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Tradition, Innovation and Systems: Livelihood of Thar Community

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Abstract

Thar Desert consists about 30 million hectares of the arid zone of sandy plains. The production of grass and forage from these common property resources (CPRs) can be increased from 0.50 to 3.6 t/ha by growing suitable grasses (*Lasiurus indicus*, *Cenchrus ciliaris*, *C. setigerus*), legumes (*Clitoria ternatea*), shrubs (*Zizyphus numularia*) and trees Khejri (*Prosopis cineraria*), Ker (*Capparis decidua*), Kumtiya (*Acacia senegal*), Jall (*Persica oleoides*), etc with improved management practices. Silvi pasture integrates trees, shrubs, grasses, and livestock to enhance resilience and productivity in the Thar Desert's arid lands. Indigenous grasses like sewan and dhaman increase pasture yield and provide shade, crucial for livestock survival during drought. Livestock-including cows, buffalo, sheep, goats, blue bulls, deer, chinkara, foxes, rabbits, *khargosh* (hares), peacocks, and various birds and animals-benefit from this practice, particularly during prolonged droughts, when pasture is typically scarce, and mortality rates increase significantly. This technology introduces silvi pasture methods and provides a cost-benefit analysis compared to conventional practices for cattle rearing.

Keywords: Sewan, dhaman, ker, khejri, jall, livestock, cprs, oran, shrubs, trees, grass. systems, agroforestry, horticulture.

Introduction

The rainfed agro ecosystem holds a unique place in Indian agriculture, covering 67% of the cultivated area, contributing 44% of food grain production, and supporting 40% of the human population and 65% of the livestock population. Grass, shrub, and tree species are critical for the development of sustainable pastoral systems in these regions.



Fig 1: A view of the arid region of the Thar desert

Details about silvi pasture development:

Methods- Silvi pasture

The farming methods in rainfed areas are quite diversified

with a variety of crops, cropping systems, agroforestry, horticulture and livestock production. Among the livestock, small ruminants are very important resources and contribute milk, fibre and other functions that are significant to the productivity, stability and sustenance of many farming systems, especially in drylands. Tree leaves and pods form a natural part of the diet of many ruminant species and have a traditional use as food sources for domesticated livestock in Asia, Africa and the Pacific. They serve as protein banks to supplement grass or crop residues in the dry season ^[1]. It is suggested to develop Silvi pasture systems/models by introducing trees or shrubs into natural pasturelands/waste lands to provide nutritious green foliage throughout the year ^[2]. Similarly, horticulture and small ruminant (sheep and goat) production systems play a vital role in the sustenance of livelihoods of rural poor of rainfed agro-ecosystems ^[3] in arid and semi-arid regions, where crop production is a risk-prone enterprise due to the uncertain rainfall and frequent draughts. Pasture development systems integrate shrubs, trees, grasses, pastures, and livestock. Local tree and grass species enhance pasture productivity by increasing fodder availability and providing natural shelter for domestic and wild animals. In the

Thar Desert, over 70% of farmers depend on rainfed agriculture and livestock. Common Property Resources (CPRs) are especially valuable to the Thar community during the monsoon and drought periods as well.



Fig 2: Community based silvi-pastures development systems providing local indigenous green grasses and natural shelter for animals during summer season in Thar desert

During silvi pastures development, farming community or implementing organisations to be identify commons land a size of around 10-15 hectares that contain medium-crowned trees and soil will be allow to local indigenous fast-growing grasses for forage. The selected land for pasture development should be fenced by barbed wire fencing or through social fencing to protect from free grazing animals. The organic matter, animal urine and manure can help to improve the soil fertility of the pasture land, which supporting forage grass growth in both the sessions i.e. winter and summer. The local indigenous grasses i.e dhaman (C.C.), Swan (L.S.) and many more local known as bekar, ghanthiya, dhamcia, gokhru, daub, motha, dudhi, sinthar, sonamukhi, kheep, bui, senia, akh, jhad bore, trees and shrubs provides grass and leaves from this pasture. The silvi pasture units are managed for pasture development committee for interduce use under a cut-and-carry system for harvesting grasses, leaves and stored for dry-season.

Socio Economic Benefits

More cattle's can be fed, after systemic development of pasture units, compared other open forest (Oren) or grazing (Gaucher) systems. Such developed pasture units provide more reliable fodder of leaves and grasses in drought spell, the developed pastures are very helpful for improving cattle weight and farm income while protecting soil quality. The pasture also very helpful for increase carbon sequestration in soils, shrubs and tree biomass also contributes to climate resilience, socio-economic and ecological benefits for the community people.

Resilience of SILVI Pasture Development

The pasture land development approach with combined the trees, shrubs, local grasses, flora and fauna, cattle grazing, fodder production on the common land and ensure ecological regeneration, biodiversity conservation. The common property resources (CPRs) always economically support to the village community. The pasture development systems nature wise also helpful to mitigate droughts, improve local climate adaptation and resilience as per following points.

- Availability of fodder, forage, grasses, leaves for cattle feeding during the dry season.
- Soil conservation and fertility improve with in the pasture.
- Silvi pasture systems ^[4] very much helpful to sequester significant amounts of carbon (CO_2 , GHG , *Temperatures*), in the soil under improved silvi pastures and good amount of biomass of standing trees as well indigenous local grasses.



Fig 3: Browsing and grazing by cattle, goats, and sheep in pastureland during winter session at Nagaur India

Silvi Pasture Development System

The traditional forests called oran in thar desert which is helpful in the conservation of wildlife. Moreover, it maintains a perfect water cycle in nature by allowing the percolation of water in the soil to increase the soil moisture. It also prevents soil erosion by binding soil with the help of roots and mitigate droughts and prevents floods by acting as natural vegetation with natural barriers

The local indigenous grass and biomass production potential could be multiplied 2X-3X by establishing suitable silvi pasture development systems on CPRs. These CPR need to be adopted proper practicing rotational grazing would be minimize damage to the local trees, shrubs and grasses in the system from browsing and grazing by cattle, goats, and sheep. This approach enhances the year-round supply of nutritious fodder, meeting the feeding needs of cows, sheep and goats, ultimately leading to higher production and maximum returns for farmers.

The silvi pasture development systems in thar desert are combination of grasses, shrubs, legumes, and trees to produce highly nutritious good quality fodder and forage, fuelwood, and timber, while optimizing land productivity and conserving plants, soil, and nutrients on a sustainable manner. In Thar desert, we know Orans (It means Aranya) as silvi pasture. Orans have trees, shrubs and local grasses with in the trees and shrubs for grazing the animals over the year as well during drought spell trees provides forage and leaves as green fodder for animals. Mainly three types of silvi pasture models we found in different name in different region and terrain as

1. Silvi pasture system
2. Agri-silvi pasture system
3. Horti-Pasture system. we know such systems in thar as orans (Aranya)

These pasture land development systems are also known as livestock-based agroforestry. During the monsoon season, cattle very much like to graze green grass, but during the dry season, when grass is scarce, animals like to eat the foliage of trees and shrubs in the silvi pasture units, CPRs in Thar desert.



Fig 4: Animals prefer to graze the foliage of trees during dry season, when grass is scarce in silvopasture at Jaisalmer, Rajasthan, India

Grassland, Technique and Technology

The silvi pasture development system is a type of agroforestry that combines different plants including grass and tree legumes for animal nutrition. Pastures are very useful for small, marginal and landless families. The silvi pasture methods are used as an open community grazing bank to feed the animals and as a shelter for cattle's as well wildlife.

These silvi pasture systems are intensively managed by village councils, communities, cattle rarer for both the purposes as forage and forest produce and products as well. These systems are providing both short- and long-term income sources for small and marginal farmers as well land less families who well dependent on these systems. These Silvi pastures conserving different types of indigenous trees and shrubs that provide seasonal local fruits, seeds, and leaves. Farmers use such products for domestic consumption and sale it in the local markets to earn money for (i.e. Ker, Sangri, Kumtia seed, Peelu, Lasorda, Ber etc.). Additionally, leaves are grazed by small and big animals.



Fig 5: The Silvi pasture area at Viratra Mata-Chohtan Barmer in Rajasthan, established by GRAVIS [5]

These Silvopastoral systems have so many water bodies for harvesting rainwater for animals, who graze here over the year. Villagers also use these waterbodies (ponds/naadi) water for drinking and domestic use. The community has a certain mechanism, rules and regulations to maintain these systems and techniques. But nowadays these mechanisms and systems need to be strengthened again, Community Based Organisations (CBOs) and civil society organisations [6] can play a positive role to strengthen and demonstrate good practices with the gram panchayat, so that they can be replicated or disseminated in similar conditions in the planet [7].

As the global population continues to expand, it is imperative for livestock farming to undergo necessary adaptations in order to effectively address the escalating food demands and enhance productivity [8]. The utilization of Precision Livestock Farming (PLF) technology has the potential to assist farmers in the surveillance of infectious illnesses within the realm of livestock agriculture, hence enhancing both food safety and availability. The implementation of PLF technology would ultimately enhance animal welfare and mitigate food safety issues, while simultaneously optimizing resource consumption [9]. There is a growing trend of digitization among livestock producers to employ radiofrequency identification (RFID) sensors, which can be affixed to ear tags and collars or positioned subcutaneously, for the purpose of monitoring a wide array of behaviours such as general activity, eating patterns, and drinking habits [10].

Fodder (Forage and Grasses)

Community pastures are an important resource of fodder in the arid and semi-arid area of Rajasthan. The contribution of village common lands to fodder, income, employment

opportunities, resource conservation, and improvement in microclimate and the environment is significant. The population below the poverty line depends on Common Property Resources (CPRs). Meanwhile, changing rainfall patterns in the state have led to a shift from agriculture to animal husbandry. Livestock constitutes a major source of livelihood for the poor, but is constantly under threat due to shortage of fodder and potable water due to groundwater depletion. Many pastureland development projects have involved the community in revitalising common pastures, solving the problem of fodder, regenerating wastelands and boosting soil and water conservation. Perennial grass species like *Cenchrus ciliaris*, *Cenchrus setigerus*, *Lasiurus sindicus* are provide high forage yield under natural rainfed conditions in normal rainfall [11].

The primary fodder grasses-sewan, anjan, and dhaman-are known for their drought resistance and nutritional quality, which includes significant protein levels. These grasses can be used directly for grazing or harvested as hay or silage, with regrowth facilitated by cutting at 10-15 cm above ground to allow recovery within 50-60 days. It gives about 8-10 t/ha of dry fodder during the monsoon season under rainfed condition. It is highly palatable with high nutritional value (crude protein 8-10% and 60-70% digestibility) for all kinds of grazing animals. It is suitable for grazing, cut-and-carry systems, silage production, and hay making.



Fig 6: Use of the surplus grasses as hay, making it into a fodder bank

Most of grazing lands are underused due to a lack of availability of quality seeds from improved genotypes. There is a wide gap between the demand and supply of grass seed, resulting in the majority of grazing lands and common lands in the planet being underutilized. The predominant species for grassland development include sewan (*Lasiurus scindicus*), anjan (*Cenchrus ciliaris*), dhaman (*Cenchrus setigerus*), and *Panicum antidotale*. Therefore, the rejuvenation of water harvesting techniques, methods and establishment of improved grasslands with suitable species and genotypes, along with the systematic utilization of pasturelands, would facilitate the sustainability of livestock production. Farming community can adopt such model in future at there farm field as well for fodder security, nutrition security and mitigate drought, and adaptation of climate change.

Conclusion

The silvi pasture systems and mechanisms is sustainable by nature because of its uses by pastoral communities and its simplicity in design and community ownership. The silvi pasture systems, methods are lifeline for agro- pastoral community of Thar desert people to feed their animals, improve the livelihood, check the migration of animals, help to mitigate droughts effect to provides forage and fodder for their animals during scarcity of fodder. The systems are manageable by local people, do not need out sourcing any technology to improving the systems and do not require much

maintenance as compare to other community-based systems, techniques, and mechanisms. The most of the time self-maintenance takes place in pastures land due to natural vegetation with trees and shrubs and also local indigenous grasses and environmental causes. The high rate of wind erosion transport soil which deposits on pasture land. Animals help to improve the fertility of the soil by dropping the meegni, gaubar (cow dung/manure) and urine by the small and big animals during grazing and browsing the canopy of trees and shrubs. The trees also provide the local fruits, pods for food, gum, fuelwood for enhance their income and livelihood, the vegetation over the silvi pasture units is also play an important role to protect the systems and methods from high wind as well in different weather conditions. Now a days the digital inclusion to develop such community-based approach more familiar and resilience.

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