

Sustaining the livestock production in rainfed areas

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Livestock production systems in rainfed areas suffer from crop failures, fodder scarcity, water scarcity, heat stress and endemic animal diseases. Sustaining livestock production in rainfed areas is to ensure the availability of sufficient quantities of water for animal feed, adequate fodder and drinking water. It should be ensured that the animals get enough food and water from natural sources, which may include rainfall. Strategies like developing integrated farming systems, enhancing fodder production, protection from extreme weather conditions, disease surveillance and timely immunization against endemic diseases, scientific feeding and breeding management would create more sustainable livestock production systems in rural areas. Subsidies for livestock related activities, capacity building for livestock producers and the promotion of farmer-producing organisations in the livestock sector would make rainfed livestock production systems more resilient and appealing.

Keywords: Fodder production, Integrated farming system, Livestock production, Rainfed areas

LIVESTOCK is an integral component of traditional farming systems in rainfed areas. Livestock directly contributes to nutritional security at the household level. Large ruminants (cattle and buffalo) and small ruminants (sheep and goat) contribute meat, milk, fibre, manure, and other functions that are significant to the productivity, stability and sustenance of farming systems in rainfed areas. Nearly two-thirds of farm households are associated with livestock production as a resilient mechanism to crop production and 80% of them are small landholders. In addition to making up more than a quarter of the agricultural GDP, livestock is the main or secondary source of income for 18 million people.

Most of the traditional livestock production systems in rainfed areas have native indigenous breeds and are primarily maintained on natural pasture lands/waste lands along with feeding household coarse crop residues. Livestock productivity is constrained by the low quality of native grasses and crop residues, a shortage of green fodder, extreme environmental conditions, insufficient health care measures, and the incidence of endemic diseases. As a result of various socio-economic and market-driven factors, during the last decade, large-scale transformations took place in both extensive and intensive livestock production systems with regard to the type and breed of livestock. A lot of high-yielding,

low disease resistant and more vulnerable crossbreed livestock populations have been increased even in rainfed livestock production systems to meet the market demands. Mechanization in agriculture in recent years has led to a 10–15% reduction in the availability of coarse cereal crops for livestock feeding.

Climate change impacts on livestock

Climate change would have a significant impact on the economic viability and production of not only high-yielding intensive livestock production systems, but also traditional extensive livestock production systems. Drought and high ambient temperatures, affect the production of milk, meat, and eggs, as well as reproduction, the health of livestock, and the condition of pastures. Heavy rains and associated floods would wash out the fodder resources and livestock. Severe hail storms cause brutal injuries to grazing livestock.

If the animals are not properly protected from high temperatures during summer or the night chills during winter, it results in lower intake of the nutrients necessary to support milk yield and body maintenance. Further, it can also decrease nutrient utilization efficiency and lead to increased loss of sodium and potassium electrolytes during summer. Summer heat waves and winter storms cause death of vulnerable animals impacting substantial financial loss to farmers. Heat stress reduces

the production of high-producing dairy cows and the conception rates by as much as 36%. Sudden temperature changes, either a rise in temperature max (>4°C above normal) during the summer or a fall in temperature min (3°C below normal) during the winter, causes decrease in milk yield in crossbred cattle and buffaloes. A rise in ambient temperature has a negative impact on growth, puberty and maturity of livestock.

Indirect effects of climate change on livestock production include alteration in the quantity and quality of feed and fodder availability and the severity and distribution of livestock diseases and parasites. A plunge in green fodder availability due to low rainfall is the first major effect on livestock production systems. Low rainfall causes poor pasture growth from grazing lands and also results in a decline in dry fodder supplies in the form of crop residues. Increased lignification reduces the digestibility. Scarcity of drinking water sources for livestock has a bearing on livestock feed production systems and pasture yield. During heavy rains and or floods, all the crops including fodder are damaged. Wet conditions increase the risk of infection by internal parasites such as round worms, tape worms, liver flukes, as well as many epidemic diseases such as FMD, HS, BQ and others. There may be non-specific water borne infections causing diarrhoea and other enteric diseases. Livestock that have been standing in water for prolonged periods of time may get pneumonia or foot rot problems.

Livestock management strategies to sustain production

Management strategies include integrated farming systems, enhancing feed and fodder production, protection from extreme environmental conditions, immunizing against endemic diseases, mitigation of nutritional deficiencies (protein, vitamins and minerals), providing wholesome clean water throughout the year, maintaining hygiene, etc which help in minimizing losses in livestock production systems.

Integrated farming systems: The most important in building the resilience of livestock production systems in rainfed areas is promoting integrated farming systems. Integration of crops, horticulture and livestock along with vermicomposting as value-addition practice has been found to have maximum gross and net returns. Inclusion of 10–20 synthetic poultry breeds like Giriraja, Vanaraja, Gramapriya and Rajasree at backyard with available food grain wastes/grain by-products (broken rice, rice bran) from the cropping system will also provide additional income through sale of eggs and chicken. All these types of systems are suitable for low annual rainfall zones of 500–750 mm. Crop-dairy animals integrated systems with high yielding graded Murrah buffaloes and crossbred cows and crops are recommended for high annual rainfall areas (>1000 mm) having irrigation facilities. These areas generally produce surplus crop residues besides cultivation of fodder crops and farmers are also resourceful to purchase feed supplements. In these systems, inclusion of 10–20 synthetic poultry breeds like Giriraja/Vanaraja/

Gramapriya/Rajasree, etc at backyard will further boost the income of the farmers. Crop-livestock-poultry-fishery integrated farming systems are mostly suitable for very high rainfall areas, where paddy is cultivated both in rainy (*kharif*) and winter (*rabi*). Cows and buffaloes are maintained at backyard with crop residues and supplements. Fish is reared in farm ponds and poultry is maintained in cages over the pond with grain and bran supplementation. The droppings of poultry serve as feed for the fish in the pond.

Enhancing feed and fodder production: Due to low or non-availability of arable land for fodder cultivation, green fodder availability both qualitatively and quantitatively is much lower than requirement, leading to many nutritional deficiencies and lower livestock production. Hence, each farmer should at least allocate 10% of their land for fodder production. Alternatively, farmers should be encouraged to grow two or more annual fodder crops as sole crops in mixed strands of legume (Stylo or cowpea or hedge lucerne) and cereal fodder crops in *kharif* followed by berseem or lucerne in *rabi* to increase nutritious forage production round the year in rainfed areas. Further, on the bunds of soil and water conservation structures, seeding of fodder varieties like Stylo and Cenchrus must be encouraged. High yielding perennial (hybrid Napier varieties like CO-3, CO-4, APBN-1) and multicut fodder varieties (MP Chari, SSG) could be promoted as fodder crops under irrigated conditions using micro-irrigation. Short duration fodder crops like sorghum and maize could be encouraged on tank beds. Fodder crops like *Stylo hamata* and *Cenchrus ciliaris* can be sown in the inter spaces in orchards or tree plantations as horti-pastoral and silvo-pastoral systems for fodder production. Perennial deep rooted top feed fodder trees and bushes such as *Prosopis cineraria*, *Hardwickia binata*, *Albizia* species, *Ziziphus nummularia*, *Colophospermum mopane*, *Leucaena leucocephala*, *Azadirachta indica*, *Ailanthus excelsa*, *Acacia nilotica* trees and thornless cactus are highly drought tolerant and produce top fodder hence, need to be promoted in degraded lands. Utilization of inter spaces in tree systems with drought tolerant grasses such as *Cenchrus ciliaris*, *Cenchrus setigerus* and *Lasiurus*



Fodder production along with cotton crop at farmer's field

sindicus enhance forage production. Further, use of unconventional resources as feed like palm press fibre, fruit pulp waste, vegetable waste, brewers' grain waste and all the cakes after expelling oil, Azolla production at homesteads and hydroponic fodder production with barley, oats, lucerne, and maize sustains the availability of green fodder throughout the year.

During early season drought, short to medium duration cultivated fodder crops like sorghum (Pusa Chari Hybrid 106 (HC 106), CSH 14, CSH 23 (SPH 1290), CSV 17) or bajra (CO 8, TNSC 1, APFB 2, Avika Bajra Chari (AVKB 19) or maize (African tall, APFM 8) which are ready for cutting by 50–60 days and can be sown immediately after rains under rainfed conditions in arable lands during *kharif* season. If a normal rain takes place in later part of the year, *rabi* crops like berseem (Wardan, UPB 110), lucerne (CO 1, LLC 3, RL 88) can be grown as second crop with the available moisture during winter. In wastelands fodder varieties like Bundel Anjan 3, CO 1 (Neela Kalu Kattai), *Stylosanthes scabra* can be cultivated for fodder production.



Azolla production: A boon for lean period and protein sufficiency in livestock

Efficient utilization of available feed resources: Livestock production in rainfed areas is predominantly dependent on the efficiency in use of the available coarse crop residues along with grazing resources and supplementation of green fodder or conserved silage or concentrate mixture. The limited purchasing power forces farmers to manage livestock by carefully adjusting the resources and production factors of their farms. Hence, capacity development of the stakeholders about feeds and fodders and their efficient conservation and use should be imparted as action learning along with providing chaff cutters in each village. Conservation of excess green fodder in the form of silage for feeding during lean season need to be promoted for sustenance of milk production by training and supply of silage bags. Soaking chopped crop residues in 2% molasses/jaggery solution or 1% salt/molasses/jaggery solution for 1–2 h and feeding later increases digestibility by 10–15%, hence these things need to be demonstrated. Further, establishing complete feed mills at sub-district level would help in efficient utilization of all the available

crop residues for feeding livestock especially during lean season or drought. To meet the nutrient requirement of huge livestock population in India, it is essential to improve the fodder quality of cereal and legume food crops through crop improvement programs. Tree leaves and pods have been traditionally used as source of feed especially for small ruminants and serves as protein banks to supplement grass or crop residues in dry season, hence efforts should be made to promote top fodder production systems. Supplementation of feed blocks, mineral blocks, vitamins, and mineral supplements is crucial during the lean season for the sustenance of livestock productivity. Hence, huge campaigns should be conducted to enlighten about the importance of micronutrients.

As most of the livestock depends on common property resources (CPRs) for nearly about 60% of daily feed requirements, proper management of CPRs play a crucial role in sustainable livestock production. As there is no control over the number of livestock allowed to be grazed, causing severe damage on the regrowth of herbaceous species in grazing lands, impacting severely not only on herbage availability but also on the productivity of grazing livestock. CPRs need to be reseeded with high-producing legume and non-legume fodder varieties at every 2–3 years intervals as a community activity. Further, grazing restriction till the fodder grows to a proper stage as community decision would improve the carrying capacity of CPRs. Introducing grass species, legumes and tree fodder species into grazing lands and application of nutrients during the monsoon would enhance the availability of feed and fodder from CPRs and also enhances carbon sequestration in soils.

Use of sprinkler and or rain gun systems for fodder production, cleaning of livestock with recycled water, high yielding and low water required multi-cut fodder varieties, improving CPRs productivity through re-sowing and weeding would increase livestock water productivity.

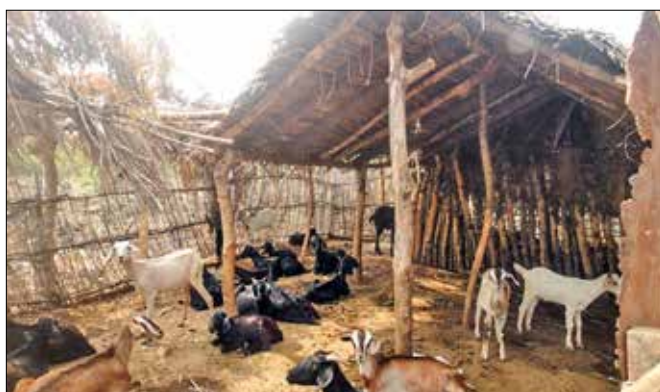
Eradication, containment and surveillance of diseases: Diseases result in reducing the livestock population through death or culling, reducing productivity of livestock, creating market shocks when demand falls and supply contracts in response and



Horti-pastoral system supporting Nellore Zodipi ram lamb production

disrupting international trade in livestock products. They decrease the productivity of livestock by reducing the efficiency of livestock converting feed into meat, milk and eggs. Hence, participatory disease surveillance, early forewarning, timely immunization against endemic diseases, quarantine of sick animals would help in containment of disease epidemics. Ring vaccination (5 km radius) and restriction of livestock movement prevents spreading of contagious diseases in rural areas in the event of any outbreak. Proper maintenance of hygiene in the shed, regular deworming and external parasite control would sustain livestock production.

Housing management: It is very essential especially under extreme weather conditions. The type of housing needed will depend on the climate, topography and the production system. Cost of construction, ease of cleaning, proper ventilation and drainage, hygiene maintenance and adequate lighting are important aspects to be considered in designing a housing for livestock. The basic requirement of good livestock housing is that it should alter or modify the micro-environment for the benefit of livestock and also protect them from predation and theft. Livestock housing should buffer the livestock from climate extremes to reduce stress allowing optimal livestock performance in terms of growth, health and reproduction. A proper housing should meet livestock requirements and serve the producers needs at low cost with locally available material.



Low-cost housing can reduce heat stress at farmer's field

Breeding management: Majority of the local breeds are having better adaptive capacity to harsh living conditions. Hence, one should identify and strengthen

local breeds that have adapted to local climatic stresses and feed resources; improve local livestock through cross-breeding with heat and disease tolerant breeds and synchronize oestrus in livestock based on the availability of feed resources and favourable climatic conditions making use of artificial insemination and embryo transfer technology.

Capacity building of livestock keepers: It is essential to improve the capacity of livestock producers and herders to understand and deal with all problems including climate change impacts in the long run. Capacity building training programmes on technologies and practices for the production and conservation of fodder along with better health management practices certainly improves the supply of livestock feed supply and animal health in livestock.

Institutional and policy support: Introducing subsidies for fodder production, establishment of complete feed mills, insurance of livestock, income diversification practices and establishing livestock early warning systems and other forecasting and crisis-preparedness systems could strengthen livestock production systems in dealing the extreme events. Finally, promoting farmer producing organization (FPOs) in livestock sector could make the livestock farmer in easy access to the government schemes and benefits.

SUMMARY

Livestock has a greater role in the economic development of the rainfed areas, helping to lift farmers out of poverty and build sustainable livelihoods. The livestock production in rainfed areas is mostly based on the availability of fodder and water. Therefore, it is essential to incorporate specific and regionally-sensitive policies and measures to promote fodder production and efficient utilization, native high-yielding breeds, infrastructure for the livestock sector etc considering the positive role of livestock in achieving sustainable food production. There should be an investment in research and development to promote and support livestock integrated farming systems that are good for the environment. This will give rural communities a steady source of income.

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Jai Kisan, Jai Vigyan

- A total of ₹ 788.33 crores have been sanctioned for opening six new agricultural colleges for eastern India under Central Agricultural University, Imphal, and a new Central Agricultural University in Meghalaya.
- For the establishment of two new agricultural research institutes in Asom and Jharkhand, a sum ₹ 100 crores is allocated.
- First academic session of the Rani Lakshmibai Central Agricultural University has been allocated for four new agricultural colleges in Datiya and Jhansi.
- An Memorandum of Understanding was signed for transforming the Rajendra Central Agricultural University, Pusa, Samstipur, Bihar. A proposal of ₹ 400 crores is submitted in EFC.
- Post-Graduate Institute of Horticulture is being established in Amritsar, Punjab.
- Foundation stone of the Indian Institute of Agricultural Biotechnology is laid at Ranchi for promoting agricultural biotechnology.