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Livestock and fodder production: A potential source of livelihood for Bihar region

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Abstract

Changes in food consumption habits, related to economic development, and combined with changing demographics, are contributing to increased demand in for livestock products all over the world. Livestock sector plays an important role in employment and income opportunities for the rural people of Bihar. In particular, Bihar is known for its high production of milk from cattle, buffalo and goat, making the livestock sector one of the major sectors with the potential to help in accomplishing the state's development goals. The contribution of livestock sector of Bihar is about 5 percent to total state GDP or GSDP, but this is lower than other predominantly agricultural states such as West Bengal. Inadequate fodder supply is one of the main constraints of livestock production in Bihar. The various reasons contributing to inadequate fodder supply are fragmentation of land, lack of infrastructure and storage house, monsoon dependent agriculture, frequent occurrence of floods and various technological constraints. Filling the wide gap between the demand and supply of fodder becomes the urgent need of the present scenario. This paper presents the various constraints related to livestock and fodder production in Bihar and also deals with the possible mitigation measures to lessen the gap between demand and supply of fodder as well as to improve livestock production.

Keywords: Bihar region, fodder production, forage production, livestock production, technological intervention

Introduction

India's supply of fodder is inadequate, resulting in very low productivity levels that reduce the marketable surplus of milk. More than 50 percent of the land area in Bihar state is planted with rice, and the major livestock feeds include rice straw along with wheat straw and some pulse residues. Recent studies have illustrated the issue of inadequate food and the low nutritional value of fodder in the Indo-Gangetic plain. The problem becomes more severe in the eastern parts of the area, where agricultural resources are scarcer, especially arable land and water. The major and essential part of animal production is fodder. The production of feed and fodder resource development is predominantly achieved through the supply of inputs and extension facilities. Bihar has set up 10 fodder block manufacturing units as a Fodder Bank in order to support farmers by supplying their animals with fodder blocks during disaster times such as drought and floods. In addition, fodder seed minikits distribution programme was introduced to foster the need for state animals at the tune of 90,000 minikits (kharif and Rabi) in 2009-10 and 1,70,000 fodder seed minikit (Kharif and Rabi) in 2010-11 ^[1].

Importance of Livestock with population in the region

The significance of the livestock sector in the state economy can be recognized by the fact that it has contributed over 45 percent to the state agricultural GDP, which is far higher than the national level (Gross National Agriculture Production) contribution of this sector, which lies at 27 percent ^[2]. Small land holders dominate agriculture in Bihar, as the average size of land holdings is small about 0.37 ha and approximately 78 percent of farm holdings are smaller than 0.50 ha with an average land holding size of 0.10 ha.

Table 1: Animal population status in Bihar (GOI census report, 2019)

Particulars	Population (millions)	Particulars	Population (millions)
Cow Population	15.3	Pig	0.34
Buffalo Population	7.7	Horses	0.32
Goat Population	12.82		

In India, livestock is a source of subsidiary income for many families, particularly the resource poor who possess few animal heads. Cows and buffaloes can provide the livestock farmers with regular income through the selling of milk. During crises, livestock such as sheep and goats act as sources of income to fulfil requirements such as weddings, treatment of sick members, schooling for children, home repair, etc. The livestock can act as moving banks and properties that provide the owners with economic security. A significant number of less literate and unskilled individuals in India relies on agriculture for their livelihoods. However, being seasonal in nature, agriculture can provide jobs for a maximum of 180 days per year. Landless and people with marginal land holdings are highly dependent on livestock during the lean agricultural season.

Animal items such as milk, eggs and meat are an essential source of animal protein not only to the owners of livestock as well as to their family members also. Milk availability per capita is around 375 g/day while that of eggs are 74/annum during the year 2017-18. Livestock provides social security to their owners. Particularly, the landless families who own animals are better positioned in the society than those who do not. Gifting of animals during weddings is indeed a very common practise in various parts of our country. The rearing of animals is part of the tradition of India. For different socio-religious functions, animals are used. Cattle for house warming rituals; rams, bucks, and chickens during festive occasions for sacrifice; Bulls and cattle are worshipped during numerous cultural functions. Many owners develop emotional connection to their animals. The bullocks form the back bone of Indian agriculture. In particular, marginal and small farmers depend on bullocks to plough, bear and transport both inputs and outputs. Dung is used for many purposes in rural areas, including fuel, fertiliser (manure from the field yard) and plastering material.

Dairy farmers in Bihar are predominantly smallholders with one or two local breed milch animals, which are fed with crop residues and natural pastures. Feed and fodder shortages are significant limiting factors in increasing livestock production.

Present scenario of livestock production in Bihar

The state's present milk production is 10 million tonnes per annum, growing from 2.7 million tonnes in 2001-02 with 8% compounded annual growth rate. By 2022, it was aimed to carry production volume to 14.867 million tonnes per year. In 2016-17, the state's egg production was 11,116.68 lakhs per annum, which was targeted to cross 234,000 lakhs per annum by 2022. In 2016-17, state meat production was 326,260 tonnes per annum, which was targeted to rise to 1423.5 thousand tonnes per annum by 2022. In 2018, total fish production was 6.5 lakh MT^[3] and projected to rise to 10.25 lakh MT by 2022.

Major constraints

Bihar state agriculture faces multidimensional challenges that come both from inside and from outside the system. State agriculture has historically been characterized by low

productivity across all enterprises, crops, horticulture, milk, poultry, eggs and fish. Low productivity has a direct impact on the population's low income and high poverty levels. As mentioned below, the major variables that contribute to low productivity are following:

Technological factors: There are 2 agricultural universities, 5 agricultural schools, 1 college for horticulture, 1 college for agricultural engineering, 1 college for dairy technology, and one state veterinary college in Bihar. There is a working Krishi Vigyan Kendra (KVK) in all 38 districts. ICAR has also a presence with eastern states regional headquarter at Patna. In addition, the National Research Centre for Litchi and Makhana has been set up in the state. Productivity of state, however, remains poor due to slow farmers adoption of new technology. In the cropping pattern, cereal dominance represents the subsistence nature of state agriculture. The institutional extension framework is facing the challenge of bringing the new innovations to the area of farmers.

Land issues: With a farm size of less than one hectare, more than ninety one percent of all holdings falls under the group of marginal holdings. Further, each of these holdings is again broken into small fragments. Land documents are outdated, making it almost impossible for any institution to invest. Small farming poses significant obstacles for economies of scale.

Rainfed agriculture: State agriculture relies heavily on monsoon. Drought or drought-like conditions have existed for 4 consecutive years in the last five years. Kharif crops are almost a gamble, leaving little chance of expensive product investment. Irrigation from the canal is meagre. Irrigation relies primarily (70 percent) on tube wells based on diesel. Owing to high cost of diesel-based irrigation, farmers find it very difficult to use even for rabi crops.

Lack of infrastructure: Access to roads and availability of power to the agricultural sector are insufficient to promote rapid agricultural production in the province. Another important issue that impacts the quality of feed and forage and presents a hazard to the health of livestock is the depletion of large quantities of available feed and forage due to contaminants and pollution during transport and storage.

Lack of institutional credit: The slow speed of Kisan Credit Card implementation leaves a large number of farmers relying on high-cost sources of non-institutional funding, seriously hindering the use of modern agricultural inputs and the adoption of new technology.

Flood & Drought-State agriculture relies heavily on the monsoon. An extreme precipitation leads to flooding and a weak precipitation may contribute to drought. Almost every year, the problem of floods and drought happens concurrently, leaving cultivation incredibly fragile and unpredictable.

Forage production Scenario

In order to increase livestock production in Bihar, adequate and balanced feed and fodder availability is required, crop residue and crop by-products are the key sources of livestock feed, while goats are normally maintained on tree leaves and grazing^[4, 5]. Feed and fodder shortage is one of the most serious obstacles to the sustainable production of livestock, which directly affects the revenue and livelihoods of various

resource-poor livestock keepers. Many feeding restrictions, such as feed, fodder and concentrate shortages, influence livestock capacity and cause tremendous losses in terms of livestock productivity and depletion. Research shows that feed-related issues in dairy animals accounted for about 36 % (per annum in value terms) loss [6]. Losses at the national level due to lack of dry and green fodder were reported at 11.6 percent and 12.3 percent respectively [6]. Around 20 lakh hectares of land are available for grazing in Bihar over the year, including waste land, cultivable waste land, pasture tree and plantations, fallow land and some sections of forest. For livestock keepers, minimizing dry fodder scarcity and maintaining the supply of green fodder during the year is a severe challenge, since most of the livestock keepers are small and marginal holders who are unable to generate and store livestock feed and forage in bulky amount and therefore experience intense shortages at some periods. This poses a significant challenge and is a big hindrance to the production and productivity of livestock in Bihar.

Table 2: Estimated normal demand for concentrate, green fodder and dry fodder for livestock and poultry in Bihar Source (Department of Animal and Fishery Resources, Govt. of Bihar, 2019)

Particulars	Quantity (IN Million Tones)
Dry fodder	2.48
Concentrate	5.88
Green fodder	38.17

By 2025, at the national level, there will be a difference of around 65% between green fodder demand and supply and for dry fodder it will be 25%. In Bihar, these differences are much more troubling. The state has 36.5 million animals, which represents 56.8 percent of the total animal population of India [2]. The estimated annual requirements of, green fodder, dry fodder and concentrates for the livestock in Bihar are 38.2 million tonnes, 24.8 million tonnes and 5.9 million tonnes, respectively. Conversely, just 85 percent of the dry fodder needs and 4.4 percent of green fodder can be fulfilled by the state. It is necessary to bridge these gaps in order to achieve desirable growth in dairy and other livestock production, which is vital to achieve 4% national agricultural growth. Therefore, it is necessary that the supply chains of fodder and the positions of different factors affecting this chain are recognized and better understood to alleviate the country's feed and fodder shortage.

Important Forage Crops of the region

Two separate zones have been generated in Bihar by frequent floods and changing cropping pattern in terms of fodder availability, while the northern region is generally deficient in fodder availability, most of the areas in the southern sections are surplus areas, especially in terms of dry fodder. The key sources of dry fodder in Bihar are residues of the major crops, notably rice, wheat, maize and pulses in the form of paddy (uncut paddy straw) Bhusa (wheat straw) and Kutti (cut paddy straw).

Table 3: Kharif season fodder crop in Bihar region

Crop/varieties	Sowing time	Harvesting	Productivity	Protein (%)
Jowar: PC-6, PC-9, PC-23, MP Chari, Multi-cut varieties: SSG-998,898,555	June-July	1 st cut: 55- 60 DAS Subsequent cuts:35-40 DAH In multi-cut varieties:50 DAS	400 q/ha Multi-cut varieties 500-600 q/ha in 3 to 4 cutting	8%
Maize: African tall, Vijay, Moti, Jawahar	June-July	At Cob formation	400 q/ha	8%
Lobia: UPC 4200,5286,287	June-July	At flowering stage	350 q/ha	16%
Bajra: L-72,74, Jaint bajra, ABKB 19	June-July	At flowering stage	300 q/ha	8%
Guar: Bundel, Guar 1, 2,3	April-August	At flowering stage	300 q/ha	8%

Paddy and wheat straw are used as the primary dry fodder by all types of dairy farms in the surplus zone and urban industrial dairy farms in the deficit region. In the surplus region, pulse straw accounted for less than 5 percent of the overall dry fodder used by dairy farms and less than 2 percent for rural dairy farms in the deficit sector. Since in deficit region is a maize growing area, a considerable amount of maize stover was used by rural commercial dairy farms there. In the deficit region, all maize stoves were not used as fodder since a significant amount was either used as fuel, especially by low income households, or burned in the field. The key green fodder in Bihar is berseem, cut grass, green oats, and

maize, with berseem being the dominant green fodder in the surplus region and maize in the deficit region. Agriculture in the surplus region is more developed with adequate irrigation facilities for berseem production. In the deficit sector, maize is a major crop and it's one of the essential green fodder. In both regions, cut grass has become a significant green fodder for rural commercial dairy units, primarily due to easy accessibility. Oats, particularly in the deficit zone, but not in the surplus zone, were also used as fodder. In the deficit region, prior to growing early summer vegetables, oats are cultivated as a green fodder crop. Bamboo leaves are also fed into the deficiency zone as green fodder.

Table 4: Rabi season fodder crop in Bihar region

Crop/varieties	Sowing time	Harvesting	Productivity	Protein (%)
Oats: Kent, UPO 100, JHO-851,822, Bundel Oat-851	2 nd fortnight of October	1 st cutting 65 DAS Subsequent cuts: 30-40 days	450-550 q/ha in 2-3 cutting	8%
Berseem: Mescavi, Ludhiwana-1, Wardan,Khadravi, Bundel berseem-2,3	2 nd fortnight of October	1 st cutting 45-50 DAS Subsequent cuts:after each 25 days	5-6 cutting 600-1000q/ha + seed 3-4q/ha	16%
Lucene: chetak, Anand-2, 25, Lucene type 6, SS 666, 627	2 nd fortnight of November	1 st cutting 45-50 DAS Subsequent cuts:after each 25 days	800-1000 q/ha	18%
Sarson- Japanese mustard 6	Sept-Oct	At siliqua formation stage	300q/ha	9%

Technological interventions for enhancing Forage Resources

Production of improved green fodder with enhanced nutrient content can boost dairy sector. Low-cost concentrate preparation from feed resources which are locally available. Poultry and livestock feed plants should be built in various zones to ensure availability of quality feed. Feed testing laboratory should be established and previously built laboratory should be modernized.

Intensive irrigated systems: The primary objective of the intensive forage production method is to enable effective use of scarce land resources and other agricultural inputs to get the most from the harvest in the form of biomass per unit area and time. Indeed, intensive cropping is the only option to improving irrigated land forage yield and overall productivity, covering around 30 percent of Bihar's cultivated area.

Multiple cropping: It consists of growing 3-4 suitable annual forage crops as single crops in mixed stands (leguminous and graminaceous) in one calendar year in order to significantly improve the quality of the foliage and to increase the productivity of the forage per unit area. The constant supply of quality forage is assured by selecting suitable crops or varieties and by adopting dispersed sowing and adequate harvesting schedules.

Association of perennial grass and legume components: The related legumes boost the quality of foliage both in terms of protein as well as minerals and helps to make the use of nitrogen fertilizers in more economical way. In addition, these systems of production are less costly and provide consistent employment options.

Year-round forage production through combination of perennial and annual forages: The requirements for green fodder of dairy farmers can be satisfied throughout the year and for marginal and small farmers requiring maximum forage from a single piece of land.

Animal Welfare Activities: Various welfare activities for animals via departmental programme such as assistance to goshalas, animal care practices such as caring for unproductive old livestock are funded by the state. Funds per layer of poultry farm are urgently needed. Provision of subsidy for the development of goat farms in the private sector.

Technical intervention: By changing traditional livestock production activities to modern husbandry techniques by incorporating best practices based on solid scientific principles and recognizable farmers participated result demonstrations. Bringing inefficient livestock resources into the domain of the priority development programme.

Conclusions

Livestock is an important part of Bihar's rural economy and fodder is a vital input for the production of livestock. A large difference remains between both dry and green fodder demand and supply. Most of the Agro-climatic zones IIIA and IIIB of southern Bihar are fodder surplus zones owing to irrigated paddy and wheat cultivation. Fodder deficits are in Agro-climatic Zone I and Zone II, and often rely on fodder surplus areas for their needs.

The production of fodder is seasonal, but demand is steady over the year or before the next season of cultivation. Insufficient storage facilities and room often cause farmers to dispose of more of their food instead of saving it for further use for their own uses or sales. In order to facilitate the production and exchange of produce, it is important to develop on-farm storage structures as well as the final route to distant markets. The markets for fodder are unorganized and unregulated and the involvement of the government or public sector is insignificant. Many fodder markets, often along roadsides and without legal certificates, exist without any designated market site. Relevant market places can promote the flow of market knowledge, improve exchanges between buyers and sellers, and encourage openness and competitiveness, leading to fair and equitable prices. Fodder being a bulky commodity, makes its marketing complicated and handling tough. Compressing devices are used by some merchants to produce fodder blocks. In order to ease handling and transport, it is important to develop cost-effective and reliable fodder compressing technologies. Control of quality of the concentrate and compound feed is also important. Both traders and consumers agree that a system should be in place to ensure the quality of the feed and dietary supplements provided. Developing cost-efficient and nutritious feeding technologies needs immediate attention, and research and development in the public sector may play an important role here.

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