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# An Overview of Livestock and Dairy Sector: Strategies for Its Growth in Eastern Indian State of Bihar

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## Abstract

*Livestock is a vital component of Indian economy in general and of agricultural sector in particular. In rural India over 15 – 20% families are landless and about 80% of the land holders belong to small and marginal farm size groups, livestock provides livelihood to two-third of the rural population. Livestock sector provides employment to about 8.8% Indian population. Contribution of livestock sector in GDP was 4.11% and it contributed 25.6% to the Agricultural GDP during 2018-2019. Livestock production constitutes an important component of Agricultural economy in Bihar as it assists in supply of food and nutrition, enhancement of income, livelihood and diversification of agricultural activities. Meanwhile, the livestock sub-sector contributed about 27% to the agricultural GSDP and 5% to state income or GSDP in 2012. Bihar has made great progress in dairy and is recognized for its high milk production from cows, buffalo and goats. Bihar's milk production increased to 92.41 lakh tonnes in 2017-18 from 71.97 lakh tonnes in 2013-14, indicating an annual growth rate of 6.33%, during the five-year period. Productivity of milk per lactating cattle was found comparatively low as compared to others states Like Punjab, Gujarat, UP and MP. Contribution of livestock share in GVOA was found 25.4% in TE-2002-03 and increased to 31% in TE-2013-14 in Bihar whereas, the all-India share of livestock in GVOA stood at 26% in TE 2013-14. The share of meat in the total value of output from livestock sector has declined while that of milk has increased. The share of milk in GVOA has increased from 14% to 23% between TE-2003-04 and TE-2013-14, while at the all-India level; the share of milk in GVOA remained at 17% during the same period. Bihar has immense potential in livestock and dairy sector. If harnessed properly by suitable policy initiatives could be helpful in augmenting income, generating employment and providing nutritional security to state in particular and nation in general.*

**Keywords:** Income, Livelihood Livestock, Milk, Nutrition

## Introduction

Livestock is an important constituent of the Indian economy in general and is an important sub-sector of Indian agriculture. In rural India where over 15–20% families are landless and about 80% of the land holders belong to the category of small and marginal farm size groups, livestock sector provides livelihood to more than two-third of the rural population (Economic survey, 2020). Livestock are a natural asset for the rural poor that can be liquidated in short period if and when required. Hence, it is a store of wealth and an insurance substitute during times of crisis.

The livestock revolution is expected to make a significant contribution towards livelihood security and reducing rural poverty. Majority of rural poor have little access to land resource, thereby limiting their opportunities in crop production activities. On the other hand, livestock wealth is more equitably distributed compared to land, and the expanding demand for animal food products generates significant opportunities for the poor in overcoming poverty through diversifying and intensifying livestock production (Kumar *et al.*, 2012). India's economy has not only grown but transformed. There has been uneven growth in the livestock sector in India, leading to an unequal distribution of benefits and the need to differentiate approaches to further development. Dairy development has followed a well-established organizational model producing a product for which local demand continues to grow (Singh *et al.*, 2012). Dairy farming has emerged as an important source of livelihood, particularly on small holder households. Livestock production constitutes an important component of Agricultural economy in Bihar and also in India as it assists in supply of food and nutrition, enhancement of income, livelihood and diversification of agricultural activities. The organic manure produced by livestock sector is an important input to crop production, and dung from livestock is widely used as fuel in rural areas. Livestock also serves as an insurance substitute, especially for poor rural households; it can easily be sold during time of distress.

### Livestock Sector- Present Scenario

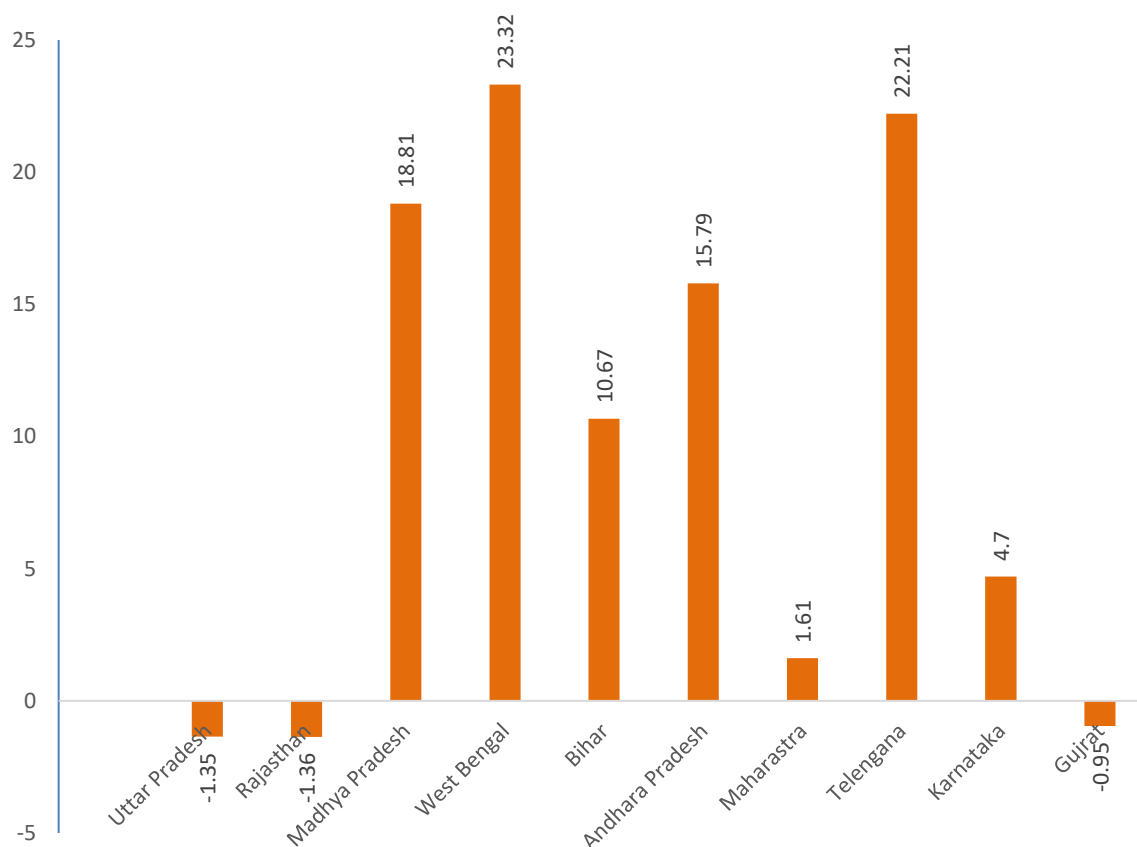
Indian livestock sector provides employment to about 8.8% of its population. Whereas the contribution in livestock sector in GDP was 4.11% in 2018-19 and it contributed 25.6% to the Agricultural GDP during the same period (Vikaspedia, 2020). India is blessed with a huge resource of livestock wealth. According to Livestock Census, 2019, the total Bovine population (Cattle, Buffalo, Mithun and Yak) is estimated to be 302.79 Million, showing an increase of 1.0% over the previous Livestock Census 2012. The total number of cattle was 192.49 million in 2019 showing an increase of 0.8 % over previous census. Livestock census 2019 also estimated the cow population to be 145.12 million depicting an increase of 18.0% over the previous livestock census 2012. The exotic/crossbred and indigenous/non-descript cattle population in the country was found to be 50.42 million and 142.11 million, respectively. The indigenous/non-descript female cattle population registered an increase of 10% in 2019 over the 2012 census. The population of the total exotic/crossbred cattle increased by 26.9% in 2019 compared to the previous census in 2012. A decline of 6% was observed in the total indigenous (both descript and non-descript) cattle population over the previous census. However, the pace of decline of indigenous cattle population during 2012-2019 was assessed less as compared to decline during 2007-12, which was about 9%. The total buffaloes in the country were estimated to be 109.85 million showing an increase of about 1.0% over the previous census. The total milch animals (in-milk and dry) in cows and buffaloes were 125.34 million, and registered an increase of 6.0% over the previous census. The total poultry in the country was estimated to 851.81 million in 2019 with an increase of 16.8% over previous census and that of total backyard poultry was 317.07 million in 2019, with 45.8% increase over 2012 census. In commercial poultry an increase of 4.5% was registered with a total of 534.74 million in 2019 over 2012. Livestock provides gainful employment all-round the year to over 16 million people, out of which 70% are women.

Meanwhile, the livestock sub-sector contributed about 27% to the agricultural GSDP and 5% to state income or GSDP in 2012 in Bihar (Data.gov.in, 2016). The percentage of households which own ruminant's livestock (cattle and buffalo) was lower in Bihar (according to the last national livestock census) than comparable states (Ministry of Agriculture, 2014 and 2010). However, Bihar has a large goat population (ranked third in India) and most goats are held by marginal groups and especially by women. Rearing of goats may prove to be an important step in poverty-reduction strategies and activities in the state. Fodder is a critical input for livestock development and data shows that there exists a huge gap between demand and supply of fodder both dry as well as green (Singh *et al.* 2012).

Bihar has made great progress in dairy and is recognized for its high milk production from cows, buffalo and goats.

The efficient management of dairy cooperative system has facilitated milk production and marketing in Bihar (Singh *et al.*, 2012). Further, Bihar's milk production increased to 92.41 lakh tonnes in 2017-18 from 71.97 lakh tonnes in 2013-14, indicating an annual growth rate of 6.33%, during the five-year period.

Livestock population in different states of India during livestock censuses 2012 and 2019 is presented in Table 1. Table 1 and Fig.1 revealed that the livestock population in Bihar was 36.5 million in 2019 while it was 32.9 million in 2012. During this period 10.67% increase in population of livestock was noticed in the state. Bihar registered a moderate growth as compared to the other states like West Bengal, Telangana, Madhya Pradesh and Andhra Pradesh. The growing importance of allied sectors such as fisheries, livestock and dairy farming in Bihar is largely due to its role in supporting livelihoods. Bihar state spread over 9.36 million hectares land. It covers 2.8 percent landmass, supports about 8 percent of human population and 5.4 percent of livestock of India. In Bihar, breed replacement rate has been slow mainly due to collapse of Public Artificial Insemination Centres (Singh *et al.*, 2010).



**Figure 1:** Percentage change in livestock population in major states of India from 2012 to 2019

**Table 1:** Comparative Livestock Wealth of Bihar as per different census (in '000)

Livestock and Poultry	2003	2007	2012	2019
Cattle	10470	12408	12232	15311
Buffalo	5766	6690	7567	7720
Sheep	346	218	232	213
Goats	9606	10167	12154	12821
Pigs	627	632	650	343
Horses and Ponies	115	51	49	32
Others	0	0	55	13
Total Livestock	26957	30167	32939	36454
Total Poultry	13968	11420	12748	16525

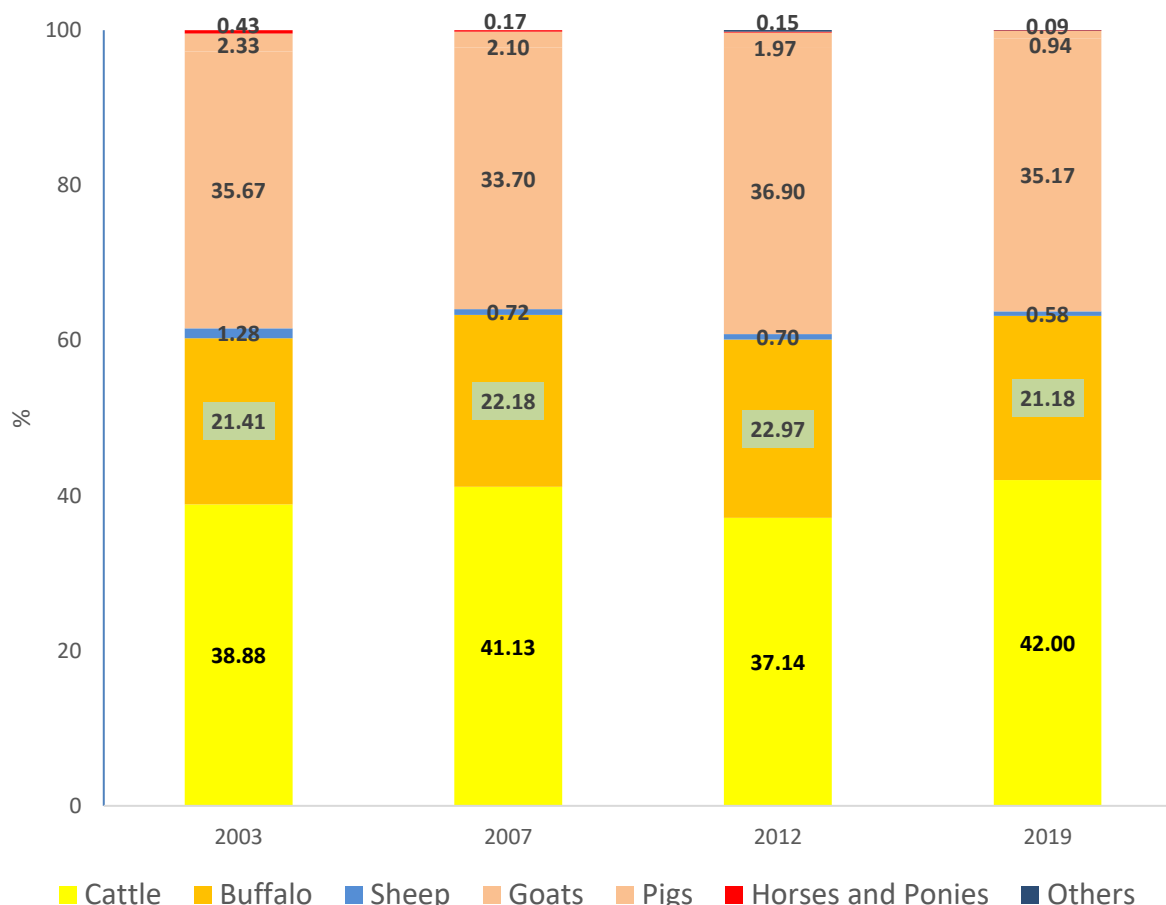
Source: Department of Animal Husbandry, GoB

Moreover, animal food being a rich source of protein is in high demand in both national and international markets.

Livestock and aquaculture together contributed about 7.10% of Gross Value Added in agriculture sector in Bihar during 2018-19. Its contribution to GDP in the last three years, i.e. during 2016-17 to 2018-19 stands at Rs. 1.45 lakh crores (Bihar Economic Survey 19-20).

### Livestock Sector in Bihar

According to latest Livestock Census 2019 (Table 1), the total livestock population in Bihar increased from 269.57 lakh in 2003 to 364.54 lakh in 2019, registering an increase of 35.23% in which the milch animals constituted about 63.18% of the total livestock population. A look at the Fig. 2 reflected that from 2003 to 2019, share of different animals in the total livestock population was observed to be more or less consistent. The share of cattle in total population was observed to be approximately 42% whereas; buffalo's share was estimated to be 21.18% during 2019. During the same period, poultry population increased from 139.68 lakh in 2003 to 165.25 lakh in 2019, a jump of nearly 18.31%.



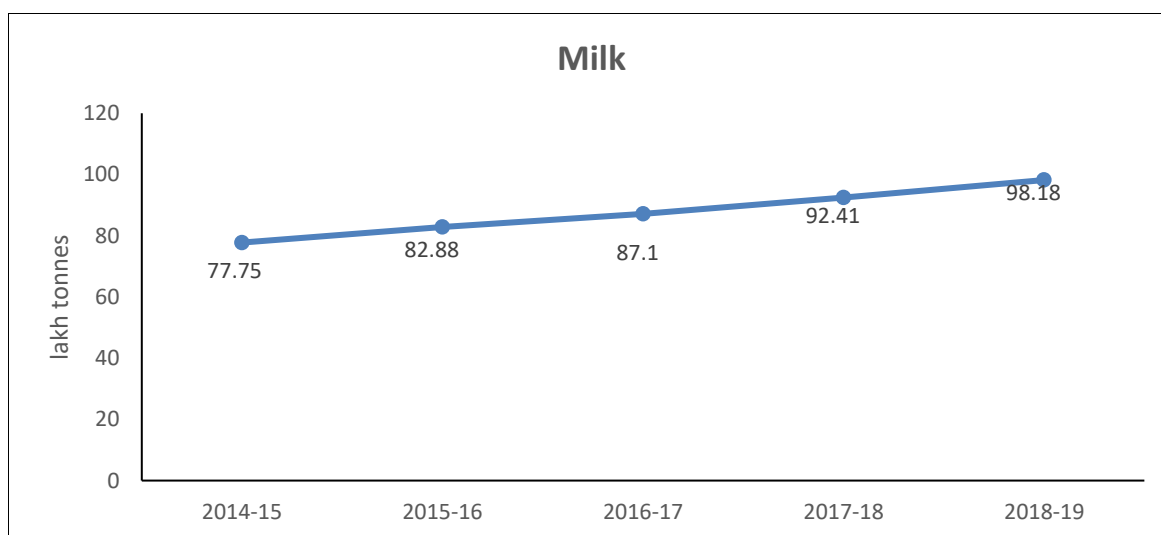
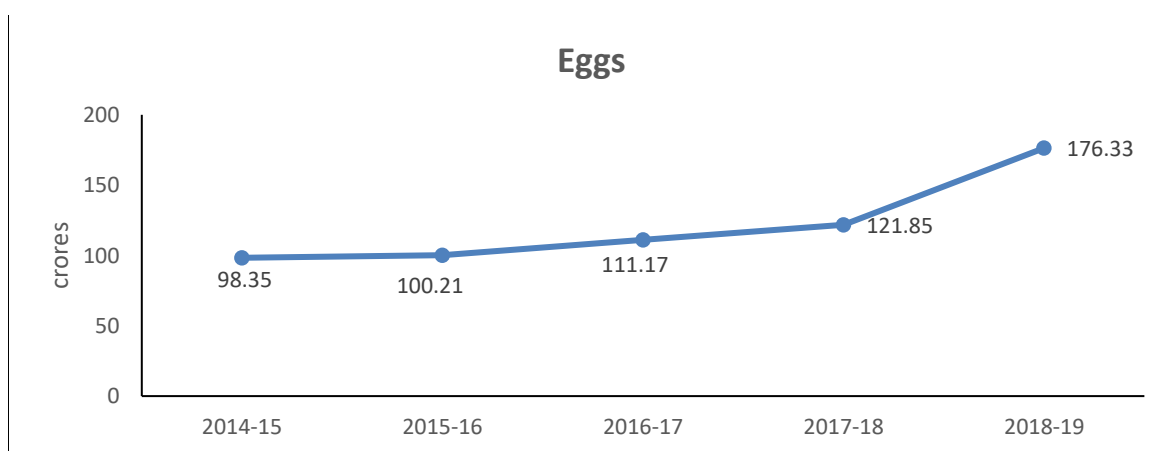
**Figure 2:** Year wise Share of animals towards total livestock population

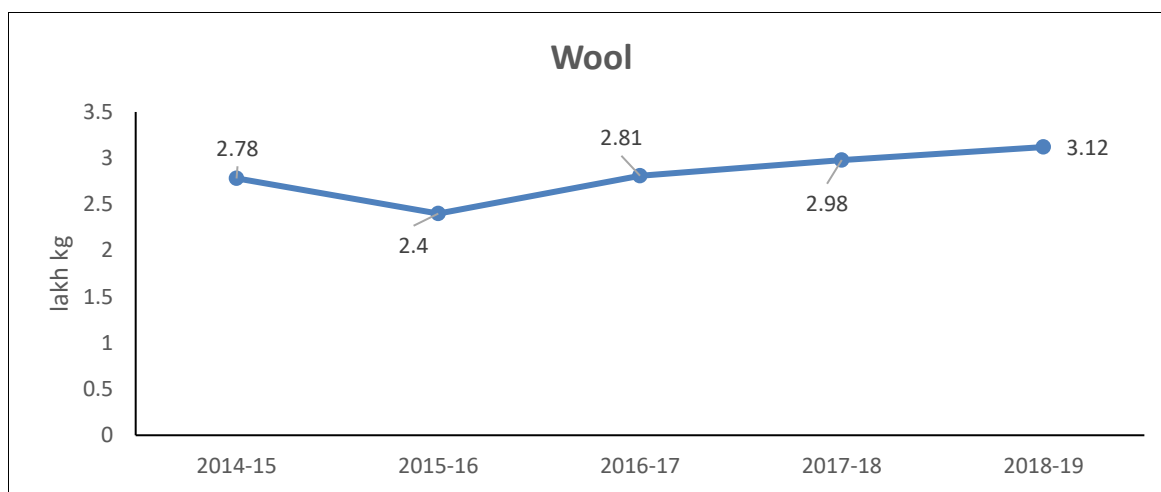
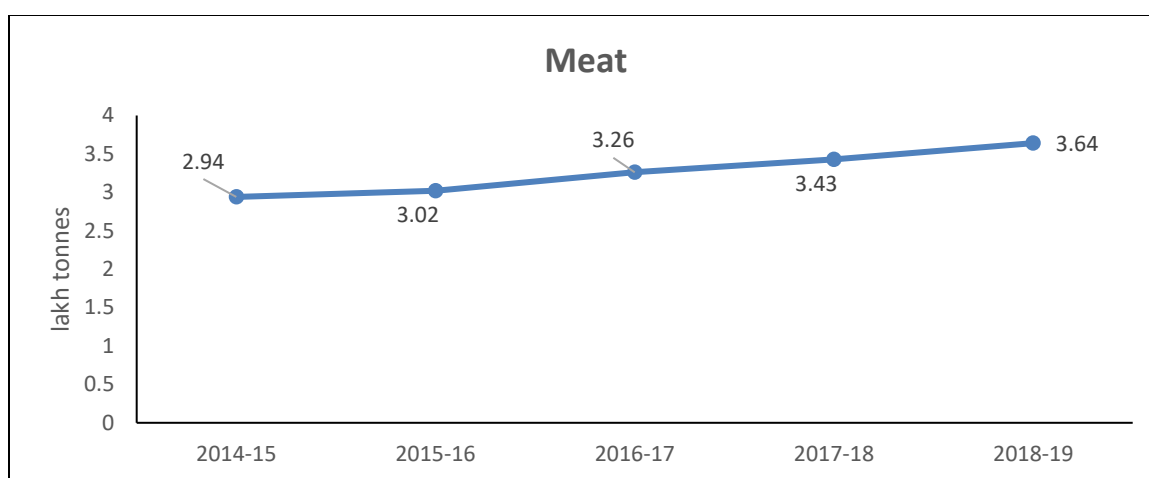
Share of goat population was estimated to be 35.1% of total livestock population in 2019. It was noticed that share of goat population was almost stagnant during different livestock censuses in Bihar. As more than 91% of the farmers of Bihar belongs to marginal and small size groups of farms, goat rearing is extremely popular among small and marginal farmers and plays an important role in poverty-alleviation and augmenting their income, especially in times of decrease in crop income as a consequence of natural disasters and other factors related to climate change. With increase in income and changing dietary pattern demand for livestock products on account of their nutritional value is rising on global basis. Hence, livestock sector of Bihar, particularly goat rearing among marginal and small farmers could be an important initiative to supplement the increasing demands for livestock products and to provide additional income to the rural masses.

**Table 2:** Trend in livestock production in Bihar (2014-15 to 2018-19)

Year	Milk (lakh tonnes)	Egg (crores)	Wool (lakh Kgs)	Meat (lakh tonnes)
2014-15	77.75	98.35	2.78	2.94
2015-16	82.88	100.21	2.4	3.02
2016-17	87.1	111.17	2.81	3.26
2017-18	92.41	121.85	2.98	3.43
2018-19	98.18	176.33	3.12	3.64
CAGR (%)	5.92	14.6	4.57	5.7

Trends of various livestock products namely, milk, egg, wool and meat production over a period of 2014-15 to 2018-19 in Bihar has been shown in Table 2 & Fig. 3(a-d). Dairy being an important income-generating activity for the rural poor in Bihar, contribution of livestock share in GVOA was found 25.4% in TE-2002-03 and increased to 31% in TE-2013-14 in Bihar whereas, the all-India share of livestock in GVOA stood at 26% in TE 2013-14. The share of meat in the total value of output from livestock sector has declined while that of milk has increased. The share of milk in GVOA has increased from 14% to 23% between TE-2003-04 and TE-2013-14, while at the all-India level; the share of milk in GVOA remained at 17% during the same period. Around 55 % of the total milk produced in the state was cow milk and 42.0% buffalo milk in 2013-14 (Hoda *et al.*,2017). Milk production in Bihar is observed to have steady upward trend from 77.75 lakh tonnes in 2014- 15 to 98.18 lakh tonnes in 2018-19, indicating an annual growth rate of 5.92% whereas, meat production has shown a steady increase from 2.94 lakh tonnes in 2014- 15 to 3.64 lakh tonne in 2018-19, recording an annual growth of 5.70%.

**Figure 3a:** Trend in milk production**Figure 3b:** Trend in egg production

**Figure 3c: Trend in wool production****Figure 3d: Trend in meat production**

The fastest growth has been observed in egg production (Fig. 3b), registering a growth rate of 14.6%. During 2018-19 egg production was estimated to be 176.33 crores in Bihar and was estimated to be 111.17 crore in 2016-17. An increase of 58.63% was noticed during this period and the projected figures for 2019-20 was 265 crore eggs. The consistent growth observed in poultry and dairy products can largely be attributed to the policy makers, pro-active extension agencies, the drive and enthusiasm of farmers, technological advancement, better management of animal health and introduction of new schemes and their better implementation.

### Dairy Sector

Bihar is one of the most important milk-producing states in India and contributing about 5.3% of the national milk production. The state currently represents the tenth largest dairy market in India. The major source of milk production in the state is cows which accounted for nearly 58.6% of the total milk production, followed by buffaloes (39.2%) and goat (2.2%). According to the report IMARC 2018, Bihar dairy market is expected to grow at a compound annual growth of around 4.9% during 2019-2024, reaching a volume of more than 6 million tonnes in 2024. Cattle and buffalo population in major states of India is presented in Table 3 and Table 4 in 2012 and 2019. Tables revealed a fair increase of 25.18% in cattle population whereas, the population of buffalo exhibited meagre in increase. Milk production in Bihar is dominated by smallholder dairy farms. The herd size is small—consisting of a few buffalo, dairy cows, or both—and the herd is reared in a system that is closely integrated with crop production. In 2013, about 93% of milk producers were marginal and small, possessing less than 2 hectares (ha) of land, and together contributed about 90% of total milk production in the state (Kumar *et al.*, 2017). Production of milk in the state increased from 2.7 million tonnes in 2001-02 to 7.2 million tonnes in 2013-14, with an annual compound growth rate of 7.9 per cent which was double as compared to the national level (3.8% per annum). Further, the production increased from 7.8 million tonnes in 2014 to 98 million tonnes and again registered a compound growth rate of 5.92% (Table 2).

**Table 3:** Cattle population, 2012 & 2019 in major states

S. No.	States	Population 2012 (In million)	Population 2019 (In millions)	% Change
1	West Bengal	16.5	19	15.18
2	Uttar Pradesh	19.6	18.8	-3.93
3	Madhya Pradesh	19.6	18.7	-4.42
4	Bihar	12.2	15.3	25.18
5	Maharashtra	15.5	13.9	-10.07
6	Rajasthan	13.3	13.9	4.41
7	Jharkhand	8.7	11.2	28.16
8	Assam	10.3	10.9	5.29

20<sup>th</sup> livestock census key results

The districts of Samastipur, Begusarai, and Patna together contributed nearly 17.05 percent of the total milk produced from cows during 2018-19. In case of goat milk, the leading producers districts were Araria (33.64 thousand tonnes), East Champaran (11.77 thousand tonnes) and Muzaffarpur (9.4 thousand tonnes), accounting for 25.5 percent of the total milk produced from goats in the state (Bihar economic Survey, 19).

**Table 4:** Buffalo population 2012 & 2019 of major states

S. No.	States	Population 2012 (In million)	Population 2019 (In million)	% Change
1	Uttar Pradesh	30.6	33	7.81
2	Rajasthan	13	13.7	5.53
3	Gujarat	10.4	10.5	1.52
4	Madhya Pradesh	8.2	10.3	25.88
5	Bihar	7.6	7.7	2.02
6	Andhra Pradesh	6.5	6.2	-3.76
7	Maharashtra	5.6	5.6	0.17
8	Haryana	6.1	4.4	-28.22
9	Telangana	4.2	4.2	1.59
10	Punjab	5.2	4	-22.17

20<sup>th</sup> livestock census Key results

About 80% of the total milk produced in Bihar was from landless poor, agricultural labourers and small and marginal farmers (ILRI, 2014). In the flood-prone north Bihar villages there was higher marketable surplus for milk with buffaloes contributing significantly to milk production. However, there was a steady increase in the share of cow milk. In the drought-prone south Bihar villages, the available marketable surplus of milk was low as compared to the flood-prone districts. The share of the cow milk was higher; among cows more than 90% milk is produced from nondescript animals (ILRI, 2014).

Despite impressive growth in production, the productivity of milk in Bihar was found to be comparatively low as compared to other states like Punjab, Gujarat, UP and MP. The productivity of milk in Bihar was estimated to be 0.7 MT per lactating animal, whereas, for Punjab, Gujarat, UP and MP productivities were assessed to be 2.4 MT, 1.1 MT, 1.0 MT, and 0.8 MT per lactating animal, respectively. Lower productivity of milk is attributed to inadequate usage of superior breed germplasm in the state. Lack of skilled manpower, deficiencies in animal health services, and limited availability of fodder could be the other major constraints for livestock development in Bihar. The productive potential of animals depends crucially on the quality of nutrition, genetic material, and health status. Currently, only one semen production center exists in the state for a total of 4,500 cattle breeding centers, highlighting the supply and demand mismatch for cattle breeding in the state (Hoda *et al.*, 2017). The state government has taken policy initiatives to emphasize the rearing of indigenous varieties of buffalo, procurement of pedigreed bulls of higher genetic potential, and investments to set up a new frozen semen centre which are strong indicators of a positive ecosystem that is being created for this sector. Sustaining the momentum through



strengthened collaboration with the state government, nationally recognized animal breeding research centres, and the private sector is warranted for overall genetic improvement of the livestock. There is also a need to undertake a mapping of preferred breeds of animals owned by farmers in the different regions in the state. Inadequacies of infrastructure (such as veterinary hospitals or diagnostic labs) in the state further constrain delivery of animal health services. Lack of laboratories and trained veterinarian staff affect prompt diagnosis of the zoonotic diseases, thereby contributing to higher livestock mortality. Currently, the state has around 1,153 veterinary hospitals/ dispensaries to cater to the needs of a livestock population of about 32.9 million (DoES). Non-availability of cold chains in the state is yet another constraint for enhancing the coverage of artificial insemination (AI) services and prevents timely delivery of health services related to de-worming and vaccination of livestock.

Provision of enough fodder for livestock is another problem; due to pressure on land for both agricultural and non-agricultural uses, grazing land has been gradually diminishing (DoAHDF, 2017). Bihar has shortage of 9.93 million tonnes of dry fodder, 23.47 million tonnes of green fodder and 5.48 million tonnes of concentrates (GoB, 2012a). Chronic feed deficit was noticed as the major constraint to animal production in Bihar. Most of the dairy farmers are smallholders having one or two local-breed milch animals, which are raised on crop residues and natural pastures with under-employed family labour. Feeding grains, oil cakes and green nutritious fodder are generally restricted to some crossbred cattle (Singh *et al.*, 2013). Paddy and wheat straw are the major fodders that accounted for about 95% of the total marketed fodder in Bihar (Singh *et al.*, 2013). Common grazing lands are limited and many of them are overgrazed. Only about 2% of the land area in the state is allocated to green fodder crops (Singh, 2013). The proportion of green fodder in total livestock feed is close to 10%. About 55% of green fodders are cultivated in the state (Singh *et al.*, 2013). Though the government provides mini kits of improved and high yielding fodder seeds to farmers, hardly 3 to 4% of the state's green fodder requirement is met by the domestic production (Singh *et al.*, 2013). Majority of livestock farmers are small and marginal landholder, consequently they may not be able to grow green fodder to feed their cattle. However, there is a lot of scope for developing fodder entrepreneurs to grow fodder for the market and local market network for green fodder could be developed to meet the fodder requirements and could be additional income earning venture. State government may frame a policy for fodder production and marketing at local level. Government intervention in fodder production and marketing may prove to be a boon livestock farming community of Bihar. Riverbanks after receding of flood water may be potential for fodder production in the flood affected area of North Bihar for bridging the fodder demand of the state.

### **Bihar State Milk Cooperative Federation Ltd. (COMFED)**

Bihar State Milk Cooperative Federation Ltd. (COMFED) was established in 1983 as an implementing agency of Operational Flood Program of dairy development on “Anand” pattern in Bihar is the leading agency for development of dairy sector in the state. The main objectives were to provide technical supports and procurement and processing of milk in the state. COMFED provides technical inputs related to breeding facility, animal health cover, feed & fodder and impart trainings to the farmers. On an average 72% of the farmers market their milk through the traditional milk supply chains and 60% of the marketed milk is purchased by the milk market agents (Kumar, 2010). Only about 16% of the milk produced is processed by COMFED and another 2-3% by the private sector. Private milk processing and marketing organizations are not getting institutional support in the state (Singh *et al.*, 2010) but without recognising and enhancing their investments and contribution, the dairy sector would not realise its full potential. A large number of small-scale processors are producing different cottage products in the state. To enhance the quality of their products and efficiency of their enterprise government initiatives are required. There are lot of scopes for setting up private dairy enterprises in the state to process and add value to milk by making milk products. Private entrepreneurs have to come forward to make the milk production profitable and income generating enterprise in the state. Micro-finance in the form of Self-Help Groups (SHG) and cooperatives etc. can certainly help women in rural areas, some studies have shown that economic empowerment of women through dairy cooperatives is possible (Dudi *et al.*, 2019)

### **Livestock Services**

To improve the productivity of livestock, it is crucial to provide access to good quality services to promote health and breeding of livestock animals and delivery of veterinary and preventive care services by systematic implementation of vaccination drives with the objective of increasing the production of livestock, improving the health of milch animals, and increasing access to livestock-related services by marginalized communities. The need is to increase the quantity and quality of animal health services to minimize diseases. The vaccination campaigns

are covering diseases like HSBQ, FMD, Brucellosis and PPR against various infectious diseases. The progress can be seen in the table over the period of 2014- 2019 which shows an increase of 107% from a mere 26.24 lakh in 2014- 15 to 555.66 lakh in 2018-19 and number of animals treated in the same period were 44.08 lakh animals in 2018-19, as compared to 32.99 lakh animals in 2014-15 similarly the number of animals covered under artificial insemination in Bihar in 2018-19 were 31.01 whereas in 2014-15 the figure was 26.40 lakh animals. It has been suggested that milk procurement agencies should form exclusive service delivery wing to ensure quality and timely dairy husbandry services by giving special emphasis to situational factor i.e. location of the farm home from the centre (Rajendran and Prasad, 2018).

**Table 5:** Trends of livestock services in Bihar

Year	Animals Treated (lakh)	Immunization (lakh)	Artificial Insemination (lakh)
2014-15	32.99	26.24	26.4
2015-16	38.26	163.31	26.31
2016-17	41.03	296.45	26.2
2017-18	44.67	526.72	28.23
2018-19	44.08	555.66	31.01
<b>CAGR (%)</b>	<b>7.62</b>	<b>107.03</b>	<b>4</b>

*Department of Animal Husbandry, GoB*

### Nutritional Security through Dairy in Bihar

The malnutrition in Bihar is higher than in any country in the world (Von Grebmer *et al.*, 2011). Poor growth and anaemic conditions are very common. The diet is deficient in micronutrients, vitamins, calcium, iron and zinc. Women's role in livestock care and animal husbandry affects household food security. A recent study by Jumrani and BIRTHAL (2015) indicated that livestock ownership by household did not automatically improve household nutrition, but income control by women from livestock production reduced malnutrition among children. Households where women oversee animal production, especially dairy animals, have better household nutrition (Jumrani and BIRTHAL, 2015) and consumption of dairy products has a strong marginal effect on child nutrition. These effects are particularly stronger for children between 6 and 24 months of age who are no longer exclusively breastfed and have high physical growth potential (Bhutta *et al.*, 2013) and dairy provided a nutritious diet throughout the year as milk and milk products with dietary diversity in cereal-based diet pattern. Dairy sector in Bihar may be self-employment opportunities for women to earn and access sufficient and nutritious food for them and their family.

### SWOT Analysis of Dairy Sector of Bihar and Strategies for Growth

**Strength:** There is widespread use of crossbred cows by farmers who are commercially oriented. The Diara Ganges river banks are very suitable for rearing more buffaloes and traditionally the people living in these areas have been rearing for milk production, the high fat milk content fetches an attractive price for producers, and supports the livelihoods of marginalized people. There is increased involvement of women in dairy production by training them in all aspects of husbandry and forming self-help groups. Most work involving rearing is slowly taken up by women farmer.

**Weakness:** Scarcity of feed and fodder during two to three months of flood period especially of North Bihar Districts is major concern. There is also lack of availability of green fodder in the month between March to June; lack of quality fodder seeds, high density of cattle population and limited grazing land; lack of availability of quality feed fluctuating prices of dry fodder (INR 4–12/kg) all leading to low milk production especially in south Bihar. Low quality of the concentrate feed (> 100 feed plants, but feed produced does not meet requirement of cows), high cost of feed and lack of affordability by marginalized castes, including women leads to low productivity. In general, there is small herd size (ranging from 1-2 animals) and poor productivity. Inadequate availability of quality breeding bulls, both for artificial insemination (AI) and natural service dwindling feed and fodder resources and poor resource management Inadequate number of farmers' organizations and breeders' societies Technology for proper utilization of cow waste specially cow dung and urine, which has medicinal values and absence of effective extension networks are some of the weakness which needs to be overcome.

**Opportunity:** Demand for milk and milk products in Bihar is increasing significantly. COMFED is encouraging chilling, collecting and processing through its infrastructure. There is availability of already established milk processing capacity as well as availability of food ingredient businesses for baking and confectionary. The cities offers more urbanization and are education hub, while the south Bihar shows opportunity for exploiting the tourism circuit to promote UHT /cheese/yoghurt through specialized wholesalers and retail stores. New trends in food preferences for the younger generation: cheese, UHT milk, yoghurt, and introduction of new and consumer friendly retail packs and probiotics helps the processing industry giving increased income to farmers. Access to markets of Bangladesh, Nepal and North-East India which are milk deficit and are in close proximity to Bihar. Women can be involved in dairy processing of value added indigenous dairy products by forming self-help groups and establishing small processing units to cater to the local market after branding these products by quality standard certification.

**Threats:** High mortality; high parasite infestation; alkali disease due to toxicity of selenium; low mineral contents in feed and fodder insufficient animal health services (disease control, treatment); no timely deworming and vaccination high young stock mortality; villages are scattered, and low veterinary services coverage exists, high incidence of mastitis (clinical and subclinical) heavy protozoan infestation (Trypanosomiasis, Babesiosis, Theileriosis, Anaplasmosis etc.) Lack of access to veterinary services by women and marginalized groups due to communication, mobility issues and affordability Lack of knowledge training to women on disease management . There is lack of quality animals for herd replacement and establishing new farms are some of the threats faced (Bihar Livestock Master Plan 2018-19 - 2022-23)

**Animal Health:** Insufficient health services, untimely deworming and vaccination, very high incidences of mastitis (clinical and subclinical) heavy protozoan infestation (Trypanosomiasis, Babesiosis, Theileriosis, Anaplasmosis etc.) and lack of access to veterinary services are some of the gaps leading to low productivity of livestock which can be tackled by vaccination against highly infectious diseases (HS, BQ, FMD etc.) at proper age and time, availability of veterinary services through seasonal health camps at village level, strengthening and operationalizing the existing sub-divisional level diagnostic facilities, establishment of referral diagnostic labs at district level, conducting year-round calendar wise deworming, and vaccination drive against HS, BQ, FMD and Brucellosis and target-based doorstep veterinary services through self-help groups.

The number of Veterinary hospitals and poly clinics in Bihar is 39 which is proposed to be strength with diagnostic laboratories and the target by 2027-28 is to have one veterinary hospital in each subdivision and by 2032-33 one hospital in each block. Under Livestock Master Plan veterinary dispensaries is proposed to increase from the current 1,083 (MAFW, 2017) to 301,400 by 2022-23, 1,700 by 2027-28 and 2,000 by 2032-33 and adoption of the recommended rate of external and internal parasite control treatments will reach 80% in the coming 15 years. Similarly, vaccination received by cattle's for critical diseases have been FMD 80% (started from 2015), brucellosis 90% (from 2017), HS and BQ 80% (historically implemented). The targeted goal is to maintain a vaccination rate of 80% by 2022-23. The need is to make the vaccination campaigns more timely and improve deworming, sanitation, housing, and management during flooding and drought.

### **Shortage of Feed/Fodder**

High density of cattle population and limited grazing land combined with scarcity of feed and fodder during two to three months of flood period, high cost of feed and lack of affordability by marginalized farmers all leads to low productivity in addition to non-supplementation of mineral mixture resulting in mineral deficiency diseases. To handle the problem of quality feed and fodder availability to farmers it is necessary that production of fodder like Napier, sugarcane grass, hybrid Napier, sorghum, Moringa oleifera must be taken in marginalised land, new cattle feed plants for provision of concentrates and rations for milking cows must be established.

### **Value Adding Infrastructure and Post Production Strategies**

Low productivity, poor milk collection system needs to be addressed urgently. It has been analysed that cooperatives needs to be strengthened in the states, procurement capital utilities should be enhanced with expansion of organized Milk market to provide greater access to dairy farmers for their milk produced and provision of cold chain at districts and blocks level which in turn requires increase availability of uninterrupted power supply. Milk collection can be enhanced at the village level with SMS based mobile payment system, creating new milk producer societies and district unions, including women only groups at village level and promoting women leaders in dairy cooperatives.

There is need for improved milk transportation from collection points through refrigerated/insulated tankers for far areas and also to establish milk condensing plants for ease of transport, establishment of additional processing facilities to improve procurement and processing. Improvement of quality standards of products and promotion of local products to help local farmers will add to state GSDP with introduction of new packaging of products and marketing in new areas like export to Nepal and Bangladesh.

## The Way Forward

Traditional livestock farming should be transformed to modern husbandry techniques by mainstreaming best practices based on scientific principles and farmers participatory result demonstrations. There is need of diversification of livestock farming as per farmers' capacity, needs and local conditions. The requirement for milk will be 292.53 lakh Kg/per day in Bihar by 2021-22 which requires gearing up of all the agencies related to livestock management of the state. The state is very strategically placed with huge market potential both nationally and internationally, with milk deficient countries like Nepal and Bangladesh on one side and states like Orissa, West Bengal as well as the North-eastern states on other. To mitigate the shortage of good crossbreds as a short-term measure to increase the milk production induction of heifers / milch animals of Shahiwal, Red Sindhi, Gir, Murrah breeds can be done under Mini dairy and Small dairy. The existing co-operative network is covers about 45.5% of the inhabited villages of Bihar i.e. 55.5% of the State is still uncovered, the thrust should be to increase this number with focus on organisation of all women dairy co-operative societies. The number of registered milk societies is 22,018 (MPCS) with total membership of the 11,39,000, which also includes includes 1,27,000 WMPCS membership of 2,653 women's milk producer co-operative societies (WMPCS). The total milk processed is 13% of of the total milk produced into various milk products ie., pasteurized milk, powdered milk, ice cream, butter, ghee etc. the target is to increase the capacity to process to 20% by 2022–23, 25% by 2027–28 and 32% by 2032–33.

Capacity building of farmers in latest techniques of animal husbandry and animal health, nutrition etc. helps farmers to manage with increased output, these trainings should focus on society organisation, artificial insemination and management with increased exposure of farmers to developed states like Punjab and Gujarat to acquaint them with improved practices so as to replicate them and becomes engines of change for the production of livestock extension agents Pashu Sakhi, agri-clinics and agro-business operators, para-vets/community animal health workers, input suppliers, other private extension service providers and extension service providers at co-operatives, farmer-based organizations, farmer self-help groups, telecommunication extension service providers/operators etc.

## Conflict of Interests

There is no conflict of interest.

## Publisher Disclaimer

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## References

1. Annual Report 2017 Department of Animal Husbandary, Dairying and Fisheries.
2. Bhutta, Z.A., Das, J.K., Rizvi, A., Gaffey, M.F., Walker, N., Horton, S., Webb, P., Lartey, A., and Black, R.E. (2013). Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *Lancet* 382 (9890): 452–477.
3. Bihar Livestock Master Plan 2018-19 - 2022-23 Animal & Fisheries Resources Department, Government of Bihar
4. DoAHDF.2017. Basic Animal Husbandry and Fisheries Statistics, Ministry of Agriculture, Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhavan, New Delhi.
5. Dudi, K., Devi, I., & Kumar, R. (2019). Contribution and Issues of Women in Livestock Sector of India- A Review. *International Journal of Livestock Research*, 9(8), 37-48. doi: 10.5455/ijlr.20190421064818
6. FAO (Food and Agriculture Organization). (2016). Milk and Dairy hold potential for improving Nutrition of World's poor. United Nations.
7. Govt. of Bihar. (2012). Agricultural Road Map. Government of Bihar. Available at: <http://krishi.bih.nic.in/roadmap2012.htm>

8. Hoda, A., P. Rajkhowa, and A. Gulati. (2017). Unleashing Bihar's Agriculture Potential: Sources and Drivers of Agriculture Growth. Working Paper 336.: Indian Council for Research on International Economic Relations (ICRIER) New Delhi.
9. ILRI. (2014). Smallholder dairy value chain development in India and selected states (Assam and Bihar): Situation analysis and trends. Inter-cooperation Social Development India July 2014. Available at: [https://cgspace.cgiar.org/bitstream/handle/10568/35469/PR\\_pr\\_sturation\\_analysis\\_India\\_web.pdf?sequence=11](https://cgspace.cgiar.org/bitstream/handle/10568/35469/PR_pr_sturation_analysis_India_web.pdf?sequence=11) )
10. Jumrani, J. and BIRTHAL, P.S., (2015). Livestock, Women, and Child Nutrition in Rural India. *Agric. Econ. Res. Rev.* 28, 223–246. <https://doi.org/10.5958/0974-0279.2016.00003.3>
11. Kishore, A, Sharma, B and Joshi, PK. (2014). Putting agriculture on the takeoff trajectory: Nurturing the seeds of growth in Bihar, India. New Delhi, India: International Food Policy Research Institute (IFPRI) and International Water Management Institute (IWMI)
12. Kumar, Abhay, Singh, KM and Singh, RKP, (2012). Role of Livestock Sector in Sustainable Livelihood Security in Bihar: Status and Opportunities. Available at: <http://dx.doi.org/10.2139/ssrn.2062823>
13. Kumar Anjani. (2010). Milk Marketing Chains in Bihar: Implications for Dairy Farmers and Traders. *Agricultural Economics Research Review*. 23:469-477. Available at <http://ageconsearch.umn.edu/bitstream/96922/2/10-Anjani-Kumar.pdf>
14. Kumar, Anjani, Thapa, G. Roy, D. and Joshi, PK. (2017). Adoption of Food Safety Measures on Milk Production in Nepal: Impact on Smallholders' Farm-Gate Prices and Profitability. *Food Policy* 20: 13–26.
15. Ministry of Agriculture. 2010. 18th Livestock Census (2007). All India Report, Based on Quick Tabulation Plan – Village Level Totals. Department of Animal Husbandry, Dairying and Fisheries. Krishi Bhawan, New Delhi, India.
16. Rahman, A, Manjunath, S, Raj, N, and Tiwari, Nikita. (2018). Towards Developing Diversified Food Systems in Bihar for Improving Nutritional Outcomes TCI-TARINA Policy Brief No. 11 • May 2018.
17. Rajendran, S., & Prasad, S. (2018). Factors Influencing Milk Producers' Preference for Dairy Husbandry Services- A case of Salem District of Tamil Nadu. *International Journal of Livestock Research*, 8(1), 225-234. <http://dx.doi.org/10.5455/ijlr.20170725104711>
18. Singh, K. M., Singh, R. K. P., Jha, A. K. and Meena, M. S. (2010). Dynamics of Livestock Sector in Bihar: A Temporal Analysis. *Agricultural Situation in India*, 66 (13): 687-702.
19. Singh, KM. and Meena, M.S. and Bharati, RC and Kumar, Abhay, An Economic Analysis of Milk Production in Bihar (2012). *Indian Journal of Animal Sciences*, 82 (10):1233-1237, October 2012.
20. Singh, KM. and Meena, MS. and Singh, RKP., (2013). Livestock Value Chains: Prospects, Challenges and Policy Implications for Eastern India. Available at: <http://dx.doi.org/10.2139/ssrn.2020916>
21. Singh, KM. Singh, RKP, Jha, AK and Kumar, Anjani, (2012). Understanding the Fodder Markets for Sustainable Development of Livestock Sector in Bihar - A Rapid Appraisal Approach. Available at: <http://dx.doi.org/10.2139/ssrn.2266482>
22. Singh, KM, Singh RKP, Jha AK, Kumar, Abhay, Kumar, Anjani and Meena, MS. Meena. (2013). Feed and fodder value chains in Bihar: Some empirical evidences. Available at: <http://mpira.ub.uni-muenchen.de/48651/>
23. Singh, R. K. P. (2013). Livestock research and development priorities for Bihar and Odisha. IFPRI. Available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2391607](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2391607) )
24. Singh, J.P., Mandal, L.N., Sinha, S.K., Mishra, S.N., Kumari, A., Kumar, S., Jha, A. K., Gebru, G., Negussie, K., Bahta, S., Reddy, B.V., Ravichandran, T. and de Haan, Nicoline. (2018). The Bihar livestock sector analysis. Bihar, India: Government of Bihar.
25. Von Grebmer, K., Maximo Torero, Tolulope Olonbiyi, Heidi Fritschel, Doris Wiesmann, Yisehac Yohannes, Lilly Schoeld, and Constanze von Oppeln. (2011). Global Hunger Index: The Challenge of Hunger: Taming Price Spikes and Excessive Food Price Volatility. Bonn, Washington, D.C., Dublin.
26. <https://vikaspedia.in/agriculture/livestock/role-of-livestock-in-indian-economy#:~:text=Livestock%20provides%20livelihood%20to%20two,25.6%25%20of%20total%20Agriculture%20GDP.>

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