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Livestock Policies and its Impact on India and Bihar, State

Aviral Pandey¹

In an economy like Bihar, dependence of population on livestock as an alternative source of income is significant. Acceleration in the availability of livestock to marginal and small farmers can offer significant opportunities for household income augmentation and employment generation in Bihar. In this context, an analysis of performance of livestock sector in Bihar has been carried out. The growth of livestock sector has been found slower in the Bihar than at the national level. The share of Bihar in India's livestock sector income has not changed significantly. Besides, low milk productivity, decline in the Bihar's share in India's egg and meat sector income is a major factor responsible for insignificant changes in livestock sector of Bihar. Several demand and supply side factors have been identified for the above trends. Availability of health infrastructure, grazing land and immunisation are significantly affecting livestock across the districts of Bihar. The study has also shown policy initiatives for the improvement of livestock sector resources and outcomes of Bihar.

Key words; Bihar, grazing land, livestock, meat yield, milk production, policy

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INTRODUCTION

Economy of Bihar is changing with appreciative space and speed. Growth rate of economy in recent years is unprecedented. Although, service sector is contributing a higher proportion in the economy in terms of income and the share of agriculture in State Domestic Product (SDP) has been declining, agriculture remains mainstream sector in Bihar. Almost 66 % of total workforce in rural Bihar is primarily dependent on agriculture sector. A slow shift in employment has been observed in recent surveys. Sectors which have emerged as significant employer are trade and hotels and construction. But these changes have not affected rural areas much in comparison to its urban part. Though, agriculture is the prime source of livelihood in rural Bihar, it is characterized by subsistence, low inputlow output, technologically lagged mixed farming system, and is dominated by smallholders (more than 55% land is under 0-1 hectares category).

The major challenge of agriculture sector in Bihar is that a huge amount of land is environmentally unproductive or less productive. These lands are mostly located in rain-fed and semi-arid regions of Bihar. Although cereals dominate the cropping pattern in this region, livestock are an important component of mixed farming system and dependence on livestock as an alternative source of income is significant especially in rain-fed and semi-arid regions of Bihar. With increasing population and at given limited industrial development, development of mixed farming system is a passive side route for improvement of livelihoods in rural Bihar.

With keeping livestock at priority, policies have been initiated by recent governments. An analysis of performance of livestock policies and its impact on livestock sector in Bihar becomes important. With identified tasks, an analysis of performance of livestock policies and its impact on livestock sector has been carried out. This work is divided in five sections. Section I gives detail of data sources and methodology. Section II makes a brief overview of growth of livestock sector in India and States. Section III provides a detailed description of composition of livestock sector in overall Bihar and its districts. (An overview of policies initiated for the development of livestock sector in India and their impact on livestock sector in Bihar is given in this section). The Main Drivers of Livestock Product Variation across district of Bihar is identified in section IV. Finally, section V comprises the conclusion.

Section I

Data Description and Methodology

This study is based on secondary data. Secondary data sources for this study are Livestock census report 2007, Bihar Statistical Handbook 2012, five year plan documents since first five year plan to Twelfth Five Year Plan, Official website of The Bihar State Milk Co-Operative Federation, Agricultural Statistics at a Glance (various years), Ministry of Agriculture, Government of India.

Multiple regression model has been used to find out determinant of Livestock across Districts of Bihar for the year 2012. In regression model depended variable is the Bovine (number of bovine). Data about number of bovine is not available for the year 2012, number of bovine at the year 2007 has been taken as a proxy for dependent variable. Dependent variables considered in the model are Dispensary (number of veterinary hospital and dispensaries), Immunisation (number of immunisation), Grazing land (quantity of grazing land), Artificial Insemination (number of artificial insemination). We have applied Ordinary Least Square (OLS) method of estimation. The log transformations for each of these models are fitted and specified. The prime objective of generating log transformation regression equations is to determine the degree of sensitivity of the dependent variable to change in the explanatory variables.

Model Building

Bovine = f (Dispensary, Immunisation, Grazing land, Artificial Insemination)

More precisely, the variable to the left-hand side of the equality symbol represents the dependent variable, while those to the right-hand side are referred to technically as explanatory variable. The logarithmic transformation of estimated model is:-

$\ln \text{ Bovine} = b_0 + b_1 \ln(\text{Dispensary}) + b_2 \ln(\text{Immunisation}) + b_3 \ln(\text{Grazing land}) + b_4 \ln(\text{Artificial Insemination})$

Section II

Overview of Growth of Livestock Sector in India and States

Policies for Livestock Sector during Five Years Plans

In 1950-51 the net value of livestock products was amounted only to Rs. 664 crores or about 16% of the income from agriculture. It was observed that quality of livestock was poor and

unbalanced. Keeping concern for improvement in quality with quantity of livestock products, animal husbandry programmes in India has been concentrated to increase the supply of milk, meat and eggs a greater consumption of which has been very essential in order to balance the present customary diets and to improve quality of the cattle since first five year plan.

After Independence, during the First Five Year Plan (1951-56) a programme known as Key Village Scheme was launched in 146 villages. This programme initially covered a population of 10,000 breedable cows and buffaloes at National level. Initially natural service was practiced but later Artificial Insemination (A.I.) was introduced at most of these Key Village Centres and 25 gosadans to provide shelter to animals were established. During the first five year plan special attention was given on the increase of the number of veterinary dispensaries to reduce cattle mortality and to improve productivity. This resulted in huge increase in their number from 2,000 to 2,650.

However, till first five year plan only a fraction of the Contribution which animal husbandry and dairying could make to the growth of the rural economy and to the rise in living standards was realised. It was sincerely felt by the planners of India that an appreciable increase in the supply of milk is an imperative necessity. Thus, the breeding policy was designed to increase the production of milk in the country without affecting the position in regard to the supply of bullocks required for cultivation. By the end of Second Five Year Plan (1955-1960) about 4,000 veterinary hospitals and dispensaries had been established of which, 650 were set up during the First Plan and about 1900 during the Second Plan. In all, by the end of the Second Plan about 2,000 key village units were established. By 1960, 670 artificial insemination centres were set up. During the Second Plan 34 more gosadans were established and 246 goshalas were selected for development. In the Second Plan the gosadan scheme was modified so as to allow for the setting up of gosadans both by State Governments and by private institutions. With a view to reducing losses, it was proposed that charmalayas should be provided at gosadans with equipment and machinery for flaying and curing of hides and utilisation of carcasses. To overcome the problem of shortage of fodder during calamities, a fodder bank was also established. Given surplus cattle, During the Second Plan, a scheme for catching, taming and disposing of wild and stray cattle was initiated as part of the gosadan programme. With a view to associating private institutions and organisations which were already engaged in cattle development, particularly the cow, the Central Council of Gosamvardhana was reorganised in 1960. The Council continued its functions such as to organise, implement and coordinate activities relating to the preservation and development of

cattle and to administer schemes for increasing milk yield and improving draught quality and expected to bring about better coordination between various agencies interested in Gosamvardhana work. For piggery products, in the Second Plan 13 piggery breeding units for the production of breeding boars for use in piggery development blocks was set up. With a view to utilise breeding materials from these units 28 piggery development blocks were also established. During the Second Plan 269 poultry extension centres were also established. Educational programmes were developed to a considerable extent in the Second Plan with the establishment of three new veterinary colleges and the expansion of five colleges out of the 14 existing ones. In addition to the post-graduate college established at the Indian Veterinary Research Institute (Izatnagar) four veterinary colleges (Mathura Madras, Bombay and Patna) were upgraded for imparting post graduate training.

Development of animal husbandry during the first two Plans suffered several limitations. Some of these were of a continuing nature, such as the large proportion of uneconomic and surplus cattle, deficient nutrition and shortage of breeding bulls. No systematic efforts were made for improving and developing the breeds of horses during the First and Second Plans. There was also shortage of trained personnel in several States. The Third Five Year Plan (1960-1965) and the subsequent Annual Plans attached considerable importance to animal husbandry. In the Third Plan, the key village programme was reorganised to provide for about 10 units in each block and establishment of central artificial inseminations centres. The programme for rinderpest intensification and a large castration programme were initiated. It was emphasized that aim of the adopted breeding policy should be to evolve and develop "dual purpose" which provide both good bullocks for efficient cultivation and increased quantities of milk for human consumption including breeds cross-breeding with exotic breeds in regions of high altitude. The key village scheme, which had been the main programme for intensive cattle development during the first two Plans, was re-examined by an expert committee. The committee made a number of recommendations, including better use of the existing fodder resources, control of grazing, cultivation of fodder crops on marginal and sub-marginal lands, introduction of suitable leguminous crops in rotation with paddy, construction of silo pits and popularisation among farmers of cultivation of pasture grasses and feeding with balanced rations. The need to organise the marketing of livestock and livestock products through co-operative marketing societies of cattle-owners was also stressed. The committee also made a number of proposals for improving existing arrangements concerning artificial insemination. In 1961, Intensive Cattle Development

(ICD) project was initiated to develop cattle in India. The shortage of breeding bulls was one of the principal handicaps in implementing animal husbandry programmes in India. To overcome this difficulty, the use of artificial inseminations rapidly extended during the third plan. The Third Plan accounted for piggery development on a larger scale. Sometime the farmers suffer considerable losses due to the death of their draught or dairy animals in case of outbreak of an epidemic.

A beginning was made by the Co-operative Mutual Insurance Company, Bombay to insure dairy animals and draught cattle in the States of Maharashtra and Gujarat. The Government of Kerala had also shown interest in such scheme. Schemes to investigate the possibilities of cattle insurance was proposed by Andhra Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, Mysore, Madras and Punjab. The formation and running of fisheries cooperatives was an important aspect of fisheries development during the Third Plan. Till 1960, there were about 2100 fisheries co-operatives with a total membership of about 2,20,000. The Third Plan also witnessed a notable breakthrough in poultry farming. The average egg production increased from 60 in 1960-1961 to 80 in 1965-1966. A large number of commercial poultry farms with 500 to 25,000 layers were set up in private sector in different parts of the country. Large private hatcheries and poultry feed manufacturing units were established. As a result of these measures, egg production increased from about 2880 million in 1961 to 5300 million in 1968-1969. However the programme of poultry development continued to be adversely affected by shortage and high prices of poultry feed. However, inadequate arrangements for marketing continue to be major hurdle in the progress of poultry development. New cattle breeding policy was evolved during this period. According to this policy, cross breeding was undertaken in areas covered by Intensive Cattle Development (ICD) Projects and in key village blocks that lie in the milk sheds of existing and proposed dairies. The projects emphasized on improved methods of breeding, provision of feed and fodder and disease control. Earlier, the cattle development programme taken up in small and scattered areas could not make much impact on account of insufficient inputs, lack of tie-up with proper marketing and inadequate coverage of cattle population. The ICD Project was conceived to rectify these shortcomings. Compared to eggs and poultry, progress in other livestock products fell short of expectation. Wool production increased from 32.55 million kg. in 1961 to 37.60 million kg. (estimated) in 1969. The production of milk increased from 20 million tonnes in 1966-1967 to 21.2 million tonnes in 1968-1969, representing a growth rate of about 3% per year. This was significantly below the rate of growth in demand for milk. Until third

plan, there was huge shortage of milk and fish and they were less than minimum nutritional level. Keeping shortage issue at priority, Fourth Five Year Plan (1969-1974) emphasized on increasing the supply of protective foods like milk, milk products, meat and eggs and at improving the output of certain animal products of commercial importance, such as wool, hides, skins, hair, bristles and bones. The National Dairy Development Board (NDDB) was founded in 1965 committed to exploitation with empowerment, tradition with modernity, stagnation with growth, transforming dairying into an instrument of development of Indian rural people. There had been some delay in giving a start to the special livestock development programmes through small and marginal farmers and agricultural labourers. By and large the targets under production oriented projects such as Intensive Cattle Development projects, Intensive Poultry Production-Cum-Marketing Centres, Sheep and Wool Extension Centres and Fluid Milk Plants and Milk Product Factories were expected to be achieved in full. There were 85 subsidised projects for cross-breed calf rearing, 57 poultry production projects, 45 piggery production projects and 38 sheep production projects through small and marginal farmers and agricultural labourers in 148 districts. Integrated milk production-cum-marketing projects were implemented in the States of Meghalaya, Assam, Sikkim, Himachal Pradesh, Jammu and Kashmir Orissa and Kerala in the second phase of the 'Operation Flood' project. Emphasis was continued on crossbreeding in cattle through establishment of exotic cattle breeding farms and intensive artificial inseminations measures. Particular emphasis was laid on scientific poultry breeding programme. Programmes for the control of rinderpest and foot and mouth disease were continued to stop death of livestock.

There was some delay in the start of a few projects but the targets for mechanisation of boats, production of fish seed and development of fishing harbours were emphasized. A special Trawler Development Fund was created for smaller entrepreneurs and cooperatives to purchase and operate trawlers for marine fisheries. Fish Farmers Development Agencies started in the states for augmenting inland fish production and exploitation of water bodies in rural areas. The UNDP assisted palagic fishery project was continued for exploration and exploitation of fishery resources and this scheme was extended to cover both the West and South-East coasts. A research vessel was provided to the Central Marine Fisheries Research Institute.

Fishery research was given high priority to develop relevant technology for production, processing and marketing of both inland and marine fisheries during Sixth Five Year Plan (1980-1985). Animal production received special attention in dry farming and hilly areas.

Silvi-pastoral system and agro-forestry programmes were given attention since they are a source of feed and fodder for livestock. Incentive prices were ensured by developing marketing and trade on producer-oriented lines.

Until six five year plan, the major drawbacks in livestock sector was over-concentration on shrimp fishing, non-exploitation of unconventional fishery resources in the marine sector and slow progress in the expansion of extensive and semi-intensive aquaculture systems in the inland and brackish-water fisheries. Processing and marketing facilities for sea food and inland fish were also inadequate. To overcome these difficulties, adequate attention was paid during the Seventh Plan through incentives and regulatory measures and fish production rose to 36.77 lakh tonnes. By the end of the Seventh Plan, 22.75 lakh tonnes of marine and 14.02 lakh tonnes of inland fish were produced, indicating an average annual growth rate 6.25 %.

Banning of bull trawlers, motorisation of traditional craft -and creation of National Welfare Fund for Development of Fishermen Villages to provide housing, sanitation and drinking water, Group Accident Insurance Scheme etc. helped in some measure to improve the quality of life of fishermen. Introduction of Beach Landing Craft with assistance through cooperative societies was a success in Orissa and Andhra Pradesh. In the inland water fisheries sector, the establishment of about 300 Fish Farmers Development Agencies (FFDA) and fish seed production by circular Chinese type of hatcheries etc. contributed to an increase in the average yield in FFDA districts to 1560 kg ha./year from the Sixth Plan level of

900 kg/ha. Fish seed production also increased from 5639 millions to 12,000 millions. Other important programmes included brackish water fishery development by transfer of technology through Brackish water Fish Farmers Development Agencies. The semi-intensive shrimp farming technology was upgraded under a UNDP assisted coastal aquaculture project (1986). In the deep sea fishing sector, considering the need for foreign technology to exploit non-shrimp resources, introduction of large number of resource specific vessels was considered. Schemes for leasing, test fishing and joint ventures were formulated. The Fishery Survey of India carried out studies on assessment of suitable craft and gears for marine fisheries and disseminated information about fishery resources availability. Deep sea fishing fleet increased suitable credit facilities, technology for harvesting non-shrimp resources, skilled manpower and infrastructure facilities including storage and processing facilities. In July, 1988, the Government of India decided to create a separate Ministry of Food Processing Industries (MFPI) and some of the functions relating to fisheries were transferred to it. For suitable coordination, a National Fisheries Advisory Board was set up in January 1989 with

the objective of rendering advice in respect of development of fisheries and orderly development of fishing industry, export of marine products, etc. To improve processing industry and internal marketing, ice plants with cold storage facilities, establishment of retail fish marketing centres, fish handling sheds, insulated fish marketing centres, insulated fish transportation vehicles etc. were developed in a substantial way for sustained growth of the fishing industry.

Until Seventh Five Year Plan (1985-1990), the contribution of the livestock sector was about Rs. 27,700 crores in 1987-88 as compared to Rs. 10,600 crores in 1980-81 which constituted 25.5% of the total agricultural output. The animal husbandry sector made good progress in the livestock production and health. During Eighth plan, several schemes of the Seventh Plan period were restructured for more effective implementation. An important aspect of the livestock development programme was the enhancement of the productivity through up-gradation by cross breeding. Frozen semen technology based on progeny bulls was a major plank of the programme and had resulted in improved productivity.

Fish production during 1990-1991 stood at 38.36 lakh tonnes, which was marginally above the target. The target for 1991-1992 was 39.90 lakh tonnes consisting of 24.40 lakh tonnes of marine fish and 15.50 lakh tonnes of inland fish. A new unit of Integrated Fisheries Project was installed in Visakhapatnam during 1990-91 to help the fishing industry to optimise utilisation of low value fish.

Technical consultancy services and introduction of diversified fish products, reimbursement of central excise duty on HSD oil used by fishing vessels less than 20 m. in length was undertaken during the two Annual Plans. For brackish water culture, more areas were supported through BFDAs. Under the National Welfare Fund Scheme, 72 fishermen villages and about 8.5 lakh fishermen were insured under the Group Accident Insurance Scheme so far. The number of fishermen Primary Co-operative Societies was around 8,170 having a membership of 6.6 lakhs. However, except in Maharashtra, Gujarat, Tamil Nadu and Orissa, the fishermen co-operatives in other States did not play any significant role in the development of fisheries. There has been a considerable improvement in the production of major livestock products, i.e., milk, egg and wool during the Eighth Five Year Plan (1997-2002). The milk production witnessed a significant growth of 4.5 % per annum to reach the level of 68.6 million tonnes during 1996-97. This increased the per capita availability of milk from around 180 gms/day in 1991-92 to 201 gms/ day in 1996-97. The step-up in the production of milk attributed to the intensified activities particularly, in improvement of

genetic-stock through cross-breeding, effective control of diseases and Operation Flood Programmes which strengthened the cooperative institutions and infrastructure facilities. The poultry sub-sector also made significant progress due to research and development activities. The eggs production which was at the level of 22 billion (in numbers) during 1991-92 increased to 28.2 billion during 1996-97. The per-capita availability of eggs increased from 25 to 30 per year, for the same period. The wool production increased from 416 lakh kg. in 1991-92 to 443 lakh kg. at the end of the Eighth Five Year Plan. Though the production of major livestock products during the Eighth Plan showed an increasing trend but their targets have not been realised. The country has vast and varied fishery resources both marine and inland. The total fish production potential in the country was estimated at 84 lakh tonnes. The total fish production increased from 41.57 lakh tonnes in 1991-1992 to 53.50 lakh tonnes in 1996-1997 registering an annual average growth rate of about 5 % during the Eighth Plan. The fish seed production also increased from 12,203 million fry to 15,700 million fry for the same period. There was significant increase in the export of marine products both in quantity and value terms. This increased from 1.39 lakh tonnes (valued at Rs.893 crore) in 1991-1992 to 3.78 lakh tonnes (Rs.4121 crore) in 1996-1997.

During Ninth Five Year Plan (2002-2007) National Project for Cattle and Buffalo Breeding was started for genetic improvement in bovines. Until ninth plan, growth in livestock sector was not very successful in nature. Keeping productive development of livestock at priority, tenth plan was concentrated on following four themes; rendering policy distortion, building participatory institutions, creating investment environment with improved productivity and promoting effective regulatory institutions. Use of technological and marketing interventions in the production, processing and distribution of livestock products has been central theme of livestock development programme since tenth plan. Special attention has been given to increase livestock owners, service providers, veterinarians and planners with the help of ICAR and its institutions and State Agriculture Universities. As most programme of agriculture department and Rural Development, Ministry of Nonconventional Energy Sources etc are common, an integration of these ministries were emphasised in this plan.

The programme of providing exotic males for improvement of sheep in the northern temperate region and pigs in the north-eastern region was continued in the Tenth Five Year Plan (2002-2007). Conservation of threatened breeds of livestock and improvement of breeds used for draught animals and packs was one of the major goals of the Tenth Plan. A holistic approach was taken to address the issue of clean milk production, which is imperative for

marketing and promoting export of dairy products. Steps were also taken for development of unorganised milk sector that controls a significant portion of the liquid milk and sweetmeat market. Special emphasis was given on improvement in availability of fodder.

To give a boost to export of poultry products, measures were taken for the development of infrastructure like cold storage, pressured air cargo capacity and reference laboratory for certification of health and products. National Fisheries Development Board (NFDB) was launched as a Special Purpose Vehicle (SPV) in the year of 2006 for implementing fishery developmental schemes in an integrated manner. A special attention was paid on the improvement of marketing. The Department of Animal Husbandry continued its programme for improvement of better studs both for horses and donkeys used for transport in hilly areas. Research and technology needs in fisheries institutes were upgraded to meet the growing demands.

The major priority areas during Twelfth Five Year Plan (2012-2017) were breed improvement, enhancing availability of feed and fodder and provision of better health services, including proper breeding management. Conservation and perpetuation of diverse local germplasm, adaptable to Indian climate conditions and resistant to various endemic diseases, was another important area, with clearer focus on sub-sectors such as small ruminants that have so far been neglected. The first phase of national dairy plan to be implemented for six years starting from 2012-2013 to 2018-2019 has been targeted to help increase the productivity of dairy animals and thereby increase milk production to meet the rapidly growing demand for milk and to help provide rural milk producers with greater access to the organised milk processing sector. Finance minister announced the launch of the National Livestock Mission in 2013-14 to support poultry, dairy farming and fisheries, which are critical for small farmers to keep earnings going and in case of failure of crop.

Disaggregated Trend of Livestock Sector Growth in India

Growth in livestock sub-sector was modest prior to green revolution (before 1968). However, the momentum in growth picked up during green revolution owing to substantial infusion of investment for reviving the sector and due to the inception of programs like Intensive Cattle Development Project (ICDP) in the mid-sixties. Consequently, the growth rate of overall livestock sector averaged at 4.11% during 1968 to 1986 (Table 1). In this period, the value of production of meat group increased at a rate of 4.92%/year, while that of milk group and egg group increased by 2.76% and 6.33% respectively. The sector continued to grow at a rate of

3.96% through the phase of wider technology dissemination with a minor slump during post reforms period. However, the livestock products did not suffer a major deceleration in growth as happened in the case of crops during the years after economic reforms. The lull in growth was manifested through subdued performance of value of output of meat, milk and eggs particularly. Similar to that of crop segment, recovery in growth was visible in livestock sector too, during the last four years after 2005-2006.

Table 1. Trend Growth Rates in Value of Product of Various Sub-Sectors of Livestock and Livestock Product at 19992000 Prices, 1950-1951 to 2009-2010 (%/year).

Phase	Livestock	Meat Group	Milk Group	Egg	Wool and Hair	Others
1950-51 to 1967-68	1.13	1.21	1.22	3.91	0.46	0.72
1968-69 to 1985-86	4.11	4.92	2.76	6.33	-2.39	1.77
1986-87 to 1996-97	3.96	4.39	4.99	5.15	1.5	0.63
1997-98 to 2005-06	3.36	3.57	3.71	4.35	1.59	1.39
2006-07 to 2009-10/2010-11	4.24	3.47	5.63	6.76	-1.55	1.6

Source: Chand and Parappurathu (2011).

Disaggregated Trend of Livestock Economy Growth at State Level

The state-wise growth of major livestock products such as milk, egg, wool and meat in the decade 2004-2005 to 2010-2011 was assessed and the states are classified into categories of low, medium and high variation in total value of output (Table 2). West Bengal is the only state where the output variation of all livestock products like milk, eggs, wool and meat was low. In Uttar Pradesh and Maharashtra, variation in milk, eggs and meat output was low. Haryana is the only state where variation in output of eggs, wool and meat was low. Karnataka is the only state where variations in output of milk, eggs and wool were medium.

Table 3 shows the name of States/UT according to their share in total milk production in India. This shows that ten states, each respectively are producing more than 5 percent of total milk production in India. These states are producing about 82 percent of total milk production in India. Except these states, other states are producing only 18 percent of total milk production in India. Bihar' share in total milk production in India is only 5 percent. Table 4 shows the name of States/UT according to their share in total egg production in India. This shows that only two states namely Andhra Pradesh and Tamil Nadu, each respectively are producing more than 15 percent of total egg production in India. Their share in India's total egg production is about 50 percent. Except these two states, share of Haryana, Karnataka, Maharashtra, Punjab and West Bengal is about 30 percent. Other states, each respectively are

producing less than 5 percent of India's total egg production. However, Bihar is producing only 1.2 percent of total egg production in India. Table 5 shows the name of States/UT according to their share in total meat production in India. This shows that seven states namely Andhra Pradesh, Haryana, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal, each respectively are producing more than 5 percent of total meat production in India. Their cumulative share in India's total meat production is about 75 percent. Other states, each respectively are producing less than 5 percent of India's total meat production. Their share in India's total meat production is only 25 percent. However, Bihar is producing only 3.8 percent of total meat production in India. Table 6 shows the name of States/UT according to their share in total fish production in India. This shows that Andhra Pradesh and West Bengal, each respectively are producing more than 15 percent of total fish production in India. Their cumulative share in India's total fish production is about 37 percent. Other states, each respectively are producing less than 15 percent of India's total fish production. Their cumulative share in India's total fish production is 63 percent. However, Bihar is producing only 4.4 percentage of total fish production in India.

Overall, Table 3, Table4, Table5 and Table 6 shows that in terms of share in India's total milk, egg, meat and fish production, Andhra Pradesh is doing well in comparison to other states. In all, Andhra Pradesh is largest producer of egg and fish, second largest producer of meat, and third largest producer of milk in India. The performance of Bihar is only satisfactory in terms of milk production,

Table 2. State wise Comparison of variation in Production of Major Livestock Product Between 2004-2005 to 2010-2011

Commodity	Low (less than 10 %)	Medium (10-30 %)	High (more than 30 %)
Milk	MP, J and K, UP, MH, HR, UTL, WB, PJ, ASM	JH, RJ, AP, TN, GJ, BH, KL, OR, KAR, HP	CHT
Egg	RJ,PJ, J and K, UP,WB, AP, MH	OR, KAR, TN, KL,UTL, BH, ASM, TP, MP, HP	GJ, HR, JH,CHT
Wool	ASM, GJ, BH, MH,WB, UTL, RJ, AP	HP, MP, KAR, TP, CHT,PB, J and K	KER, HR, OR,UP,TN
Meat	RJ, MH, WB, UP, KL, MP, BH,	JH, OR, AP, KL, J and K, PJ	KER, HR, OR,UP,TN, CHT, TN, HR, HP, UTL, GJ

A and N:Andaman and Nicobar Islands, AP: Andhra Pradesh; ARP: Arunachal Pradesh, ASM: Assam, BH: Bihar, CHG: Chandigarh, CHT: Chhattisgarh, D and N: Dadra and Nagar Haveli, D and D: Daman and Diu, DH: Delhi, GA:Goa, GJ: Gujarat, HR: Haryana, HP: Himachal Pradesh, J and K: Jammu and Kashmir, JH: Jharkhand, KAR: Karnataka, KL: Kerala, LP: Lakshadweep, MP: Madhya Pradesh, MN: Manipur, MH: Maharashtra, MG: Meghalaya, MZ: Mizoram NG: Nagaland, OR: Orissa, PD: Pondicherry, PJ: Punjab, RJ: Rajasthan, SK: Sikkim, TN: Tamil Nadu, TP; Tripura, UP: Uttar Pradesh, UTL: Uttarakhand, WB: West Bengal.

Source: Agricultural Statistics at a Glance (various years), Ministry of Agriculture, Government of India

Table 3. Name of States/UT According to State's/Union Territory's (UT) Share in Total Milk Production in India (2012-2013).

Item	States/Union Territories
More than 5 %	AP, BH, GJ, HR, MP, MH, PJ, RJ, TN, UP
Less than 5 and more than 1%	J and k, JH, KAR, KL, OR, UTL, WB
Less than 1 %	A and N, ARP, ASM, CHG, CHT, D and D, DH, D and N, GA, HP, LP, MN, MG, MZ, NG, PD, SK, TP

A and N: Andaman and Nicobar Islands, AP: Andhra Pradesh; ARP: Arunachal Pradesh, ASM: Assam, BH: Bihar, CHG: Chandigarh, CHT: Chhattisgarh, D and N: Dadra and Nagar Haveli, D and D: Daman and Diu, DH: Delhi, GA: Goa, GJ: Gujarat, HR: Haryana, HP: Himachal Pradesh, J and K: Jammu and Kashmir, JH: Jharkhand, KAR: Karnataka, KL: Kerala, LP: Lakshadweep, MP: Madhya Pradesh, MN: Manipur, MH: Maharashtra, MG: Meghalaya, MZ: Mizoram, NG: Nagaland, OR: Orissa, PD: Pondicherry, PJ: Punjab, RJ: Rajasthan, SK: Sikkim, TN: Tamil Nadu, TP: Tripura, UP: Uttar Pradesh, UTL: Uttarakhand, WB: West Bengal.

Source: Agricultural Statistics at a Glance (various years), Ministry of Agriculture, Government of India

Table 4. Name of States/UT According to State's/UT's Share in Total Egg Production in India (2012-2013)

Item	State and Union Territory
More than 15 %	AP, TN
Less than 15 and More than 5 %	HR, KAR, MH, PJ, WB
Less than 5 and more than 1%	BH, CHT, GJ, KL, MP, OR, RJ, UP
Less than 1 %	A and N, AP, ASM, CHG, D and D, D and N, DH, GA, HP, J and K, JH, LP, MN, MG, MZ, NG, PD, SK, TP, UTL

A and N: Andaman and Nicobar Islands, AP: Andhra Pradesh; ARP: Arunachal Pradesh, ASM: Assam, BH: Bihar, CHG: Chandigarh, CHT: Chhattisgarh, D and N: Dadra and Nagar Haveli, D and D: Daman and Diu, DH: Delhi, GA: Goa, GJ: Gujarat, HR: Haryana, HP: Himachal Pradesh, J and K: Jammu and Kashmir, JH: Jharkhand, KAR: Karnataka, KL: Kerala, LP: Lakshadweep, MP: Madhya Pradesh, MN: Manipur, MH: Maharashtra, MG: Meghalaya, MZ: Mizoram, NG: Nagaland, OR: Orissa, PD: Pondicherry, PJ: Punjab, RJ: Rajasthan, SK: Sikkim, TN: Tamil Nadu, TP: Tripura, UP: Uttar Pradesh, UTL: Uttarakhand, WB: West Bengal.

Source: Agricultural Statistics at a Glance (various years), Ministry of Agriculture, Government of India

Table 5. Name of States/UT According to State's/UT's Share in Total Meat Production in India (2012-2013).

Item	States/Union Territories
More than 5 %	AP, HR, KL, MH, TN, UP, WB
Less than 5 and more than 1%	BH, DH, KAR, NG, OR, PJ, RJ
Less than 1 %	A and N, ARP, ASM, CHG, CHT, D and D, D and N, GA, GJ, HP, J and K, JH, LP, MP, MN, MG, MZ, NG, PD, SK, TP, UTL

A and N: Andaman and Nicobar Islands, AP: Andhra Pradesh; ARP: Arunachal Pradesh, ASM: Assam, BH: Bihar, CHG: Chandigarh, CHT: Chhattisgarh, D and N: Dadra and Nagar Haveli, D and D: Daman and Diu, DH: Delhi, GA: Goa, GJ: Gujarat, HR: Haryana, HP: Himachal Pradesh, J and K: Jammu and Kashmir, JH: Jharkhand, KAR: Karnataka, KL: Kerala, LP: Lakshadweep, MP: Madhya Pradesh, MN: Manipur, MH: Maharashtra, MG: Meghalaya, MZ: Mizoram, NG: Nagaland, OR: Orissa, PD: Pondicherry, PJ: Punjab, RJ: Rajasthan, SK: Sikkim, TN: Tamil Nadu, TP: Tripura, UP: Uttar Pradesh, UTL: Uttarakhand, WB: West Bengal.

Source: Agricultural Statistics at a Glance (various years), Ministry of Agriculture, Government of India

Section III

Composition of Livestock Economy in Overall Bihar and Its district

Livestock and Livestock Products in Bihar

Livestock is a core sector of the State economy. It provides opportunities for poverty alleviation. About 50 % of rural household keeps livestock at home in Bihar (NSS, 54th round survey report) which is less than the all India average of 56 %. Comparison of different states shows that the percentage of household who possess livestock is very high in Haryana and Rajasthan. Household consumption survey reports show that the scope for livestock product is increasing in India. Here, it is important to find out why quantity of livestock is low? Disaggregated trend of livestock product given in table 7 raise serious concern that except milk, performance of egg, wool and meat has not been found satisfactory between 2004 and 2011. The overall growth in milk production has not been significant during 2004-2011. In comparison to 31 % positive growth in 2004-2005, there was 32 % decline in eggs production between 2009-2010 and 2010-2011. Volatility in eggs production and meat has been very high between 2004 and 2011. Overall, trends given in table 7 shows that decline in eggs and milk were responsible for the decline in overall livestock sector growth.

Table 7. Disaggregated Trend of Livestock Product Growth in Bihar

Item	2004-2005 to 2005-2006	2005-2006 to 2006-2007	2006-2007 to 2007-2008	2007-2008 to 2008-2009	2008-2009 to 2009-2010	2009-2010 to 2010-2011
Milk	6.69	7.74	6.10	2.63	3.17	6.51
Eggs	31.72	-9.08	13.74	-0.12	2.44	-32.31
Wool	-1.32	1.75	4.25	2.58	0.30	0.72
Meat	6.49	-1.96	2.73	1.90	1.98	-4.42
Livestock	7.10	5.85	6.05	1.99	3.27	4.20

Source: Author's Calculation

Changes in Livestock Resource Base: Livestock and Livestock Product Marketing in Bihar

Marketing facility plays significant role in livestock product growth. Dairy development has significantly affected milk marketing in Bihar. Table 8 shows marketing of milk in Bihar since 1987-1988. The quantity of milk marketing was 60800 kg/day in 1987-1988. The share Patna and Muzaffarpur in total milk marketing was highest in 1987-1988. Quantity of milk marketing has increased since 1987-1988 in Bihar. It has touched the quantity of milk marketing to 574 kg/day in 2012-2013. In total milk marketing share of Shahabad, Barauni,

Gaya, Patna and Samastipur has increased significantly during 1987-1988 to 2012-2013. Table 9 shows total number of different kinds of livestock presented for sale in the fairs during 2001-2002 and 2010-2011. It clearly shows that there was significant increase in the number of buffaloes during 2006-2007. In all, shares of buffaloes, goat and sheep in total sale was high during 2001-2011. Besides, total sale of Livestock increased during 2001-2007 and, it decreased during 2007-2011 though the share of Bihar in India's total milk production is only 5 percent.

Table 8. Disaggregated Trend of Livestock Economy Growth in Bihar at District Level Milk Marketing

Milk Union/Unit	thousand kg/day					
	1987-1988	1997-1998	2003-2004	2006-2007	2011-2012	2012-2013
Patna	31.54	68.84	103.72	124.46	177.36	186.72
Muzaffarpur	22.91	27.49	51.87	55.79	88.4	102.51
Gaya	3.88	6.78	14.19	15.56	32.32	38.64
Vikramshila	-	3.75	6.83	8.48	20.63	23.67
Barauni	2.47	6.85	41.33	48.55	66.78	81.91
Samastipur	-	21.55	54.43	56.84	100.22	110.51
Shahabad	-	0.04	16.02	14.72	34.19	37.36
Kosi	-	-	-	-	25.87	31.46
Total	60.8	135.3	288.39	324.4	545.77	574.14

Source: Official website of The Bihar State Milk Co-Operative Federation Ltd, on 15.07.14

Table 9. Statement Showing the Total Number of Different Kinds of Livestock Presented for Sale in the Fairs (192 Fairs)

Item Year	Bulls	Bullocks	Cows	Young Stock	Buffaloes	Goats and Sheep	Others
2001-02	819	355405	413415	290138	455816	394735	24275
2003-04	845	325135	418637	259515	445771	433401	22252
2005-06	785	318124	424526	268677	383779	487552	23956
2006-07	760	283324	389670	265655	877783	484655	18235
2007-08	735	267125	367745	256642	364584	464785	17630
2008-09	710	255265	364332	254320	357264	453733	16660
2009-10	685	244138	344234	246270	351672	443254	16230
2010-11	641	231608	341855	239441	349861	437805	16101

Source: Bihar Statistical Hand Book 2012

Section IV

Identifying the Main Drivers of Livestock Product Variation at State Level

Economy of Bihar is facing a major challenge that besides high growth, rate change in employment is not sufficient especially in those districts where agriculture is facing challenges due to drought and Flood. In the absence of proper agriculture growth, livestock sector is only hope to support livelihood in rural Bihar especially in drought and flood affected region. Government has been emphasizing on agriculture and its allied sector like livestock but still Bihar is unable to realise its real capacity. Except milk production, the

performance of meat, eggs and fish production was very low in Bihar and it contributes less than 5 % in total production. There are so many factors responsible for low growth of livestock sector in Bihar. Correlation analysis has been done to identify determinants of livestock sector at state level. Detail of variables is given in methodology section. Table 10 shows factors responsible for district level variation in livestock sector (cattle and buffaloes). The estimates of ordinary least square are presented in Table 10. In all, the adjusted R-square is good. The present study attempts to identify factors responsible for differentiation of livestock across districts of Bihar. The sign of coefficient in Table 10 is along the expected line. The estimated coefficients of variables other than grazing land and artificial inseminations are robust (significant at 1% level of significance). Relationship between grazing land and bovine indicates the presence of significant inter linkages between availability of fodder and bovine across the districts of Bihar. Market for fodder is also not up to a mark in rural Bihar.

Table 10. Determinant of Livestock across Districts of Bihar

<i>Explanatory variables</i>	<i>Coefficients</i>	<i>t Stat</i>
Intercept	11.23***	33.02
Dispensary	0.32***	2.79
Immunisation	0.54***	4.96
Grazing land	0.05*	1.7
Artificial Insemination	0.004	0.1
R Square	0.81	
Adjusted R Square	0.79	

Note: * shows 10 percent level of significance, ** shows 5 percent level of significance and *** shows 1 percent level of significance

In absence of proper marketing facility and increasing agriculture mechanization, the availability of fodder in Bihar is emerging as a serious challenge. At given constraints, fodder has become a major expenditure in rural Bihar. Only those districts have higher number of bovine where fodder availability is comparatively high. There is significant relationship between dispensary and bovine indicates the presence of inter linkages between medical infrastructure and bovine. Deaths due to infectious diseases is a major challenge in the growth of livestock sector in Bihar. Number of bovine is comparatively high in districts having medical infrastructure. Relationship between immunisation and bovine also indicates that animal health facility is positively affecting availability of bovine in Bihar. Relationship between artificial insemination and bovine indicate insignificant relationship between artificial insemination and bovine. However, positive relationship between artificial

insemination and bovine shows that artificial inseminations are high where number of bovine is high.

Section V

CONCLUSION

The growth of livestock sector has been found slower in Bihar than at the national level. The share of Bihar in India's livestock sector income has not changed significantly. In terms of total livestock income, Bihar is lagging behind states like Uttar Pradesh, Andhra Pradesh, Rajasthan, Maharashtra, Tamil Nadu, Punjab, West Bengal and Gujarat. However, a significant proportion of landless labourers, small and marginal farmers have access to milk producing livestock resources but in terms of actual number medium and large households have greater access to milk producing livestock resources. Besides, low milk productivity, decline in the Bihar's share in India's egg and meat sector income is a major factor responsible for insignificant changes in livestock sector of Bihar. Several demand and supply side factors have been identified for the above trends like relationship between animal dispensary and bovine indicates the presence of inter linkages between medical infrastructure and bovine. Relationship between grazing land and bovine indicates the presence of inter linkages between food availability of fodder and bovine across the districts of Bihar. Relationship between immunisation and bovine indicate that health facility is positively affecting availability of bovine in Bihar. Relationship between artificial insemination and bovine indicate insignificant relationship between artificial insemination and bovine. Increase in the quality of animal health infrastructure for animals, availability of fodder is important to increase number of bovine in Bihar.

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