ABSTRACT

1. Introduction

There is a rapid rise in the demand and production of livestock products. Livestock production has been growing faster than any other agricultural sub-sector, and it is forecasted that by 2020, livestock will constitute more than half of the total global agricultural output in financial terms. The growth of demand for animal products is much higher in the developing world compared to the developed countries. This process has been termed as “Livestock Revolution”. It is called a revolution because change is happening rapidly and on a massive scale.

India exhibits all the signs of being at the onset of its livestock sector boom. One dimension of Livestock Revolution in India is its impact on small-scale farmers. The livestock sector’s boom can be extremely helpful in enhancing the income of small and marginal farmers. There is a hope that the Livestock Revolution will be beneficial for the poor. The revolution offers two main reasons for optimism. First, the Poor can very easily improve their income when they have a major stake in a sector that is growing. Second, the current rapid intensification of animal production comes at a time when the rural poor direly needs higher returns to their shrinking land than field crops alone can offer.

On the other hand, it is not guaranteed that small-scale producers will be able to take advantage of these opportunities given by Livestock Revolution. The right policies and technologies need to be in place to enable them to do so.

In India, the impacts of Livestock Revolution have not yet become negative as the farming system is still predominated by mixed crop, livestock farming, but in future they may cast ill effects for example in case of poultry sector the industrial system is rapidly growing and cause problems for small-scale farmers so right now problems related to Livestock Revolution are only a concern, as our country is only in the initial phases of this Revolution.

The livestock sector’s boom can be extremely helpful in enhancing the income of small and marginal farmers. It raises the possibility that the Livestock Revolution will be beneficial for the small-scale producers. In the wake of Livestock Revolution,
laissez-faire policy will be very dangerous because the bulkiest share of livestock in India is owned by small-scale producers so any repercussion in the sector due to the negligence of policymakers is going to hit hard small scale producers and can swell the rural poverty further. So policy makers should take note of this Livestock Revolution and make efforts as hard as possible to make it a boon rather than a bane for small farmers of our country.

Hence, the study with the following objectives tries to capture the impact of Livestock Revolution on small-scale producers, so that the policy makers can make possible efforts to harness the benefits of the Livestock Revolution for the small-scale producers. Proper policies related to the livestock sector can’t be made without understanding the impact of Livestock Revolution on small-scale producers.

Small scale producers are the focus of this thesis. In the present study, the small-scale producers have been defined as marginal and sub-marginal farm households that own or/and cultivate less than 2.0 hectares of land. These are farmers who depend greatly on livestock for their livelihoods. They are often involved in small-scale farming systems where livestock plays a central role as a source of food, income and critical inputs for agricultural production (such as draught power and fertilising manure). Small-scale farmers/producers/holders are used interchangeably in the thesis.

2. Objectives

The present study aims to understand the structural changes in the global livestock sector and examine the status of the Indian livestock sector in the world. It also aims to examine the structural shifts in Indian livestock sector because of Livestock Revolution. It highlights the importance of livestock sector of the agricultural economy in general and for small-scale farmers in particular. It evaluates the impact of the Livestock Revolution on small-scale livestock producers in India along with highlighting the issues and constraints faced by them. Finally, it concludes the entire research work and gives policy suggestions.

3. Research Methodology:

The impact of Livestock Revolution on small-scale livestock producers is assessed by assuming that their livelihood and income greatly depend on the share of livestock kept by them. Therefore, first, the distribution of livestock is assessed among the four
farm size groups i.e. small and marginal (below 2 ha), semi-medium (2.0-3.99 ha), medium (4.0-9.99 ha) and large (10 ha and above) so, that the concentration of livestock among each farm category can be assessed, this is also the reflection of their stake in the livestock sector. Secondly, the diversification in the livestock species kept by various farm categories is assessed which reflects the chances in the growth of farmer’s income and livelihood. Thirdly, the impact of various factors, related to Livestock Revolution is analysed on the share of livestock kept by small-scale producers.

The stepwise regression model is used in the study for identifying the best set of predictors impacting the share of livestock kept by small-scale producers. Two study periods are taken i.e., 1980 to 1990 and 1991 to 2011. It is hypothesised that share of livestock kept by small-scale producers livestock over a period have been impacted by various factors like consumption of livestock products, share of livestock GDP in agricultural GDP, livestock inventory, producer prices of milk, producer prices of meat, prices of feed crops, livestock production index, product diversification, processing of milk and processing of meat. The analysis was done with the help of SPSS 16.0 software.

Simpson index of diversity (SID) was used to measure the diversification among the livestock species kept by various farm groups in India

The Index ranges between 0 and 1. If there exists complete specialisation, the index moves towards 0. The index is interpreted, as follows

$$ SID = 1 - \sum_{i=1}^{n} p_i^2 $$

Where, SID is the Simpson index of diversity, and Pi is the proportionate value of ith livestock species in the total livestock.

Other analytical tools like Lorenz curves, Gini coefficient index etc were also used to satisfy the objectives.
4. Research Hypotheses

Following hypotheses have been formulated to understand the impact of the Livestock Revolution on small scale producers in India.

$H_01$: Consumption of livestock products does not impact the share of livestock kept by small-scale producers.

$H_{a1}$: Consumption of livestock products impacts the share of livestock kept by small-scale producers.

$H_02$: Livestock production does not impact the share of livestock kept by small-scale producers.

$H_{a2}$: Livestock production impacts the share of livestock kept by small-scale producers.

$H_03$: Livestock inventory does not impact the share of livestock kept by small-scale producers.

$H_{a3}$: Livestock inventory impacts the share of livestock kept by small-scale producers.

$H_04$: Processing of milk does not impact the share of livestock kept by small-scale producers.

$H_{a4}$: Processing of milk impacts the share of livestock kept by small-scale producers.

$H_05$: Feed prices do not impact the share of livestock kept by small-scale producers.

$H_{a5}$: Feed prices impact the share of livestock kept by small-scale producers.

$H_06$: Producer prices of livestock products do not impact the share of livestock kept by small-scale producers.

$H_{a6}$: Producer prices of livestock products impact the share of livestock kept by small-scale producers.

$H_07$: Diversification in livestock production does not impact the share of livestock kept by small-scale producers.

$H_{a7}$: Diversification in livestock production impacts the share of livestock kept by small-scale producers.
5. Main findings

5.1 Changes at Global Level

The production of livestock products in developed countries is growing at a very slow rate while in the developing countries, it is growing very fast, for example, India is the largest producer of milk in the world. India has increased its eggs, milk and meat production at the growth rate of 9.95%, 6.87% and 3.18% annually during TE 1990 to TE 2013. China in East Asia and Brazil in Latin America are also the star performers like India. China’s milk and egg’s production rose by more than five times and more than 1.5 times respectively. She raised her meat production by almost three times. Livestock production in Brazil also increased remarkably.

The level of consumption of livestock commodities in developing countries is very low in comparison to the developed countries, but the consumption of meat, milk and eggs has almost stagnated in developed countries while in the developing countries it is growing at very high rates. The fastest growth in livestock consumption has occurred in Asia where again the star performers are China in case of meat and India in case of milk. The former has doubled its consumption of meat in just a decade while the latter has astonishingly witnessed rapid progress in the production of milk. The per capita consumption of milk in India has increased from 42.98 kg/year to 84.22 kg/year from TE 1983 to TE 2011 at a robust growth rate of 4.17% annually.

5.2. Structural Changes in Indian Livestock Sector

Production and consumption of livestock products are rapidly rising. The dramatic rise in demand for livestock products, along with the changes in international trade, is placing pressure on India’s livestock sector both to expand and adapt. This adaptation takes the form of two major shifts - a shift in livestock functions and species. There is a trend from multi-purpose to single purpose animals, with animal food as the main objective. Another trend is the growing importance of monogastrics, especially poultry as economic converters of concentrate feed.

Between 1997 and 2003, poultry witnessed an all-time high growth of about eight percent a year. A sharpest rising trend can be witnessed in the case of poultry vis a vis other livestock species. Cattle population declined from 204.6 million in TE 1992 to 190.9 million in TE 2012. The decline in the cattle population is confined to indigenous stock. The number of indigenous cattle declined while the crossbred
increased. This indicates the technological progress in the sector. Within the indigenous stock, the decline was drastic for males. The populations of draught animals witnessed negative and decelerating trend. Cattle and buffaloes used for breeding purposes declined by -8.32% and -3.46% respectively while that of used for draught power purposes declined by -7.48% for cattle and -7.45 for buffaloes. This reflects that food function of livestock is getting significant over its other functions such as draught power and breeding.

Species wise livestock population is concentrated among few states; similar concentration is witnessed in the case of livestock production in India.

Milk is the prime product of livestock sector from India. Livestock production in India is highly concentrated towards milk (cow and buffalo). Diversification in the livestock production is decreasing, and it is getting more and more concentrated towards milk 88% of livestock production in India comprised of milk. Milk production is continuously increasing since the initiation of Operation Flood in the early seventies. The cow milk production grew at a rate of 5.05% while that of buffalo grew at the rate of 3.54% during 2001-The growth in production of meat has been faster as compared to milk production. Chicken meat witnessed the highest growth rate of 8.24% during the 2001-12 followed by eggs production growth rate i.e. 5.05%.

India experienced a structural shift, with an increasing share of livestock in the agricultural value of output, from 20.57% in 1980-81 to about 30% in 2011-12 while the share of agriculture in country’s total GDP declined from 38.21% to 16.42% during the same period. Livestock has been contributing more value of output than the food grain crops for a decade. The livestock sector grew faster than the agricultural sector in most of the states during 1990’s as well as 2000’s.

The growth of livestock exports has accentuated considerably during the post-WTO period. India’s share in total livestock exports rose from a meagre 0.25% in TE 1984 to 1.44% during 2012. India has made an appreciable rise in global exports still its share is minuscule which is basically due to huge domestic demand for livestock products. The share of bovine meat exports rose from 0.56% in TE 1984 to 7.04% in 2012, India’s share in world's livestock exports increased more than five times from TE 1984 to TE 2012. The performance of livestock exports has been impressive, while the reverse has happened in the case of livestock imports.
The share of bovine meat in total agricultural exports from India has even taken the lead over the share of sugar and honey, oilseeds, tea and tobacco and cashew nuts in Indian agricultural exports during the recent years. Buffalo meat has now become the second largest agricultural commodity for exports after rice during TE 2013-14. The rise of livestock share in agricultural export reveals the extent of internationalisation of livestock sector which would be partly attributed to trade policy reforms.

India has the competitive advantage in the production of different livestock products. A comparative study of producer prices of different livestock products with the countries having a booming livestock sector revealed that producer prices of buffalo milk, buffalo meat and pig meat in India are substantially lower than producer prices of all other countries from TE 1993-TE 2011. NPC of various Indian livestock products was also less than one which also indicated the competitiveness of Indian livestock products.

Data from the National Sample Survey Organization (GoI) shows that there is a continuous upward trend in expenditure on livestock products which is at the expense of a reduction in expenditure on food grains. Between 1983 and 2011, the share of milk in total food expenditure increased from 13.7% to 19%, while that of cereals declined from 42.7% to 21.16%. The share of food expenditure on meat, milk and eggs increased from 6% to 9% respectively during the same period. The consumption level of animal based products in urban, as well as rural areas is rising. Nutritional intake from livestock products in India is also showing a sharp rising trend.

5.3. Significance of Livestock Sector for Small Scale Farmers in India

Livestock can be considered to be the generators of agricultural growth in India. The rate of growth in livestock sector has been higher than that of the growth in the crop and forestry sector since 1980’s. The livestock sector grew at 5.4 % annually during 1980’s. Livestock products represent a significant proportion of agricultural exports in India. Animal husbandry contributes significantly in providing self-employment to rural people. Animal husbandry can be seen as the most important agricultural activity in providing self-employment to rural women.

The growth of livestock sector contributes remarkably towards poverty reduction as indicated by the significant negative regression coefficient of share of livestock GDP in agricultural GDP However, the significant positive values of the regression
coefficient for the share of agricultural GDP in national GDP are an indication of the fact that the trickle down process and the inclusiveness of agricultural growth process have been limited.

The share of income from crop farming showed a positive relationship with farm size whereas the share of income from livestock was inversely related to farm size. Hence, the income from livestock holds utmost importance to small and marginal farmers. Moreover, Livestock is closer to the line of equality, compared to the Lorenz curve for land, indicating that livestock resources are more equitably distributed than land. The Gini-coefficient index for livestock is lesser than the Gini-coefficient ratio for land which again indicates that livestock holdings are more equitably distributed than land. Hence, the income from livestock is more beneficial to the marginal and small landholders.

5.4 Issues concerning small-scale farmers in India in the era of Livestock Revolution

There are various issues of Livestock Revolution like issues related to incomes of the small-scale producers, social consequences/equity issues, environmental, animal and human health issues of the Livestock Revolution. Though the issues of Livestock Revolution are not very critical at the moment, but they may assume greater significance in the near future, if appropriate corrective mechanisms are not put in place.

5.5. The impact of Livestock Revolution on Small Scale Producers

Until quite recently the environmental, social and health impacts of livestock production in India have generally been considered to have more positive consequences than negative ones because the production system is still numerically dominated by rural-based integrated smallholder crop-livestock mixed farming systems.

In milk production, which is the prime product of Indian livestock, small-scale producers continue to dominate. Marginal and small holders together controlled 68.97% of total livestock holdings during 1996-97 which increased to 75.65% during 2011-12 while the share of semi-medium, medium and large holdings in the country's total livestock holdings declined from 16.85% to 14.67%, 10.85% to 7.93% and 3.33% to 1.75% respectively during the same period. The total livestock holdings of small and marginal farmers have been increasing since 1980-81, while the reverse is the case with the other farm categories.
The share of small and marginal holders increased for all types of livestock from 1996-97 to 2011-12. While the share of semi-medium, medium and large holdings declined for almost all types of livestock species. The increment in the proportion of livestock species kept by small and marginal holders shows that they have the potential to enhance their scale of production as they are capable of producing at a lower cost because of availability of sufficient labour with them.

In the case of small and marginal livestock producers, SID increased remarkably from 0.52 in 1996-97 to 0.78 in 2011-12. The diversification among the livestock species kept by the smaller sized farm categories i.e. marginal, small, and semi-medium increased, while the diversification among the livestock species kept by medium and large farmers decreased. The results point to the fact that in the era of the Livestock Revolution small and marginal farmers are able to diversify their livestock portfolio faster than the larger ones.

Livestock Revolution has positive effects on small and marginal farmers’ income. Their annual income per livestock increased almost two times from 1990-91 to 2011-12, although it increased for all farm sizes, but the most robust growth rate in livestock income (4.65%) was witnessed in the case of small and marginal farmers. Moreover, the growth rates in income of livestock per animal had an inverse relationship with the farm size. The smaller is the size of farm, the greater is the growth in the income from livestock.

Further, two different periods were taken to show the impact of Livestock Revolution on small-scale producers. Following tables depicts the result of hypothesis testing.
### Table 1: Summary of Results of Hypothesis Testing, 1980-1990

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_{a1}$</td>
<td>Consumption of livestock products impacts the share of livestock kept by small-scale producers</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H_{a2}$</td>
<td>Livestock production impacts the share of livestock kept by small-scale producers</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H_{a3}$</td>
<td>Livestock inventory impacts the share of livestock kept by small-scale producers</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_{a4}$</td>
<td>Processing of milk impacts the share of livestock kept by small-scale producers</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_{a5}$</td>
<td>Feed prices impact the share of livestock kept by small-scale producers</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_{a6}$</td>
<td>Producer prices of livestock products impact the share of livestock kept by small-scale producers</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_{a7}$</td>
<td>Diversification in livestock production impacts the share of livestock kept by small-scale producers</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

### Table 2: Summary of Results of Hypothesis Testing, 1990-2011

<table>
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<tr>
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</tr>
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<tbody>
<tr>
<td>$H_{a1}$</td>
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<td>$H_{a7}$</td>
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<td>Rejected</td>
</tr>
</tbody>
</table>
During the first period, 1980-90, only two factors were significantly impacting the share of livestock kept by small-scale producers i.e. livestock production index and consumption of livestock products in the best set of predictors. Both the factors were significantly impacting the share of livestock kept by small-scale producers livestock positively. Remaining variables were not impacting share of small-scale producers livestock in this period, while in the next period i.e. 1991-2011, five out of ten factors were impacting the share of livestock kept by small-scale producers. This means that the impact of Livestock Revolution has become more evident on small-scale farmers over time. During the latter period, two factors i.e. prices of feed crops and livestock production index were impacting the share of livestock kept by small-scale producers negatively while the remaining three factors i.e. consumption of livestock products, processing of milk and livestock inventory were impacting the share of small-scale producer's in a positive way. Consumption of livestock products turned out to be more beneficial for small scale producers over time. This clearly indicates that Livestock Revolution is helpful for small scale producers. Processing of milk had the highest regression coefficient (1.08) followed by consumption of livestock products (0.91) and livestock inventory (0.29). The regression coefficient of livestock production index which was positive in previous period turned negative in the latter period with a regression coefficient of -0.84. This might be because of the fact that production is gradually shifting into the hands of industrial producers. So, the livestock production has started impacting negatively for the small-scale producers, although up till now its impact is minuscule. The prices of feed crops also impacted small scale producers in a negative way. Livestock production from small-scale producers could be affected by feed constraint.

6. Conclusion

In India, consequences of Livestock Revolution have not yet become negative as the farming system is still predominated by mixed crop-livestock farming but in future it may cast ill effects as in case of poultry sector the industrial system is rapidly growing and cause problems to small-scale farmers, so right now it’s only a concern as India is only in the initial phases of Livestock Revolution. Until quite recently the environmental, social and health impacts of livestock production in India have generally been considered to have more positive consequences than negative ones because the production system is still numerically dominated by rural-based
integrated smallholder crop-livestock mixed farming systems. As it was seen in this study that the consumption of livestock products is beneficial to small-scale producers. Over time it impacts became more positive on the share of livestock kept by them indicating that consumption of livestock products is giving them a golden opportunity to raise their income and livelihood. Their income has increased they have started diversifying their husbandry, their share in livestock has increased over time, value addition services like processing of milk are beneficial for small scale producers. Hence, up till now, the Livestock Revolution is beneficial for the small scale producers of the country like India. There is a general apprehension that overtime large farms will continue to outcompete smallholders and gain further market share because of Livestock Revolution. According to Delgado et al. (2003) India, where most farms are small and dairy dominates, is a notable exception. The happiest picture of livestock sector in case of pro-poor is of dairy farmers in India. But, precautions need to be taken as India is witnessing a dualistic mode of development, with two conflicting components. First, a modern, demand-driven and capital-intensive sector, producing poultry meat, eggs, pork, and sometimes milk, increasingly uses state-of-the-art technologies. It is rapidly expanding to meet urban demand. At the same time, a traditional, resource-driven and labour-intensive sector continues to provide a multitude of services to subsistence-oriented farms. While not efficient in terms of introduced inputs, this sector uses resources of little or no alternative uses, and for the same reason, its potential to expand beyond moderate growth rates is constrained by low technology uptake, insufficient market facilities and infrastructure, and small economies of scale.

In the present study some negative impacts of Livestock Revolution can also be seen like the regression coefficient of livestock production index which was positive in previous period turned negative in the latter period with a regression coefficient of -0.84, this might be because of the fact that production is gradually shifting into the hands of industrial producers. So, there is an apprehension that if livestock production shifts from small-scale producers’ hands and moves to corporates they may face problems. Moreover, if feed prices go up, it will be difficult for them to survive in the livestock business.
The findings have implications for the policy makers to build up policies which may help the small-scale producers. In the era of Livestock Revolution, laissez-faire policy will be very dangerous because the bulkiest share of livestock in India is owned by small-scale producers, so any repercussion in the sector due to the negligence of policymakers is going to hit hard small scale producers and can swell rural poverty further. Hence, policy makers should take note of the Livestock Revolution and make efforts as hard as possible to make it a boon rather than a bane for the small farmers of India.