JUST AGRICULTURE
multidisciplinary e-Newsletter

Forage production and livestock scenario in arid region of Rajasthan

Pankaj Lavania[1] and Kailash Chand Bairwa[2]

[1]College of Agriculture, Jodhpur (Agriculture University, Jodhpur), Rajasthan

[2]College of Agriculture, Baytu-Barmer (Agriculture University, Jodhpur), Rajasthan

ARTICLE ID: 001

Introduction about the region:

Rajasthan state is having area of 3.42 Laces Sq. Kms and is` the Largest state in the Country. It is having 33 Districts under seven administrative divisions. The hot region of nearly 62% lies in the state of Rajasthan covering 12 Western districts of Barmer, Bikaner, Jaisalmer, Jodhpur, Churu, Nagaur, Jalore, Jhunjhnu, Sikar, Pali, Hanumangarh, and Ganganagar. It is relatively sparsely populated having total human population of 5.6 Cores, 77% of this reside in the rural areas andmost of them having un-irrigated small or marginal land holdings. Large part of the state is arid or semi arid fall under Thar Desert and having adverse climatic conditions with scarcity of water for irrigation and erratic rains with very low average annual rainfall worsen the conditions. This is the reason which increases the importance of Animal Husbandry sector over the Agriculture as crop production become insecure due to scarcity of rains and underground water especially during recurrent droughts. It is, therefore, not inappropriate to conclude that the major stay of rural economy in hot arid region is still animal husbandry. In addition to provide quality nutrition in terms of meat and industrial raw material (wool, leather etc.), Small ruminant-based animal husbandry also enhances the economic viability and sustainability of farming system. Arid region of the country is certainly better placed than rest of the region in terms of meat and fibre. That may be reason that the people in this area suffer less from energy- protein deficiencies and hunger despite the lower crop production. The region suffer from low and erratic annual rainfall precipitation (100-410 mm), high evaporation (1500-2000mm) and poor physical and fertility condition of soil making crop farming a big gamble.

Importance of livestock with population in the region:

JUST AGRICULTURE
multidisciplinary e-Newsletter

As per 2019 Livestock census Rajasthan possesses 13.9 million Cattle, 13.7 Million Buffaloes, 7.9 sheep, 20.84 Million Goats 56.8 Million having total livestock population. The state possesses 11% of the total Livestock population of India that yield almost 9.10 % of the total milk production, and 35.10 % of the total wool production. Animal husbandry plays an important role in live hood security and economic sustenance of people. The arid region has about 28.57 million livestock population which during last century has increased by 61%. The man: livestock ratio is much higher in arid areas and presently per 100 human populations there are 124 livestock numbers in the area which may go to 200-300 is extreme districts of this zone indicating economic dependency of farmers on livestock husbandry. The draught in the arid region is a common occurrence with frequency as high as 48 to 63 in past century and sometimes persistent of 3-6 years, which affect agricultural and fodder production. The frequent draught leads to complete failure of crops very often, so much so that a good crop year has been observed to have a cyclic nature of 11 years. This coupled with degraded pastures due to over grazing cause feed deficit for large populations of animal. Livestock farming contributes significantly to the economy of the arid region but because of management needs it involves much more intensive use of labor as compared to crop farming. Dairy enterprise in turn involves more intensive use of labor as compared to sheep and goat farming. On an average 5.5 man hours per household per day during monsoon are utilized in dairying and only 1man-hour is utilized per adult cow unit. Therefore, at the present level of production with cattle and cow unit, dairy alone provides employment of 10 million man-hours per day. This sector has proved as a means to provide stability with a consistent growth rate of over 6% per annum.

Strength:

- Round the year employment opportunity with more than 50% of total house hold income in arid region as against 22.5% of National average**.**
- Technologically simple vocation as traditional, the arid farmers keep in proportioning to the free crop residues and family labour in their own households production system**.**
- Most important economic activity in arid zone (More than agriculture).
- Women empowering.
- Labour intensive
- Rural self employment

JUST AGRICULTURE
multidisciplinary e-Newsletter

- More than 75 rural households have livestock as an important component.
- Average income from livestock 30-35% whereas reaches 60-80% from dairying.
- Draught proofing technology
- Traditional
- Technological simple & adaptive
- Ownership highly dispersed in ESWS
- In other agro-climatic zones it is next to agriculture

Animal husbandry also enhances the economic viability and sustainability of farming system. It diversifies production and management options; increase total farm production and income.

Major constraints:

- Climate
- Distant Pasture
- Prevalence of Important Disease
- Scarcities of feed and fodder resources
- Deficiencies
- Toxicity
- Pesticides
- Feed additives
- Drugs
- Environment pollutants

Forage production scenario:

The fodder production vary widely depends on the cropping pattern, socio-economic conditions and type of livestock. The dairy animals are normally fed on the fodder available from cultivated areas, supplemented to a small extent by harvest –harvested grasses and top feeds. The three sources of fodder supply are crop residues, cultivated fodder and fodder from common properly resources, viz. Forests, permanent pastures and grazing lands. The deficiency in feed and fodder is identified as one of the major constraints in achieving desired level of livestock productivity. Current need for the animal fodder and other nutritional requirement falls shortly by huge margin of which green fodder accounts for about 60% and dry fodder accounts for about 20%. This corresponds the deficit of 28% CP and 24% TDN. In Rajasthan the fodder deficit in Western Rajasthan is estimated to be as high as 60% of the demand and

JUST AGRICULTURE
multidisciplinary e-Newsletter

might range from 55% in western Rajasthan districts of Bikaner, Jaisalmer and Barmer to 69% in the Central districts of Jodhpur, Nagour and Churu and 72% in the eastern districts of Pali and Sikar. The acute shortage in the central and eastern districts is on account of extensive cropping, fragmentation of land holding, intensive cultivation and shrinkage of pastures and grazing land.

Important forage crops of the region:

During normal rainfall year crop residues viz., bajara (pearl millet) kadbi, dry leaves and plant of green gram, moth bean, cluster bean, cow pea, Lucern, wheat straw, Sorghum, Maize etc. became the main source of animal feed. Besides, Arid grasses (*Dicanthium annulatum, Cenchrus ciliaris, Cenchrus setigerus, Lasiurus sindicus, Panicum antidotale, Panicum turgidum)* tree based top feeds (*Acacia tortilis, Acacia nilotica, Acacia Senegal, Prosopis cineraria, Prosopis juliflora*) pala (leaf fodder of *Zizyphus numealria)* and legumes (*Lablab purpurus, Clitoria ternatea, Atylosia scarabaeoides*).

Table-1: Source of forage production in Rajasthan:

Name of forage	Crops
Kharif crops	Pearl millet, Sorghum, Maize, cowpea, cluster bean, moth bean, Kura grass, Napier x Bajra hybrid, Teosinte, etc.
Zaid crops	Pearl millet, Sorghum, Maize, cowpea, Kura grass, Napier x Bajra hybrid
Rabi crops	Oat, Barley, Berseem, Lucerne, Maize, Senji, Mustard, Pea, Fenugreek, Kasani, Napier x Bajra hybrid, etc.
Crop residues	Straw of wheat, barley, oat; Stover of Pearl millet, Sorghum, Maize, Residues of pulses and oilseeds like moong, moth, cowpea, cluster bean, groundnut, etc.
Weed plants	Weed plants received after weeding of arable crops during kharif and rabi season.
Trees/shrubs	Khejri, Bordi, Jal, Ker, Vilayati babool, *Acacia* species, Neem, Gundi, Bui, Kheep, Dhav, Phog, etc.
Grasses	Anjan/Dhaman, Moda Dhaman, Sewan, Karad, Gramna, Bhurat, Aristida, Sporobolus, etc.

Technological interventions for enhancing Forage Resources:

JUST AGRICULTURE
multidisciplinary e-Newsletter

- Selection of suitable fodder crops according to agro-ecological situation:
  - For rain fed situation single cut crop/varieties
  - For timely sown irrigated situation multi cut crop/varieties
  - For late sown irrigated situation single cut crop/varieties
  - Suitable crop and varieties for problematic soil and water situations
- Validation and adoption of significant varieties of cultivated fodder crops under different agro-ecological situations through farmer participatory action.

Table-2: Significant varieties of cultivated fodder crops for western Rajasthan:

Fodder crops	**Significant varieties**
Pearl millet	Giant Bajra, Raj Bajra Chari-2,Raj-171, JBV-2, JBV-3
Sorghum	SSG-59-3, MP-Chari, CSH-24 MF, COFS-29,CSV-15,20&23
Maize	PratapMakka Chari-6, J-1006, African Tall
NXB hybrid	APBN-1, CO-3, CO-4, PBN-233
Oat	RO-19, JHO-2000-4, JHO-851, OL-125, Kent, HJ-8
Barley	RD-2035,RD 2715
Lucern	ANAND -02 &03 and RL-88

- Fodder crop management technologies may be validated and popularized under different agro-ecological situations through famer participatory action research programme for enhancing fodder productivity.

Table-3: Suitable combinations of cereal and legume crops in western Rajasthan

S.N.	Mixed / Inter cropping of cereals and legumes
1	Bajra + Cowpea/ guar
2	Single cut Sorghum + Cowpea/guar
3	Maize + Cowpea
4	Oat + Mustard/Pea
5	Barley + Mustard/Pea

JUST AGRICULTURE
multidisciplinary e-Newsletter

- Promote cultivation of dual purpose crops/varieties for enhancing fodder production.

Crop/varieties basically cultivated for grain production, additionally provides huge amount of straw/Stover also.

S.No.	Crop with their varieties
1	Pearl millet: Raj-171, JBV-2, Pusa composite 443, GHB-558
2	Sorghum:CSV-15,17,20 and 23
3	Maize: Navjot
4	Wheat:Raj-3077,3765 and WH -1080

- Crop/varieties first harvested for green fodder and regenerated crop is managed for grain production such as Barley varieties: RD-2035 & 2715.
- **Judicious use of feed resources-Creation of fodder/feed banks at farmers field**

Karai: Karai is one of the indigenous methods of fodder storage in western Rajsthan. In this method fodder can be stored safely up to 10 years. The karai is made slightly away from the village. Locally available material is used for making the karai. It is made in such a way that the stored feed is safe from sun,rain water and high wind storms and also from human and animal's attack. The karai is conical in shape with 3-4 M dia at the base and 8M height. At the base peal millet and mustard straw is kept to safe guard the stored fodder against termite. The karai is covered with *Jhumpi* made of pearl millet stalk and is replaced every three years. The karai is provided with 0.5M wide 1-1.5M, deep trench around it to safeguard against domestic and wild animals.

JUST AGRICULTURE
multidisciplinary e-Newsletter

A View of Western Rajasthan

Pachawa: Pachawa is one another indigenous techniques of fodder storage in western Rajasthan. The capacity of the pachawa is as high as 1000 quintal. The shape of pachawa at the base may be circular, square or rectangular. The square /rectangular shape pachawa may be consumed slowly with time, whereas the circular shape once open is to be chafed in piece and stored in room / covered space and /or to be sold/consumed. While erecting the pachawa its longest side should be kept parallel to the commonly blowing winds to avoid any overturning. Mustard and sesame's stalk along with other dry grasses are spread over (1-1.5M thickness) raised floor to safeguard against termite. Total height of the pachawa is kept around 6-8M whereas width is kept under 4-5M. After attaining the height (6-8M) the top surface is made like inverted "V" and is covered with thatched roof (V- shape) made using the pearl millet stalks. The pachawa is provided with dry branches of thorny plant up to 2-3 M height and an open trench 0.5m wide 1-1.5m deep around it provide safety against domestic and wild animals.

JUST AGRICULTURE
multidisciplinary e-Newsletter

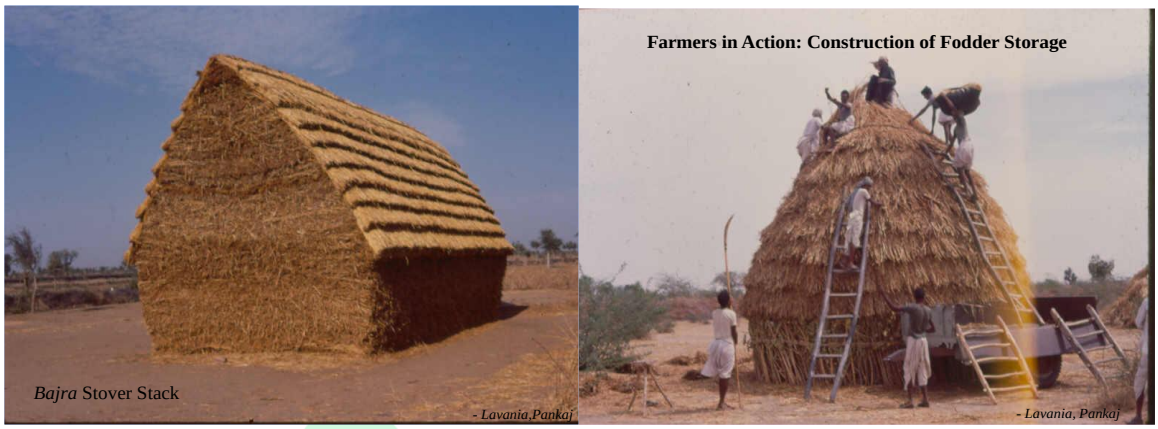

Fig. Pachawa and Karai

Conclusions:

A wide gap in demand and availability of fodder and feed in arid western Rajasthan is reflected in low productivity of animal health, so important for sustainable livelihood. There are opportunities for augmenting productivity of forage in arid regions. Traditional systems of "Orans" need to be rejuvenated and maintained to reduce pressure on grazing lands. Improved grassland technologies envisaging protection of area, reseeding with high perennial grasses, soil and water conservation, Utilization of pasture. The non-conventional systems viz., silvi-pasture and horti-pasture and forage production systems can be widely adopted on wastelands constituting 1/3rdof arid region in western Rajasthan.

References:

- Balak R., Narain, P. ,Sharma, J. R., Nagaraja, R and Jayanti, S. 2005. *Wasteland Management in Arid Western Rajasthan* – A joint publication of CAZRI, Jodhpur, RRSC, Jodhpur and MRSC, Hyderabad.
- Choudhary, A. L., Gahlot, A. K. and Beniwal, B. K. 1999. Livestock resources management in arid region for food security and export promotion. Paper presented in the 4th Agricultural Science Congress, 21-14, February.
- Narain, P and Singh, R. S. 2002. Drought scenario in arid western Rajasthan. In: Drought Management in Indian Arid Zone (Eds. Narain, P, Joshi, D.C. and Kathju, S.). CAZRI, Jodhpur, pp 16-29.
- Patidar, M. 2006. Strip cropping of grasses and legumes in silvipastoral system. In livelihood security and diversified farming system for arid region organized by Arid Zone Association on India held at CAZRI, Jodhpur during 14-17, pp 33.

JUST AGRICULTURE
multidisciplinary e-Newsletter

- Rai, P., Solanki, K. R. and Rao, G. R. 1999. Silvipasture research in India. A review 1:107-120.
- Shankar, V. and Kumar, S. 1987.Grazing resources of semiarid and arid regions. In: pasture and forage crops Research (Ed. Panjab Singh), IGFRI, Jhansi.pp-44.