



Tropentag, September 10-12, 2025, hybrid conference

“Reconcile land system changes
with planetary health”

Permanent pastures as an alternative land use model for marginal farmland in Andhra Pradesh (India)

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Abstract

In drought prone areas of India, changes in rainfall patterns, poor farming practices and growing income expectations have made rain-fed agriculture uneconomical, leaving farmland fallow or under-cultivated. This fallow land does not spontaneously regenerate into grassland; plant succession seems to stagnate and little biomass is produced. Even in the case of under-cultivation, soil parameters tend to decline; soil degradation or desertification becomes a serious threat. In addition to the scarcity of economic resources, there is also a lack of essential ecological services for rural and urban areas. The aim of our research was to develop an alternative low input land use model for such land, capable of providing economic resources to the rural population and increasing parameters such as SOM, soil structure, water infiltration capacity, and biodiversity. Permanent pasture could help to achieve these goals indeed, grasses provide fodder for livestock, are known to sequester carbon below ground and structure the soil deeply through their roots. In a screening of grass cultivars and spontaneous grass ecotypes, the native grasses emerged as the only option. Particularly *Heteropogon contortus* L. and *Chrysopogon fulvus* (Speng.) Chiov., showed good performance in terms of productivity, soil coverage rate, short or no dormancy and high drought resistance. Germplasm collections were followed by screening of different accessions at the same site, and ecotypes were improved by single plant selection. Native legumes were found to have unreliable germination and low biomass production but we identified species with potential. *Stylosantos scabra* and *Stylosantos haemata*, which were outwilded about 40 years ago, are performing well in consociation with the native grasses. We have gained experience in seed production of native grasses, in seed pelleting, in seeding with satisfactory germination, particularly with regard to sowing depth and soil temperature at sowing. Currently, the focus of our research is on grazing and pasture residue management for optimal forage production, root structure and subsoil C allocation. In general, land ownership is highly fragmented, for rational grassland management small fields should be combined into larger units. This could take the form of common grazing grounds managed as cooperatives with defined grazing rights and obligations.

Keywords: Andhra Pradesh, Central-south India, clima change mitigation, grass ecotypes, grassland regeneration, livestock in semiarid areas, marginal farmland, permanent pastures, soil degradation