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Livestock sector as a tool for reducing inequality in India: An economic analysis of trends and drivers of growth

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Livestock sector as a tool for reducing inequality in India: An economic analysis of trends and drivers of growth

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Abstract

Livestock sector provides livelihood to two-third of rural community, employment to about 8.8 % of the population in India and also provides food in the form of animal protein and nutrients. This sector is perceived to be more pro-poor option as compared to land, for income and livelihood and has been identified as a sector having enormous potential for poverty reduction and doubling farmers income. In view of rising optimism and potential of this sector, this paper analyses the development of the livestock sector since independence. Using livestock census data, it examines the trends particularly size, structure and compositional changes in the number of livestock held by households. It analyses the various socioeconomic determinants of the number of livestock held by households in India using a poisson regression. It highlights the inequality and variation in livestock holdings across households belonging to different socio-economic groups and finally suggests certain policy measures that could overcome the constraints faced by this sector and could help in raising farmers income and reducing inequality in livestock holdings in India.

Key words: Livestock, land, socioeconomic, food

JEL classification: Q22, Q100, Q150

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Introduction

The livestock sector plays an important role in the socio-economic development of rural households. It contributes about 5.1 percent to the Gross Domestic Product and 29.8 percent to the agricultural gross domestic product. As per the 20th Livestock census 2019, the total livestock population shows an increase of 4.6 per cent over the Livestock census 2012. The share of livestock in agricultural sector GDP growth has been increasing faster than the agricultural and allied sector (National Accounts Statistics 2019, CSO, GOI) in the past decade because of the rising demand for livestock products propelled by income, population growth and urbanization. National agriculture policy has identified livestock as an important sector. This suggests that livestock is likely to emerge as an engine of agricultural growth in the coming decades.

Livestock sector provides a variety of food and non-food products. The major livestock products are milk, meat, wool and eggs. India is the largest producer of milk in the world with an annual production of 198.4 million tonnes in 2019-20, it accounts for about 23 percent of world milk production (GOI, 2020). The gross value added from milk products within the livestock sector across India amounted to over 4.4 trillion Indian rupees in fiscal year 2018 (Statista research department, 2021). This group of products made up 66 percent of the economic value in this sector. Livestock products contributed over 6.8 trillion rupees in 2018 to the country's economy. Since the beginning of operation flood in India in early seventies, milk production as well as per capita availability is continuously increasing (Statista research department, 2021). But if we compare the per capita availability with other countries in the world, India remains far behind global standards. Several reasons are responsible for this. One possibility is that although India has one of the largest number of animals but low per capita availability signifies unproductive animals due to problem of feed and fodder, veterinary services, infrastructure, procurement of milk etc (Landes *et al.,* 2017, Birthal and Jha, 2005). Moreover, large population is an important factor contributing towards low per capita availability.

India has large animal diversity. India holds more than a quarter of world’s bovine population, and with a production of more than 133 million tons in 2012-13, it is the largest producer of milk in the world (GOI, 2014, Kishore *et al.,* 2016). Among the bovine animals, buffaloes which constitutes around 36 percent of total bovine animals has 49 percent share in milk production. Whereas indigenous cow, which constitutes around 47.4 percent of total bovine animals has only 21 percent share in milk production. Cross breed cow which comprises 16 percent has 27 percent share in milk production. This is mainly due to differences in yield across the three varieties of bovine animals (GoI, 2019).

Given that milk production has increased since independence and there is lot of heterogeneity in terms of milk yield among different species of animals, but the chronic scarcity of feed and fodder and shrinking area and deteriorating quality of grazing lands entail that the milk output increases without further increase in the number of cows and buffaloes. It means that Indian livestock sector needs to become more efficient.

In this paper, we study trends and patterns in livestock development in India since independence and try to identify key drivers of these patterns using Livestock Census (1960-2019), supplemented by an analysis of the household-level data from a large-scale survey on Land and Livestock Holdings conducted by the National Sample Survey Organization (GoI, 1997; GoI, 2006; GoI, 2016). This paper will mainly analyze the overall trends in the livestock sector and will later shift its focus on the holdings of bovine animals which constitutes a mamoth share in total holdings.

Recent literature has highlighted that distribution of livestock is closely related to land holding (Birwal, 2017, Vaidyanathan 1988). On the one hand, draught animals are required for cultivation of agricultural land and for providing manure, and on the other, land holdings facilitate, through provisioning of fodder, holding of male and female bovine animals. Another objective of this paper is to analyze the relationship between land and livestock holdings and also the trends in livestock holdings across different land size and social groups. Using a poisson regression technique, It would finally analyze the impact of different socioeconomic factors determining the holdings of bovine animals in India using household level data collected by land and livestock survey, NSSO.

Such an analysis could be beneficial for policy makers in realizing the potential of livestock sector in reducing poverty and inequality in India. Further, it will help in identifying the factors influencing the holdings of livestock particularly bovines which will in turn help in formulating policies for poor and marginalized sections of the society. It could help them in enhancing their livelihoods and income by controlling the constraints faced by them.

Livestock Population and its trends

Table 1 gives details of the livestock population using data from the Livestock Census from 1961 to 2019. India has a huge livestock population of 185 million 'cow & bullock', 105 million buffaloes, 215 million ovine animals (goats & sheep) and 8 million pigs (figures based on year 2019). Out of the total livestock in the country, around 36.04 percent are 'cow & bullock', 20.39 percent are buffaloes, 41.76 percent are ovine animals (sheep & goats) and only 1.59 percent are pigs. All other animals are less than 0.25 percent of the total livestock population. The composition of livestock population has changed over the last few

decades. As can be seen from Table 1, livestock population has increased continuously since 1961 except in mid 70s, late 90s and in 2007-12. After a fall in previous years (2007-12), in recent years i.e. 2012-19, the overall livestock population has again shown a rising trend. This trend can be observed for two of the major compositions of livestock— bovine and ovine animals. However, the increase in bovine animals has just attained the 2007 levels.

Looking at bovine animals alone, it is observed that in rural India, after reaching highest growth (18.22) in 1977-82, the growth rate started declining & became negative between 1992(-0.38) and 2003 (-2.61). The growth in bovine animals population had recovered during 2003-07, but declined during 2007-12 turning negative (-0.82) but recovered again during 2012-19 (0.79)(computed from Table 1). In absolute terms the bovine animals population has increased from 267.6 million in 2003 to 290 million in 2019 unlike two earlier periods when it showed a decline. With this increase in 2007 the bovine animals population had reached at an all time high level (Table 1).

The overall trend of declining bovine animals stock during the decade of 90s can be explained as a consequence of agrarian crisis. Agrarian crisis had not only caused rising landlessness, a decline in average land holding of the marginal and small farmers but also stagnation of the food-grain production during this period. Since by-products of food-grain crops are the most important source of fodder for most of these rural households, their access to fodder is likely to have become more constrained. Thus, a decline in access to fodder is likely to have forced these rural households to dispense their bovine animals stock in general and male bovine animals holdings in particular (Patnaik, 2007, Mishra and Sharma, 1990, Kishore *et al,* 2016).

Male bovine animals serve mainly as a source of draught power especially in rural area. There has been a reduction in male bovine animals stock between 115 million in 1992 to 55.4 million in 2019. The rate of decline observed in recent period is much higher as compared to the previous decades of this century. Female bovine animals stock showed an increase during the same period from 168.8 million in 1992 to 234.6 million in 2019.

Table 1, which also gives the figure for population of male bovine animals, indicates that the number of adult male bovine animals had gone down from 80 to 62.15 million between the years 1992 and 2003. The numbers had further declined to 36.94 million in 2019. This shows that the preference for holding a male bovine animal in rural India has gone down over the period. The other crucial factor for such a severe decline can be the rise in opportunity cost of rearing a male bovine animals vis-à-vis renting facilities (which are easily accessible now a days) of machine implements for marginal and small farmers. Female bovine animals mainly provide milk but are also used for reproduction. There was a small

increase in population of female bovine animals in the 1990s.However, as given in the table, female bovine animals has increased continuously since 1961-2019. However, the rate of growth of adult female bovine animals and female bovine animals during 1992-2003 was less than that during the decade of 1982-92. The growth rate seemed to have risen up again during 2003-12 and in recent years the corresponding figures have increased by 14 percent and 2.36 percent for female bovine and adult female bovine animals respectively. However, looking at the composition of female bovines, it can be seen that the growth rate of young female bovines is larger as compared to adult female bovines in the recent decade. Thus, the increase in female bovines is mainly attributed to the increase in young female bovines as compared to adult female bovine animals.

Above we have discussed trends in male and female bovine animals and in particular trends in adult female and male bovine animals. The change in the bovine animals stock held by farmers households is significant for study period. It is important to note that this decline in growth of adult female productive population and a near constant growth in young calves occurred in the recent period when milk prices were growing at an accelerated pace, at least in nominal terms. Only two situations could explain the decline in growth of adult female population; first, the attrition rate was high. Secondly, there was a slowdown in share of young stock coming into adulthood, though the absolute numbers may have been greater than before (Rajeshwaran et al, 2014).

The increase in population of female bovine animals in the 1970s and 1980s was related to the expansion of dairy cooperative movement and expansion of rural banking. In the 80s, provision of subsidized credit for purchasing milch bovine animals was an important component of the integrated rural development programme (IRDP). In the 1990s, the steep decline in availability of formal sector credit in rural areas and a slowdown in expansion of dairy cooperative movement led to a decline in growth of rural female bovine animal holdings (Ramachandra and Swaminathan, 2005).

In dairy farming activity, buffaloes as well as cross-breed cow yield higher returns as compared to the indigenous cow stock. Also, buffalo is a farmers' first preference due to its adaptability to local conditions and higher fat content in comparison to that of the cow. Further, buffalo has inherent disease resistance as against the cow (Prasad, 2002). Even then the percentage of female stock accounted for substantially higher proportion of indigenous cow, followed by buffalo and cross-breed cow. Cow (crossbreed and indigenous) seemed to have lost its importance since 1997, falling from 59.2 Percent of female bovine animals (cow plus buffaloes) in 1997 to 57.3 percent in 2007 and in 2012, as compared to the proportion of buffaloes, being 40.8 percent of female bovine animals (cow plus buffaloes) in 1997 and further rising to 42.7 percent in 2007 and remaining about the same in 2012. . The decline in cow stock had been a result of proportionate decline in indigenous cow whereas the percentage of crossbred cow had increased.

But in recent years (2012-19), cow has again gained its importance increasing back to 59.13 percent of female bovine animals whereas the proportion of buffaloes again falling to 40.87 percent. Further, there is a shift away from indigenous cow to buffalo and crossbred cow holding.

Table 1- Population of livestock in Rural India based on Livestock Census (in millions)

Livestock	1961	1967	1972	1977	1982	1987	1992	1997	2003	2007	2012	2019
Adult bullock	70.9	71.6	72	65.8	70.8	72.4	72.2	66.5	55.7	54.8	48.1	33.4
Young bullock	22	22.5	21.8	20.1	24.5	25.1	26.1	25.7	23.6	26.5	18.3	13.7
Total Bullock	**92.9**	**94.1**	**93.8**	**85.9**	**95.3**	**97.4**	**98.3**	**92.2**	**79.3**	**81.3**	**66.5**	**46.5**
Adult cow	52.3	52.6	53.3	50.8	56.1	58.7	61	60.7	60.4	68.8	73.1	77.2
Young cow	23.1	23.8	23.1	22	30.2	34.7	36.6	36.8	35.9	40.2	44.2	61.5
Total cow	**75.4**	**76.4**	**76.5**	**72.9**	**86.3**	**93.4**	**97.6**	**97.5**	**96.3**	**109**	**117.3**	**138.8**
Crossbred cow& bullock	NA	NA	NA	NA	7.9	9.8	13.5	17.9	21.9	30	36.8	47.8
Indigenous cow& bullock	NA	NA	NA	NA	174.6	180.9	182.4	171.8	153.7	160.3	146.9	137.5
Cow and bullock	170.4	170.5	172.4	158.7	185.8	190.7	195.9	189.7	175.7	190.3	183.7	185.3
Adult male buffaloes	7.51	7.99	7.79	7.36	7.74	7.12	7.88	7.58	6.42	6.21	5.15	3.5
Young male buffaloes	6.27	6.13	6.67	6.71	7.05	8.01	8.9	10.2	10.6	12.6	10.4	5.4
Total male buffaloes	**13.8**	**14.1**	**14.5**	**14.1**	**14.8**	**15.1**	**16.8**	**17.8**	**17**	**18.8**	**15.5**	**8.9**
Adult female buffaloes	23.8	24.8	27.4	28	30.7	36.7	41.3	44	47.6	51.4	53.9	52.3
Young female buffaloes	11.4	11.7	12.4	12.6	16.5	19.8	21.9	23.3	27.4	29.8	34.7	43.6
Total female buffaloes	**35.2**	**36.5**	**39.8**	**40.6**	**47.1**	**56.5**	**63.1**	**67.3**	**74.9**	**81.1**	**88.6**	**95.9**
All buffaloes (Male & female)	49.2	50.6	54.7	54.7	66.5	71.6	79.9	85.1	91.9	99.9	104.1	104.8
Adult male bovine animals	78.4	79.6	79.8	73.2	78.6	79.5	80.1	74.1	62.2	61	53.3	36.9
Young male bovine animals	28.2	28.6	28.4	26.8	31.5	33.1	35	35.9	34.2	39.1	28.7	18.5
Total male bovine animals	**106.6**	**108.2**	**108.3**	**99.9**	**110.1**	**112.6**	**115**	**110**	**96.3**	**100.1**	**82**	**55.4**
Adult female bovine animals	76.1	77.4	80.7	78.9	86.8	95.3	102.3	104.7	108	120.2	126.9	129.5
Young female bovine animals	34.5	35.5	35.5	34.6	46.6	54.6	58.5	60.1	63.3	70	78.9	105.1
Total female bovine animals	**110.6**	**112.8**	**116.2**	**113.5**	**133.4**	**149.9**	**160.8**	**164.8**	**171.3**	**190.2**	**205.9**	**234.6**
All Bovine animals	**219.6**	**221.1**	**227.1**	**213.4**	**252.3**	**262.3**	**275.8**	**274.8**	**267.6**	**290.2**	**287.8**	**290.1**
Sheep	39.4	41.1	39.1	38.8	47.5	42	48.9	55.4	58	69.6	63.8	72.2
Goats	58.8	62.4	64.8	62.7	91.7	104.2	109.4	116.7	117.5	133.3	129.1	142.4
Ovine animals	**98.1**	**103.5**	**103.9**	**101.6**	**139.2**	**146.2**	**158.2**	**172.2**	**175.5**	**202.9**	**192.8**	**214.7**
Pigs	**4.9**	**4.6**	**6.4**	**5.9**	**9**	**9.7**	**11.3**	**11.5**	**11.4**	**10**	**9.2**	**8.2**
Total Livestock	**325.7**	**332.2**	**340.3**	**323.7**	**403.5**	**421.6**	**448.2**	**461.2**	**456.8**	**505**	**492.4**	**514.1**

Source: Livestock Census (1961-2019), Government of India

2. Relationship between land and bovine holdings

Livestock sector in general and dairy sector in particular has considerable potential to contribute towards alleviation of problems of unemployment and poverty. Since, the scale of operations carried out on a farm is closely related to the size of holdings, it is likely that the animal husbandry would have some bearing on the size of bovine reared on land holdings. In this study certain associations have emerged between the size of land holding and the number of different types of livestock.

The analysis of relationship between land and bovine holding brings out two features. First, in general, distribution of bovine holding is less unequal than the distribution of land holding. Second, distribution of bovine animal is closely related to land holding. On the one hand, draft animals are required for cultivation of agricultural land, and on the other, land holdings facilitate, through provisioning of fodder, holding of male and female bovine animals.

Data from NSS surveys reveals the percentage distribution of livestock across various land sizes in 1991-92 and 2002-03 and 2012-13. Data shows that landless households own very little livestock. In 2002-03, 31.93 percent of the total rural households were landless and holding a very little share of the total livestock. They had relatively higher proportion of ovine animals (2.12 Percent) and pig (3.17 Percent) holding as compared to bovine animals holding (0.60 Percent). Proportion of landless households increased very sharply between 1991-92 and 2002-03 and had further increased between 2002-03 and 2012-13. Characterized by greater landlessness, number of bovine animals owned by landless households fell by 74 Percent during 1991-92 and 2002-03, but between 2002-03 and 2012-13 number of bovine animals owned increased by more than 7 times.

The share of bovine animals owned by households having marginal and small size land holding is greater than the share of land owned by households in these categories. Together these categories own 74 Percent of bovine animals stock of the country (2012-13). Marginal land owners (0.002-1ha) owned 51.26 Percent of total bovine animals stock and 22.17 Percent of operated area in 2002-03, and increased to 54.59 percent of total bovine animals stock and 28.82 percent of operated area in 2012-13.

Thus, marginal and small holding farmers utilise their land for supporting greater number of bovine animals heads than large farmers. Given that agricultural land is the most important source of fodder for most rural households, these data suggest that the fodder producing capacity of land operated by large farmers is utilised sub-optimally for maintenance of bovine animals holdings.

Table 2: Size and distribution of land and livestock holdings, 1991-92, 2002-03 and 2012-13

Size class of household operational holding (ha)	Percentage									Per 100 households					
	Households in land holding size category			operational land holding			bovine animals holdings			Male bovine animal			Female bovine animal		
	NSS rounds			NSS rounds			NSS rounds			NSS rounds			NSS rounds		
	48	59	70	48	59	70	48	59	70	48	59	70	48	59	70
Nil(≤ 0.002)	21.8	31.9	32.2	0	0	0.0	2.5	0.6	5.4	5.9	0.8	7.2	15.2	2.1	15.9
Marginal(0.002-0.5)	33.6	33.4	35.3	5.5	8.6	11.5	23.2	29.9	32.3	57	44	34	83	96	92
Marginal (0.5-1)	14.7	13.8	14.5	10.1	13.6	17.3	19.3	21.4	22.3	138	101	79	129	141	134
Small (1-2)	14.2	11.2	10.4	18.7	20.6	23.2	22.6	21.1	19.4	162	124	94	160	169	164
Semi medium(2-4)	9.7	6.23	5.34	24.1	22.4	22.5	17.2	14.9	12.7	168	151	110	192	222	218
Medium (4-10)	4.9	2.9	2.1	26.4	22.6	19.5	9.8	9.3	6.7	168	178	155	238	317	286
Large(>10)	1.1	0.6	0.3	15.2	12.2	6.1	2.5	2.6	1.4	148	215	218	329	532	528
All sizes	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**90**	**59**	**45**	**107**	**97**	**93**

It can be seen that there is a positive association between per hundred household bovine holding (male as well as female bovine) and their operated land size categories.

It may be noted that there was a steep rise in number of landless households between 1991-92 and 2002-03 and a still greater decline in the number of male and female bovine animals held by them during this period. Though landlessness has increased further in 2012-13, no of male and female bovine animals held by them has increased substantially between 2002-03 and 2012-13.

In case of marginal and small farmers, on the other hand, the number of bovine animals held increased more than the increase in proportion of households between 1991-92 and 2002-03. In 2012-13 proportion of households in marginal category had increased while that in small category had decreased, their bovine animals holding(both marginal and small) per hundred households has decreased. The data suggest that households in this category, given limited access to fodder and other resources, shifted from ownership of male bovine animals to female bovine animals. This is likely to have been accompanied by a shift to renting of tractors and other machines for meeting their draught power requirements.

In case of higher size-categories of holdings, while the proportion of households belonging to these categories declined, there was an increase in the absolute number of female bovine animals held by them

between 1991-92 and 2002-03. Even in these categories, further decline in the proportion of semi-medium to large land holding households, per hundred households' male and female bovine animals holdings has declined.

These trends suggest that over the 1990s it became increasingly more difficult for landless households to maintain any type of livestock. On the other hand, households with access to land, and consequently to fodder, choose to maintain a greater number of female bovine animals than earlier by reducing the number of male bovine animals held by them. Medium and large land holding households increased their stock of both male and female bovine animals. Recent time period has on the contrary witnessed declining numbers of both male and female bovine animals for all land holding households (except landless) and increase in numbers for landless households. This suggests that apart from land, there could be other factors such as education, employment, social groups etc that are impacting the bovine holdings of all land size categories except landless. This motivates us to analyze the impact of various socio economic factors determining the number of bovine animals held by the households.

DETERMINANTS OF NUMBER OF BOVINE ANIMALS HELD BY THE HOUSEHOLDS: A STATISTICAL ANALYSIS

On the basis of the analysis above, this section examines the determinants of number of bovine animal holdings of the household. Since, number of bovine animals included count values data, we attempt to examine its determinants using a poisson regression. The model is estimated using a maximum likelihood estimator.

Here a number of household specific socioeconomic variables are considered in the regression analysis such as land operated by the household, social group of the household, number of children in a household and education level of the members of the household. Education variable has been considered as highest and lowest education level of adult female and male members in the household.

Table below presents the poisson regression results of 35,604 households using 70th round of NSS data. The model has a pseudo R2 of 0.2113. Comparing the impact of caste groups on total number of bovine animals, we find that as compared to 'Others' category, households belonging to ST, OBCs, SC and muslims category hold significantly less bovine animals. The coefficient of SC, ST , OBC and Muslim dummy is negative and significant at 1 percent. Similarly, all the land size categories (landless, semi marginal, marginal, small, semi medium and medium) dummy are negatively and significantly impacting number of bovine animals implying that these land size category households own less number of bovine animals as compared to large category households.

We have seen from the results that households belonging to large category of land holdings as well as 'Others' social groups hold more bovines as compared to their counterparts. Now in order to understand, how far operated land across various social groups is impacting the determinants of no. of bovine animals, we introduced the interaction of operated land across various social groups.

We find that the coefficient of interaction of ST with operated land is highest and positively significant implying that as land owned by farmers in ST category increases, the number of animals held by them also increases.This is justifiable as ST households are mainly reside in tribal/hilly areas where landholdings are a major constraint. Thus, if ST category households are given more land then it could motivate them to hold more bovines since the problem of feed and fodder will not arise.

Similarly, for 'Others' and OBC categories land plays an important role as a determinant of number of land holdings. Whereas the coefficient of interaction of SC and Muslim categories with operated land is insignificant. It implies that land does not play an important role in the holding of bovine animals for SC and Muslim categories, rather there could be certain other factors such as social taboos etc that could impact their holding of bovine animals.

The coefficient of the number of children in a household and the number of members whose education level is below class Xth is positive and significant, implying that as number of children in a household increases the demand for milk also increases which in turn motivates the household to increase their holdings of bovine animals. Also, households with less level of education have lesser avenues to earn their livelihoods and thus choose livestock as a source of their income. It is seen that the female members of the households are particularly involved in rearing animals. Our results show that lower the level of female education in a household, the more are their holdings of bovine animals.

From the previous two sections we find that land and social groups are significant determinants of the number of bovine animals held by the households. In the absence of alternative sources of employment, bovines and dairying may be a significant source of income, nutrition and risk diversification for these households but because of credit constraint and dependence on larger land holding households for fodder, it was found that relatively smaller herd size were kept by landless households, small and marginal farmers instead of keeping large number of bovines. On the other hand, medium and large farmers, despite having enough fodder availability, these households face constraints either in terms of labor availability, since animal husbandry is a labor intensive work, and adult members of the household may be unwilling to rear animals, hired labor may be costly and these households are unwilling to bear the cost of hiring outside labor throughout the year.

Table 3 Determinants of number of bovine holdings of the households: poisson regression analysis

Dependent Variable:	**Total number of bovine**		
	Coefficient	**Standard error**	**P>|z|**
Independent Variables			
Social group ref. category= Others			
SC dummy	**-0.258**	0.020	0.000
ST dummy	**-0.218**	0.017	0.000
Muslim dummy	**-0.251**	0.021	0.000
OBC dummy	**-0.031**	0.012	0.011
Land size categories ref. category= Landless			
Landless dummy	**-2.682**	0.059	0.000
Semi marginal dummy	**-1.046**	0.056	0.000
Marginal dummy	**-0.688**	0.548	0.000
Small dummy	**-0.555**	0.053	0.000
Semi medium dummy	**-0.324**	0.050	0.000
Medium dummy	**-0.167**	0.045	0.000
Interaction term			
SC*Operated land	**0.006**	0.009	0.520
ST*Operated land	**0.054**	0.007	0.000
Muslim*Operated land	**0.001**	0.007	0.880
OBC*Operated land	**0.013**	0.003	0.000
Others*Operated land	**0.019**	0.003	0.000
Number of members below 10th	**0.093**	0.002	0.000
Lowest female education in hh	**-0.033**	0.001	0.000
No of children in hh (<14)	**0.030**	0.002	0.000
Constant	1.295		
No. of Observations	**35604**		
Pseudo R2	**0.2113**		

Conclusion

The paper analyses trends in livestock holding since the sixties. Paper primarily uses data of Livestock Census (1961-2019) to analyse these trends. As per the data, livestock holding increased continuously till late 1990s, except during 1972-77. During the mid-seventies, during late nineties and again in recent years (2007-12), there had been a decline in livestock holdings. Data also shows an increase in the proportion of female bovine animals in total bovine animals over the period of study.

The period between 1991-92 and 2002-03 was characterized by a marked fall in agricultural growth, steeply rising landlessness and inequality in landholdings, and a general crisis in the agricultural sector. This continued even during 2002-03 and 2012-13 where again landlessness and inequality in landholdings increased. In this backdrop, the paper further analysed the relationship between animal holdings and size of operational land holdings.

Analysis of official large-scale survey data (NSS 48th ,59th and 70th)show that the ownership of livestock was extremely unequal across households in different size-classes of operational holdings. In general, landless and small peasants owned fewer livestock heads than households in higher size-classes of landholdings. It may be noted that the trends over time in livestock holdings had also not been uniform across all land sizes. The steepest decline in livestock holdings happened for landless and small farmers in 2002-03. In contrast, the livestock holdings of households in the highest size-class of operational holdings went up during the 1990s. In case of small and marginal farmers, an overall decline in bovine animals holdings was accompanied by a compositional shift away from holding of draught animals towards holding of milch animals. In contrast, in case of medium and large farmers, the compositional shift towards female bovine animals was a result of greater increase in milch bovine animals than in draught animals. On the other hand during 2002-03 and 2012-13 there was a further decline in per hundred bovine animals holdings for all land size categories, except for landless households, for whom there has been an increase in bovine animals holdings.

Using poisson regression analysis on 70th round of NSS data , the paper also analyzed the impact of various socio economic factors on the number of bovine animals held by a household. We find that households belonging to large category of land holdings as well as 'Others' social groups hold more bovines as compared to their counterparts. In order to understand, how far operated land across various social groups is impacting the determinants of no. of bovine animals, we introduced the interaction of operated land across various social groups. The results depict that land does not play an important role in the holding of bovine animals for SC and Muslim categories, rather there could be certain other factors such as social taboos etc that could impact their holding of bovine animals.

Paper highlighted inequality of livestock holdings among various farmer households in the form of either larger holding of livestock with the large farmers vis-à-vis small farmers and the landless or holding of expensive animals like bovine animals in hands of large farmers and that of small ruminants with the poor. This is mainly because state policies biased in favour of developed states and larger farmers within these states, keeping the benefits of such policies away from small farmers and relatively less developed/ backward states. This inequality further increased between 1991-92 and 2002-03 when there was large rise in the extent of landlessness. In case of marginal and small farmers, there was an overall decline in

bovine animals holdings. This decline was a result of a steep fall in holdings of male bovine animals and a small increase in holding of female bovine animals. As a result, the overall decline in bovine animals holdings was accompanied by a change in the composition of livestock towards milch animal stock. In case of large farmers, there was an increase in overall bovine animal holdings; the increase in holdings of milch bovine animals was greater than the increase in holdings of male bovine animals. This continued even during 2002-03 and 2012-13 where again landlessness and inequality in landholdings increased and again per hundred households male and female bovine animals declined for all land holdings categories except landless households.

It is arguable that the state policies which were designed to give a boost to the livestock sector have not been able to provide support for expansion of livestock holdings in the country. Most of these policies have been product specific and have not focused on the entire range of products covered under the livestock sector. Secondly, their spread was limited to a few developed states. Thirdly, the constraints faced by farmers, specially the small and marginal farmers, were only partially addressed by these policies. This was so because important issues like fodder availability remained out of the purview of these policies. Consequently, in absence of feed and fodder availability, the targeted group, comprising the small and marginal farmers, did not find these policies of much use. Fourthly, under the Structural Adjustment Programme, during the decade from 1991-92 to 2002-03 and 2002-03 to 2012-13, public programmes such as IRDP , for supporting the livestock sector were weakened considerably. Decline in agricultural growth rates, particularly in case of cereal crops, in the post-economic reform period acutely affected availability of fodder. A sharp decline in fodder availability for landless, marginal and small farmers with a decline in average land holding and weakening of public programmes for development of livestock sector led to an overall drop in livestock holdings, and a steep rise in inequality in livestock holdings.

Given the immense potential of this sector in raising farmers income, reducing inequality and poverty in India, the government could promote policies that could benefit economically poor and socially deprived groups. These policies could be framed in a manner that the benefits could be distributed equally among various socio economic groups.

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