought, the hence increase the need for fodder tree plantationfor survival of smallholder herders. This policy brief has thus tried to highlight the fact that herders' perspectives can be used to improve the food security and climate resilience through IFTs.

Herders: The custodians of grazing lands and fodder trees

Fodder trees and shrubs help herds to pass through the scarcity periods due to their deep rooting system and hence better tolerance to drought and floods. Fodder trees can be promoted in partnership with custodian herders in these areas, and can then better be acknowledged as the stewards of forested areas.In Pakistan, so far no precise data on mobility pattern, annual dynamics and economic contribution of these herding communities is available due to neglect and marginality. These herders draw on their backlog of observations and experience to manage trees and shrubs to their benefit. They know how to play upon plant complementarities as they choose the pastures on which to graze their flocks, taking advantage of ecosystems with diversified forageand foliage availability. They are the ones whose economic benefit is stringently attached with standing trees for shade and feed.

IFTs are planted close to residence for easy loping by women herder

Featured case studies

Social Forestry program in Northern Pakistan

Between 1980 and 1999, the plantation campaigns in Northern Pakistan to rehabilitate the degraded hill slopes and improve the watershed function, tree species planted included Eucalyptus camaldulensis, Pinusroxburghii and Robiniapseudoacacia. The benefits of plantation went to landowners and the cost borne by landless pastoralists in the shape of reduced access to leased winter grazing areas by 75.9%. As a result, the average herd size of the landless pastoralist decreased from 340 to 140. About 25% of the landless pastoralists sold all their animals and ended up as cropping labor or finding daily wage labour elsewhere (Leede et al. 1999). IFTs plantation would have prevented social costs.

Conservation and livelihood impacts of fodder trees plantation

A case study of Kavrepalanchok district of Nepal revealed that the meat production from goat and milk from Buffalo have increased considerably. The high income was associated with the introduction of various fodder trees along private terraces. It was concluded that there is a great need for agroforestry system to integrate conservation benefits with the livelihood of rural people (Bishnu&Bhattara 2014)

Importance of the indigenous multi-purpose fodder tree (MPFT) species

Indigenous MPFTs have been reported to have important social, economic and ecological functions, such as food supply, shade, traditional medicines, and the preservation of milk, animal nutrition, social values and household income. For animal feeding, vegetation was cut, especially leaves, young tips, twigs and fruits. It is concluded that the indigenous MPFT have a strong social and ecological value, and a source of income supplementation (Takele et al., 2014)

Therefore they are usually not obliged to cut them down rather like to protect them just to ensure long-term availability of feed for their herds. Hence, they should better be acknowledged as the 'stewards' of fodder sources rather destroyers. Considering this, they can also be harnessed to rehabilitate degraded rangelands for the benefit of the environment as well as the economy of the dependent herders and the country at large.

Fodder trees reduce grazing pressure on rangelands

Herding has been considered as one of the noblest ancient professions both religiously and culturally and has been practised by almost all the prophets. Plants and animals are co-evolved and interdependent; however, maintaining the balance between the two has always remained a critical challenge for almost every grazing land. Herds' survival is dependent on the continuous availability of feed resources in these grazing areas and fodder trees and shrubs are crucial for the survival of pastoral livestock. Grazing animals have played a significant role in shaping the current ecology. Current plant diversity has been evolved as a result of browsing of animal speciesover the periods of millions of years. Grazing animals help to determine plants community composition, structure and productivity through their selective consumption pattern, hoof action and nitrogen deposits in grazing areas. The continued selective browsing helps some species to regrow frequently whileother species tend to lean out gradually over time. They also help in maintainingthe tree base by dispersing tree seeds over wide areas either through their digestive tract, furs or feet etc. Their hooves help in germination of certain species by decrusting the soil and incorporating the seeds in the soil.

Fodder trees can reduce land use competition for food or feed

Humans and livestock production are in direct competition for land use for food and feed.In order to meet the growing food requirements of increasing human population, more and more land is being taken under cultivation to grow more food crops. On the other hand, feed production is also important for livestock farmers to meet their needs to satisfy meat and milk production for consumers ultimately. Provided the limited cultivable and productive land, it has always been contested either food crops or feed crops need to be grown. Given the benefit that IFTs do not require large cropping areas and can be grown in marginal areas not suitable for cropping, they are gaining more significance under the constraints of land. Besides, such plantation also curtails the need for other inputs like water availability and fertilizers etc. With the increasing trend of growing cash crops instead of food crops, the condition has become even worsened since no residues are left for livestock.

IFTs role in adaptation and mitigating response to climate change

1— IFT being rich in protein and mineral contents can be served as an alternative source of feed especially in areas where conventional agriculture may not be possible or desirable because of dangers of site degradation; soil erosion, steep and rocky slopes or severe climatic conditions.

2— IFTs considered an important adaptive response to climate change because trees with their deep root systems that can draw water from deeper soils are more resilient to variability in weather patterns, and can provide fodder for longer than shallower-rooted plants in dry periods.

3— Being perennial in nature, IFT lives for years, sequestering and storing carbon in their roots and branches as they grow, as well as in the soil.

4— Many IFT contains sufficient tannins that can be used to significantly reduce methane production in the ruminant animals. Tannins from IFT have shown to reduce methane production by 13% without affecting the animal productivity.

5— Trees do not need heavy inputs of fertilizers, pesticides, fungicides, and labour, as do agricultural crops, hence contribute to climate mitigation.

6— IFT can produce as much, if not more, green fodder per unit area than fodder crops and can additionally work as windshields.

Fodder trees (Grewia oppositifolia) pruned by farmers on their field during winter scarcity

IFTs help to reduce the intensity of climatic events

During periods of drought and resulting crop failure, IFT provides the alternative feed source.Also, their roots entrenched in the dry regions trap water and hence help in reducing the stress of dry weather.Roots are responsible for anchoring trees to the soil and help to draw water from deep down to surface hence reduces the intensity of drought weather. The roots of plants dig deep into the soil and create space between soil particles. When it rains in highlands, water that flows downhill gets drained into the space created by the root system of plants. Due to this, the chance of flooding is greatly reduced. Trees slow stormwater runoff and reduce the threat of flooding.Trees prevent soil erosion to create a network of flexible tendrils that help stabilize the soil around. The probability of flooding increases in the absence of plants, especially in rocky areas, rocks prevent water from seeping into the ground. IFT can play a significant role in the prevention of landslides and rehabilitation of landslide-affected areas in mountainous areas. Trees roots help to control the sliding soil in place and hence play a significant part in preventing soil erosion.

IFT as a rescuefeed for entrapped livestockduring flood disasters

Floods have become more frequent in recent times as a result of disturbed rainfall patterns. The agriculture-dependent rural smallholders in Pakistan, during flood hazard, try to move to the safer areas which are slightly at a height just to avoid to be drifted away with flood water. Since livestock is their precious resource, they can't leave their animals behind. In flood disaster, when all the feed resources are submerged underwater, they can only move their livestock with them to the safer areas on which their future rehabilitation strategy depends. Some people are obliged to sell their livestock at throw-away prices to avoid their death from hunger. So to ensure animals survival, it becomes incumbent for the disaster relief agencies and organizations, in addition,, to provide food and medicines supplies to people, also provide fodder to livestock. But fodder availability is sometimes compromised given the emergency state. Consequently, livestock becomes at risk of feed deficiency and disease emergence. IFT promotion in the flood-prone areas can reduce to fill this gap in feed availability and requirement as the foliage always remains above the flood water levels.

IFT; which species and where to plant

Fodder trees and shrubs have always proved to be the buffer to keep the mobile herd intact during seasonal and yearly variability in rainfall. Rangelands constitute 65% of Pakistan land surface utilized by pastoral herds and despite their neglect in the development and research agenda, are among the primary contributors to its livestock economy. Rangelands are spread throughout the country covering its entire northern, western and Southeastern parts. These areas are thus primarily candidate for fodder trees and shrubs extension. Based on altitude, temperature, rainfall and soil type/slope variability, different zones in these drylands have their own well-adapted species and varieties of fodder trees and shrubs. The flood proven areas, on the other hand, cover mostly fertile irrigated lands. Residing primarily in the riparian areas and aits, the smallholder extensive herders primarily subsist on livestock to utilize the lands not suitable for cultivation but remain available for grazing in low flood seasons. Livestock herding becomes more important survival strategy as in contrast to cultivated crops, they can be moved to high grounds and spurs during floods.These areas have also their own regional indigenous species, with micro-level zoning for each individual species, like river boundaries and cropland boundaries etc.

Different fodder trees planted by farmers on field boundaries inmountain valleys of Northern Pakistan

At Kalam highlands the transhumant herders bent the flexible Betula utilis tree for his goat herd as a protein source

Economic returns from fodder trees

Fodder trees can help herders and farmers to improve their income and livelihood using foliage as a business enterprise.The economic benefits of growing fruit trees are generallyconsidered to be more than fodder trees. However, these cannot be grown in open areas. Further, there are dual purpose trees, with both fruit and foliage and sometimes for shade inside and outside houses. The land space suitable for fodder tree production is wider than the fruit trees, as these can be planted outside, on field boundaries, roadsides, canal sides, riverine area, spurs and mountains. They are safer outside boundaries, in contrast to fruit trees as special lopping techniques, tools and labour are required to lop the fodder trees. Livestock enterprise collective mechanism is easy to devise because benefits are many, cost and benefits will be shared by the local community.

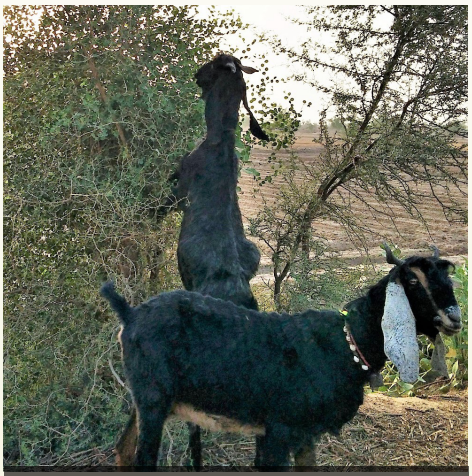
It's not just Fodder!

Interestingly, distinct species of Fodder trees hold spiritual, emotional, cultural significance in different religions and traditional communities historically (pics). Palatable leaves are consumed by the animals. However, the non-palatable leftovers like stems are used either for fuel or to make some traditional items. Amazing traditional craftslike baskets are being madecreatively using these raw leftovers that can only be considered 'a waste' by an outsider. Besides, farmers plantfodder trees along the boundaries of agricultural fieldstraditionally to prevent damage to crops from storms and animals. Also to be used as an alternative source of food in feed scarce

times. Besides, different fodder trees are also used for the treatment of different ailments for hundreds of years.Scientific tools can help to complement this relationship.

Policy implications

1— Limited data for the limited region is available about IFTs; there is a need to further research on the species and varieties distribution, climate tolerance, foliage availability per unit area and season of use of IFTs.
2— Indigenous knowledge about IFT and their multiple uses have usually been overlooked. Social forestry rehabilitation programs overlook the uniqueness of indigenous fodder trees and preferred other exotic species.
3— Afforestation schemes can be further improved by incorporating the users and dependent communities' preferences for trees and partnerships.
4— Afforestation projects should rather look at these intricate socio-ecological relationships to sustain plants to fix climate change rather searching for some quick fixes.
5— IFTs plantation in hazard-prone areas can also mitigate the negative socio-ecological implications, like tenure disputes particularly in fodder scarce areas, hence can contribute to land use disputes resolution.
6— IFTs are therefore an important contributor to climate resilience and need to be put on the list of top priority in climate mitigation using the actual land managers (herders) as partners



Goat is a natural browse loving specie and utelize tree leaves for milk and mutton

Further reading

Hess, H.D., T.T. Tiemann, F. Noto, J.E. Carulla and M. Kreuzer. 2006. Strategic use of tannins as means to limit methane emission from ruminant livestock. Elsevier. International Congress Series 12:164–167

Rahim. I., D. Maselli, H. Rueff and U.Wiesmann. 2011. Indigenous fodder trees can increase grazing accessibility for landless and mobile pastoralists in northern Pakistan. Pastoralism: Research, Policy and Practice 2011, 1:2. Springer Open Access Journal http://www.pastoralismjournal.com/content/1/1/2

Leede B. M., I. Rahim and Jan Wind. 1999. Nomadic Graziers and Hillside Development: A case study in Swat and Buner. Technical Report 2.9. Published by Environmental Rehabilitation Project, Malakand Division in collaboration with DHV Consultants Amersfoort, The Netherlands. WFP (4659)/ERM/PK) 009001

Bishnu H. P and S. Bhattara. 2014. Conservation and livelihood impacts of agroforestry system: A case study of Kavrepalanchok district of Nepal. Paper presented at World Congress on Agroforestry, 10-14 February 2014, Delhi, India. http://www.wca2014.org/abstract/conservation-and-livelihood-impacts-of-agroforestrysystem-a-case-study-of-kavrepalanchok-district-of-nepal/

Mutambara J, I. V. Dube and B.M. Mvumi. 2012. Agroforestry technologies involving fodder production and implication on livelihood of smallholder livestock farmers in Zimbabwe. A case study of Goromonzi District. Livestock Research for Rural Development 24 (11) 2012. http://www.lrrd.org/lrrd24/11/muta24210.htm

Takele G, Nigatu L, Getachew A (2014) Ecological and Socio-Economic Importance of Indigenous Multipurpose Fodder Trees in Three Districts of Wolayta Zone, Southern Ethiopia. J Biodiversity Endanger Species 2:136. doi: 10.4172/2332-2543.1000136
M. Akram, S.H. Hanjra, M.A. Qazi, and J.A. Bhatti.Availability and use of shrubs and tree fodders in Pakistan. 1990. Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan.

Researchers Featured

Inam-Ur-Rahim
Chief Research Officer, Center for Applied Policy Research in Livestock, University of Veterinary and Animal Sciences (UVAS), Lahore, Pakistan.
inam.rahim@uvas.edu.pk

Isbah Hameed
Lecturer, Department of Environmental Sciences, University of Veterinary and Animal Sciences (UVAS), Lahore, Pakistan
isbah.hameed@uvas.edu.pk

A Publiction of
Center for Applied Policy Research in Livestock (CAPRIL)