An Economic Analysis of Indian Livestock Sector using livestock census 2019

Submitted by

Amal Kalluvarambil Vinod

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Dr. Anchal Arora

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Content

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First and foremost, I would extend my sincere gratitude to Dr. Anchal Arora, department of Economics at Indian Institute of Foreign Trade, New Delhi, for her guidance and patience in helping me manoeuvre through this dissertation thesis.

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Executive Summary

Livestock is an integral element of Indian Agricultural ecosystem and has multidimensional contribution to the overall growth and development of agriculture as well as the rural livelihood. Livestock directly impact the food security by means of supplying highly nutrient-rich edible products, generate a sustainable income source, as well as an employment for many households especially as a cushion to the agriculture dependent households against crop failure, providing draught power and manure for the crop cultivation and also help in generating foreign exchange through the export of produce.

India has the world's largest livestock population with comprising 35.94 percentage of cattle, 20.45 percentage of buffalo, 27.80 percentage of goats and 13.87 percentage of sheep. The period after independence saw India's total livestock population increase from 289.4 million in 1951 to 535.78 million in 2019, alongside the total poultry population increased from 73.5 million to 851.81 million during the period 1951 to 2019. *(Source: Livestock Census 2019, Department of Animal Husbandry and Dairying)*

This thesis aims at conducting an economic analysis of livestock sector in India using livestock census 2019 and compare the population trend of the whole livestock sector between 2012 and 2019 census. This study will focus on the bovine species comprising of cattle's and buffaloes because of their maximum contribution towards milk production. India being the world's largest milk producer (*National Dairy Development Board, 2019*) has great potential to be a global milk supplier and the sector has great potential in improving the income of Indian farmers and usher greater prosperity to the population, especially those involved in agriculture.

Using data from Trademap, this thesis also studies the export trend in the sector and how the Indian export market for dairy products under HSN code 04 has been performing over the period from 2013 to 2020. A comparative analysis of India's growth in the export volumes and that of the major competitors in the global stage has been tabulated. The export markets that are the top importers for the products under HSN 04 was compared to the top export markets from India and from this comparative study, a list of markets which are potential export destination for India dairy exporters were identified. Many of the identified markets are the European countries and the particular country of interest was United Kingdom, especially on the backdrop of Brexit and UK being one of the top 10 importers of dairy products in the world. Also, to understand about the growth of Indian exports under this HSN category, a Revealed Comparative Advantage (RCA) study was performed for all the products under HSN 04 at the 6-digit level from India.

Finally, the thesis also discusses the policy measures taken up by Government of India and the highlights of some of these policies and if the intended results are being observed at the grassroot level from comparing the livestock census 2019 and 2012 data. Popular schemes undertaken by the Government of India such as national livestock mission, livestock health

and disease control, animal husbandry infrastructure development, Rashtriya Gokul mission among many others have been discussed.

The research methodology used in the thesis mostly focused on secondary data published in the livestock census of 2019 and 2012. Data is also taken from various Government of India published statistical database such as the National Dairy development board, APEDA database, etc.

The thesis summarizes the population trend of bovine species with a growth of 1.3% and currently at 303.76 million. The population of milk producing cattle's have increased by 19% and buffaloes have increased by 1.1%. Indian milk production has increased by nearly 803% between 1970 to 2018. However, the per capita milk availability is 394 grams per day, and this is only approximately 50% of the per capita milk availability in the top world countries of Sweden, Kazakhstan and United States of America. The breed distribution in India needs substantial improvement to incorporate the high yielding Indian indigenous breeds and exotic breeds. The thesis identifies Indian export value of dairy products under HSN 04, and this trend is also promising over the data analysed during the period from 2013 to 2020, top importers and top exporters in the world have been comparatively studied and India's performance in compared with the competitors. Indian exporters in dairy product category still have a lot of global import markets which are yet to be delved into such as the United Kingdom, Vietnam and Philippines. Recommendations are made regarding the possible trade agreements that can promote Indian dairy exporters to introduce their products to these markets. It also studies major policies undertaken by Government of India to strengthen this sector. The results provide an area of improvement to further strengthen the productivity of the sector, especially through awareness programs to ensure that the rural household are made available with the capital required to setup livestock rearing. The need for government to step up their efforts to mitigate contagious diseases that infects cattle's such foot and mouth disease, influenza etc. and provide routine assistance to rural small-scale farmers to ensure that their livestock are maintained with timely health checks and hygiene. These initiatives from the government will encourage farmers especially small holders to take up livestock rearing along with agriculture and thereby diversify their income and also improve the overall prosperity of the country.

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1. Introduction

India is a country where nearly 58% of the population is directly and indirectly depending on agriculture and associated activities for their primary source of income. Primary sector contributes nearly 18% of the Indian GDP. Along with agriculture, livestock provides employment for nearly 9% of the population and accounts nearly 26% of the total agriculture contribution to GDP, hence livestock and animal husbandry plays a critical role in shaping India's development and fight to improve per capita income, thereby improve the overall prosperity of the population.

Livestock sector plays a critical role in the welfare and upbringing of the rural population in India. Livestock also has its share in agriculture diversification and also plays an important role in improving the nutritional value of the general public consumption through acting as a source of protein in the form of milk, egg and meat.

Table 1: Contribution of Livestock towards Gross Value addition

Share of Agriculture & Allied and Livestock Sector in GVA (₹ Crore)					
At Current Prices					
Year	GVA (Total)	GVA (Agriculture & Allied)		GVA (Livestock Sector)	
		Amount	% Share to total GVA	Amount	% Share to total GVA
2011-12	81,06,946	15,01,947	18.5	3,27,334	4
2012-13	92,02,692	16,75,107	18.2	3,68,823	4
2013-14	1,03,63,153	19,26,372	18.6	4,22,733	4.1
2014-15	1,15,04,279	20,93,612	18.2	5,10,411	4.4
2015-16	1,25,74,499	22,27,533	17.7	5,82,410	4.6
2016-17	1,39,65,200	25,18,662	18	6,72,611	4.8
2017-18	1,55,13,122	27,96,908	18	7,85,180	5.1
2018-19	1,71,39,962	29,22,846	17.1	8,71,884	5.1

(Source: National dairy development board)

The above table depicts data which signifies the growing prominence of livestock sector in improving the income of agricultural household and also help in diversification and risk mitigation of the income among these households, the above table details the contribution of livestock towards the gross value addition (GVA) of livestock and agriculture towards total GVA. The GVA from agriculture has decreased from 18.5 % to 17.1 % of the total GVA in India from 2011 to 2019, whereas during the same time period the contribution of livestock sector has improved from 4% to 5.1% of GVA. This is not a large increase in percentage wise but when the absolute numbers are compared, then it is evident that when the agricultural GVA has increased by 1.9x, livestock GVA has increased by 2.6x. This is a clear indicator of growing acceptance and prominence of rearing livestock among the Indian households.

When the growth of overall farmer income was studied from 1993 to 2016 it was understood that the farm income per cultivator in India has increased from Rs. 21,110 in 1993 to Rs. 44,027 in 2016 according to real prices *(National accounts statistics, Government of India)*. That is, the farm income per cultivator has more than doubled and the role of livestock sector in propelling this improvement is substantial. Hence due to the growing potential of livestock sector in improving the income withing rural India and to identify the growth opportunities beyond Indian markets is what this thesis ultimately aims to achieve.

Livestock census forms the major source of statistics for animal husbandry sector. Livestock census is a massive initiative taken up by covering every household in the country in which data is collected taking the absolute count of the domesticated animals and birds in the country and finally come up with a conclusive number for the total livestock wealth of the Nation.

Analyzing the performance of livestock sector is an important aspect and the primary dataset for this purpose is the livestock census which was first taken up in the year 1919 and been a routine activity ever since.

This thesis will present an economic analysis of Indian livestock sector using the 20th livestock census that was released in the year 2019. The 20th livestock census was conducted during the years 2018-2019 and the enumeration was done across all the villages and urban wards in India. Several species of animals such as cattle, buffalo, sheep, pig, horse, goats, camel, rabbit and poultry birds such as fowl, duck, etc. possessed by both households, household enterprises and non-household enterprises were accounted here. The census captures breed wise number of animals and poultry birds, and this knowledge is extremely helpful in understanding the population dynamics across the species as well as geographies of states and Union Territories.

During the course of the thesis, study will focus on understanding the trends in population change among major livestock categories and study how the productivity has been affected by this trend in population. The thesis will be focusing primarily on the bovine category since they form a mammoth share in the livestock product. Along with analyzing the absolute numbers of the bovine population and the productivity, it will also analyze the performance of India in the export of livestock products (under HS codes 04) and how the competitive advantage of our country has shaped by this trend.

Along with analyzing the performance of Indian livestock sector, the performance of the major global competitors in prominent product categories will also be discussed and how the global market access for Indian products have shaped in the last decade will be explored (2010- 2020).

Some of the potential markets which are not yet being utilized by Indian exporters in this category will also be identified and statistically arrive at the products which are showing the best performance among the Indian livestock product export basket.

The data used for the thesis is divided among the respective species category and further divided on the basis of the major states in each species category.

Finally, the thesis will also give a brief about the various schemes undertaken by the Government of India such as national livestock mission, Rashtriya Gokul mission, animal husbandry infrastructure development, livestock health and disease control among many others. This will help us have a holistic view, if the policies taken up by the government has boosted the sector and is bearing fruits at the grassroot level along with the overall improvement of the sector or not.

Most of the studies that are published till recently are pertaining to the 2012 livestock census and since the last 8 years many initiatives have been taken up by various ministries to improve the self-reliance of Indian Livestock sector the results will definitely be pronounced in the latest survey. This thesis focuses on published data available in various government of India such as the Livestock census 2019, Animal husbandry statistics 2019, FOA statistics, Ministry of agriculture and National statistical survey database.

This is a novel study using the latest available data and the detailed understanding of these aspects will help in enumerating the performance of the livestock sector not just in domestic but also in the export and international market for Indian livestock products and how we have developed as a global force. Such an economic analysis will be beneficial for the government/policy makers in providing certain policy implications which could be beneficial in exploiting the potential of this sector and ultimately to boost up the Indian economy.

2. Research Objective

The objective of this research is to have a critical bird-eye view of the Indian Livestock Sector in conjugation with the livestock census of 2019. The research will focus on the following aspects of livestock sector:

- The growth in absolute number of livestock sector particularly of the bovine species (cattle's and buffaloes) in India
- The increased volume and value of products that are produced from Livestock
- The export growth of livestock sector
- The government policies and initiatives that has had a significant impact on livestock sector

The study is envisioned to fill the lacunae in our understanding with a comprehension of the livestock census of 2019. The study compares the trend in livestock population between the livestock census of 2012 and 2019 and correlates it to the growth in milk productivity from the sector. The thesis will study the growth in Indian export of dairy products and analyze the

current major export markets. In the next step the analysis of potential markets that are yet to be delved into by Indian dairy exporters will be done and also make suggestions of the products that are showing the maximum growth potential statistically using the revealed comparative advantage index.

Finally, the government policies that are shaping the sector will be discussed and along with their primary objectives and if they are helping the sector shape in the means formulated by policy makers.

3. Literature Review

To gain a deeper insight and understanding of the topic, a literature review has been conducted. These published research work helped me in my research and in deciding relevant study material for preparing this dissertation.

Livestock is a capital asset, that is produced in the past and contributes to future product output. Investing in or acquiring livestock mostly involves borrowing or saving capital in the expectation of future return on capital. Rearing of livestock also requires a circulating capital need to help meet the cost of production be in terms of feed and nutrients or other auxiliary cost. *Upton;* (2004) had discussed the need to efficiently shape the livestock sector and its contribution in the overall improvement of the farmer income and overall risk mitigation especially in agrarian based developing countries. He discusses about livestock sector as a capital investment that has the ability to complement agricultural earning and also help formulate a sustainable ecosystem. The study uses secondary data from the OECD database and performs statistical analysis to understand the contribution of livestock in many of these countries.

M.Herrero et.al. (2012) in their research paper '*The Role of Livestock in Developing countries'*, also discusses the double-edged sword nature of livestock sector in developing countries where traditional practices are very rampant. In a word today that is concerned about sustainability and environmental conservation, extreme care needs to be taken to ensure that the development of livestock sector doesn't come at the cost of environmental degradation. The government in developing countries have a significant role to play to ensure the growth is in the right direction and a balance is maintained between growth and environmental conservation. The research article uses secondary data taken from FAOSTAT (Food and Agricultural Organization) database. The research paper concludes on the findings which signify the need to improve the efficiency of livestock sector through livestock practices that are sustainable and also help in building a market-oriented approach with the right mix of policy incentives to develop livestock sector.

K.P.Sonavale et.al.; (2020) perform a critical analysis up until the 2012 livestock census. The study had examined the growth as well as the export from the Indian livestock sector. The various factors affecting the output and the trends of production, and the factors of

determinants were also analysed. The study also performed regression analysis, Coppock's index and the Markov Chain analysis was computed to study the data to have a deeper insight to the results and trends observed. The research is based on the historical data from APEDA (Agriculture and Processed food products Export Development Authority) and FAO Database. The research methodology focuses on compounded growth rates and instability analysis using coefficient of variation and Coppock Index.

S.N.Mishra; (1995) discusses the various development angles of Indian Livestock Sector. It also delves into the genetic variability of livestock sector in India, environmental factors that has favored Indian breeds be it the topical or the Himalayan climate. The study also focuses on the importance of livestock sector in sustaining the food as well as the overall nutritional requirement of the second largest populated country in the world and at the same time act as a substantial source of income and employment for the rural households. Livestock sector has always been mutually beneficial to developing and improving the organic input required for agriculture. Since the advent of industrial development and the blue revolution the need and demand for milk and other associated products have been on the rise and this has also incentivized livestock breeders. In conjugation leather, leather tanning, jewelry and a host of cosmetic industry also require livestock derived products as ingredients and all these are helping the enrichment and growth of livestock sector. The paper uses secondary data from the IASRI (Indian Agricultural Statistics Research Institute) and CSO (Central Statistical Organization).

A.K. Dikshit et.al. (2010) estimated the feed consumption rate and its growth and subsidization over the years since independence. An in-depth study on the concentrates requirement and its subsequent result in improving the production from livestock is also correlated. Although exact estimates of the country total feed requirement were not available, efforts were taken through approximation techniques to reach at the most conclusive estimates. The paper uses data from a feed consumption survey undertaken by ICAR (Indian Council of Agricultural Research) and NATP (National Agricultural Technology Project). The sampling technique used is systematic random sampling in 10 regions in India excluding the North-east sector, by delineating regions into village, district and regional level based on the number of households in the particular region.

P.S. George (1996) studied the overall emergence of livestock sector as an important segment of the Agricultural ecosystem in India. He had reviewed the growth of livestock sector through the period of 1970 – 1993. He has reviewed 29 research papers published in IJAE relating to dairying and livestock sector focusing on the Indian bovine population and its regional distribution. The review takes into consideration the crop - livestock interactions, cattle size and composition, technology market behaviour, resource productivity, , income as well as employment opportunity and livestock feed and fodder.

Upton M; (2004) analyzes the development of world trade in livestock and livestock derived products with a focus on developing countries of Asia. He also summarizes the overall trend that was observed among the expanding markets in becoming net importers of livestock due to the growing demand for the products. He has discussed about the trend comparative advantage developed by certain countries in Asia and how they have gained through the

overall trade liberalization. The paper uses secondary research using the FAO database (FAOSTAT 1996, 2003).

The need to study the livestock sector in India using the latest data that was published in the livestock census of 2019 will be a guide to understand if the growth in the sector has been in line with the expectations.

4. Research Methodology

Using various secondary sources such as Livestock census 2019, Animal Husbandry statistics etc., this study proposes to use some cross tabulation, graphical analysis of the production and productivity of livestock sector in India in the recent years.

When analyzing the export categories, this study uses RCA (Revealed comparative Index) index to explain the results.

$$\text{Revealed Comparative Advantage} = \frac{\dfrac{\text{Export value of India at 6-digit level}}{\text{Export value of India at 2-digit level}}}{\dfrac{\text{Export value of world at 6-digit level}}{\text{Export value of world at 2-digit level}}}$$

When the RCA value is greater than 1, then it is indicative that the export growth from India in that particular product category is growing at a much higher rate compared to the global demand growth.

Trade data will be primarily used from the Trademap database and will be analysed using SPSS statistics analyzing software.

Data Source:

- Livestock census 2019
- Animal husbandry statistics 2019
- FOA statistics
- Trademap
- Ministry of agriculture (APEDA Database)
- National statistical survey database
- Cybex Database

5. Trends in Livestock population of India as of 2019

In the 20th livestock census in order to conclude the total livestock number, the species that were mainly considered include cattle, buffalo, goats, sheep, pig, horses, mules, donkey, camels, Mithun and yaks.

Some of the key highlights statistically in the 20th census are the following. The total livestock population has shown a growth of 4.8 % to the earlier 2012 census and currently stand at 536.76 million in total. The rural and urban shares are 95.78% (514.11 million) and 4.22% (22.65 million) respectively. The livestock population in rural region has increased by 4.56% and urban region has increased by 11.19% compared to the 2012 census. Total bovine (Cattle, buffalo, Mithun and Yak) population has shown a growth of 1.3% to the previous census and stands at 303.76 million. The total number of cattle in the country stands at 193.46 million of which 51.36 million is of exotic or crossbred varieties. The population of exotic breeds have increased by 29.3% whereas the population of indigenous breed have declined by 6%. The total buffalo population stands at 109.85 million with an increase of 1.1% to the previous census. The total sheep population in the country is 74.26 million and has increased by 14.1%. The goat population has reached 148.88 million and has increased by 10.1%. The total pig population is 9.06 million and has declined by 12.03%. The total Mithun population is 3.9 lakhs and has increased by 29.5%. The total yak population has decreased by 24.9% and now stands at 58 thousand. The total poultry in the country is 851.81 million and has increased by 16.8%. The total backyard poultry is 317.07 million and increased by 45.8%. The total commercial poultry in India was at 534.74 million and has increased by approximately 4.5%.

This thesis deep-dives into the prominent species of Indian livestock sector which is mostly the bovine sector that includes cattle's and buffaloes. A reason to pick the bovine sector is the fact that India is the largest milk producer (*Source: National Dairy development board*) and leads the charts of total milk production by a large margin when compared to the next nearest competitor by nearly 2x times and majority of milk that is produced in India are from cattle's and buffaloes.

The population distribution of major livestock species sector is represented in the below pie-chart. It can be understood that 56% of the total livestock population is accounted by cattle's and buffalo population.

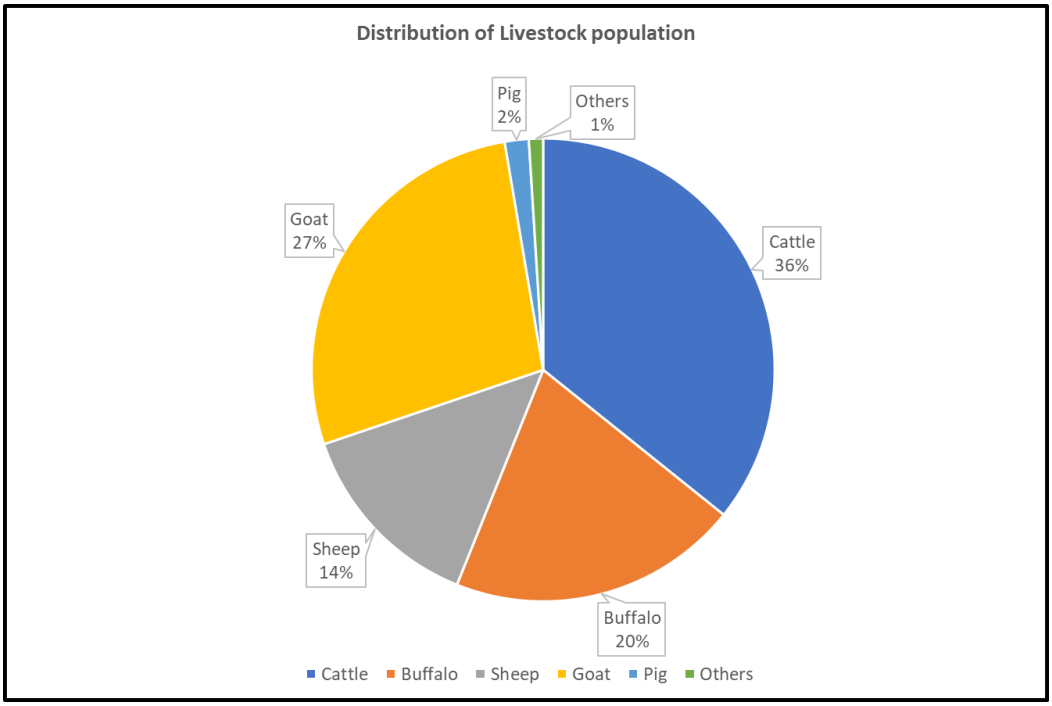


Fig 1: Distribution of Livestock Population in India (Source: Livestock census 2019)

To develop a better insight to the trend in the population in comparison to the census data from 2007 and 2012, a comparative analysis of the population of major species categories are represented in *figure 2*. From the figure it can be understood that the cattle population has indeed marginally decreased in 2019 from 2007 by approximately 5.5 million (2.8%), however the buffalo population has increased by approximately 4.5 million (4.2%) between 2007 and 2019. The detailed analysis is depicted in the figure below.

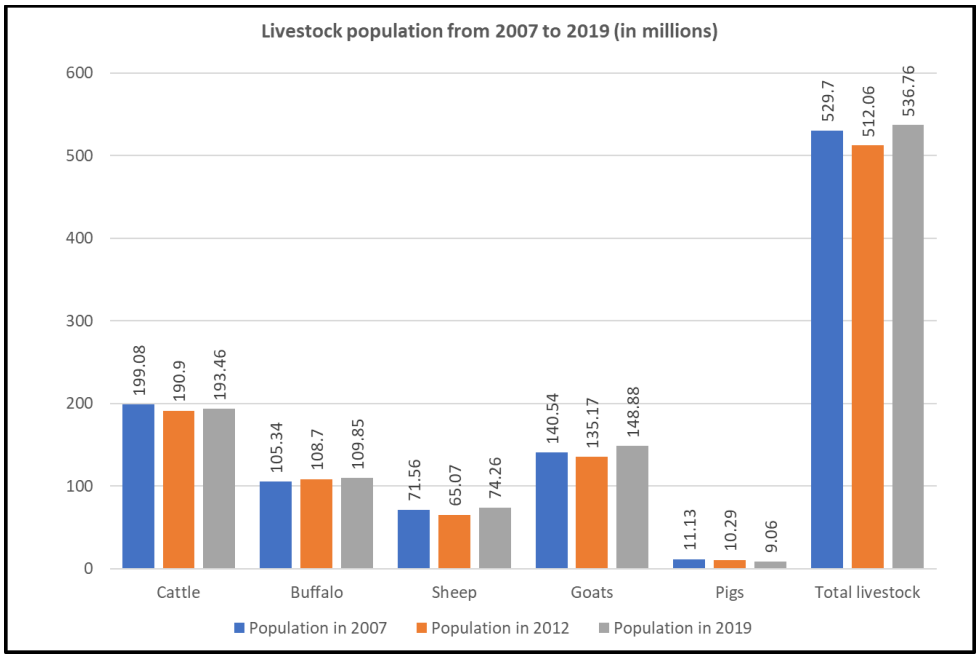


Fig 2: Livestock population change from 2007 to 2019 among major species (Source: Livestock census 2012 and 2019)

In the next stage of study, we analysed the population trend of the total livestock sector among the top 10 states (as per 2019 census) in India between 2012 and 2019 census *(figure 3*). The top 3 states in terms of livestock population was still held by Uttar Pradesh and followed by Rajasthan and Madhya Pradesh. However, one observation was that the absolute population of total livestock in both Uttar Pradesh and Rajasthan had decreased marginally between 2019 and 2007.

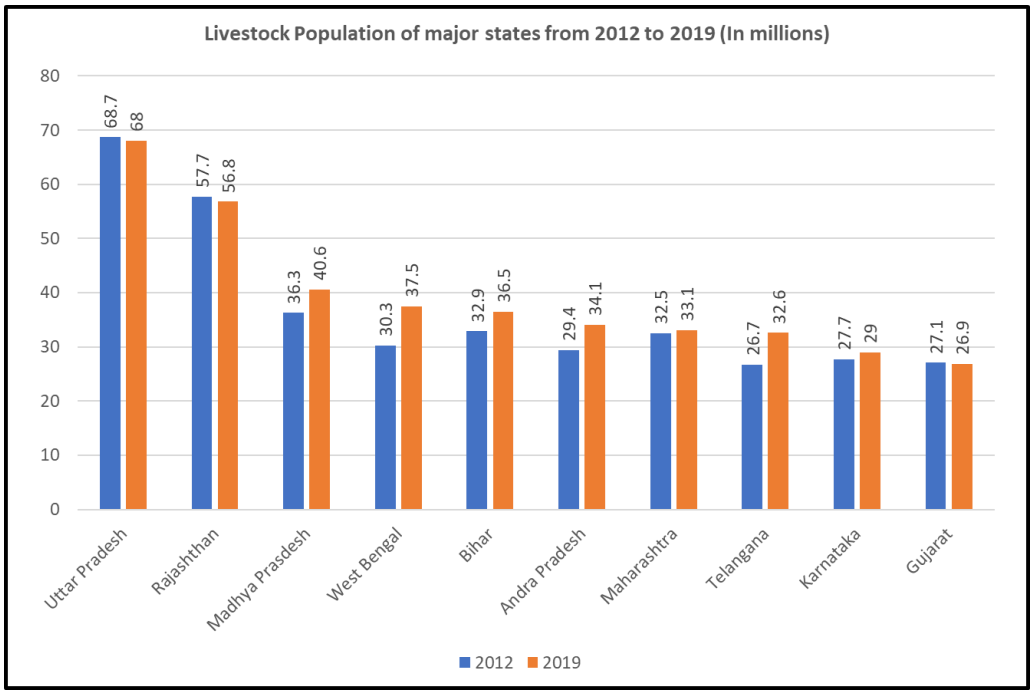


Fig 3: Livestock population trend among the top 10 states between 2012 and 2019 census (Source: Livestock census 2012 and 2019)

In the subsequent section, the thesis concentrates its focus on cattle's and buffalo species. Firstly, the cattle sector is taken up. Total Cattle population in India is 193.46 million in 2019. Approximately 36% of the total livestock population is accounted by Cattle. The total cattle population in country has increased by about 1.3% compared to 2012 livestock census. Male cattle population decreased by 30% whereas female cattle population increased by 18.6%. Total Milch cattle population increased by 10.4% and has reached 74.59 million. The total number of productive cattle populations has increased by 18.5% compared to the 2012 livestock census (*all statistics source: Livestock census 2019*). Below the breed wise study of cattle population is presented. From the study it can be understood that number of exotic / cross breed has increased but the population of indigenous breeds have decreased in the census 2019 compared to the 2012 census statistics. This trend can be illustrative when the milk productivity in the sector is studied in the subsequent sections.

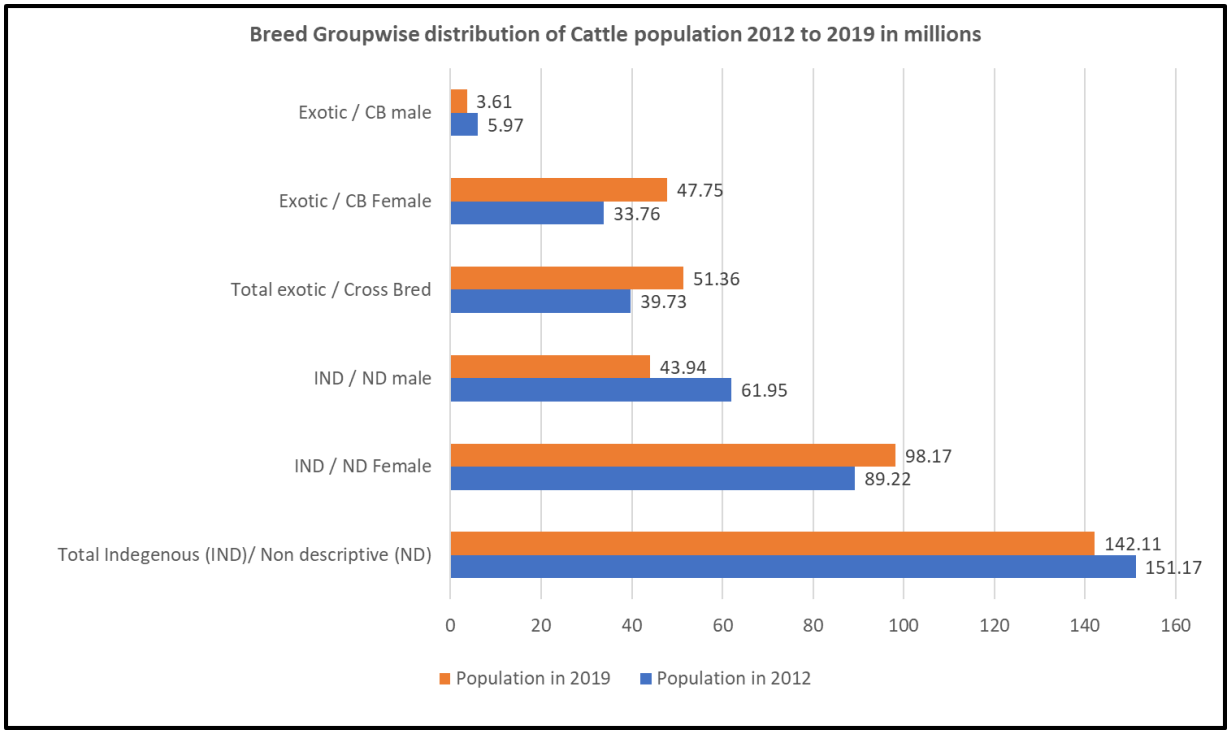


Fig 4: Breed wise distribution among cattle population between 2012 and 2019 census (Source: Livestock census 2012 and 2019)

The cattle population in major cattle population holding states was compared between 2012 and 2019 according to the livestock census 2019 list of top 10 states in terms of cattle population. *Figure 5* depicts the data, and the top position is held by West Bengal and is followed closely by Uttar Pradesh and Madhya Pradesh in second and third positions respectively. According to the 2012 livestock census, West Bengal was in the third position below both Uttar Pradesh (1st) and Madhya Pradesh (2nd), however in the next seven years that followed, West Bengal has been able to show tremendous growth in the total cattle population and the marginal fall in the number of cattle in Uttar Pradesh and Madhya Pradesh resulted in West Bengal being the state with the highest number of cattle.

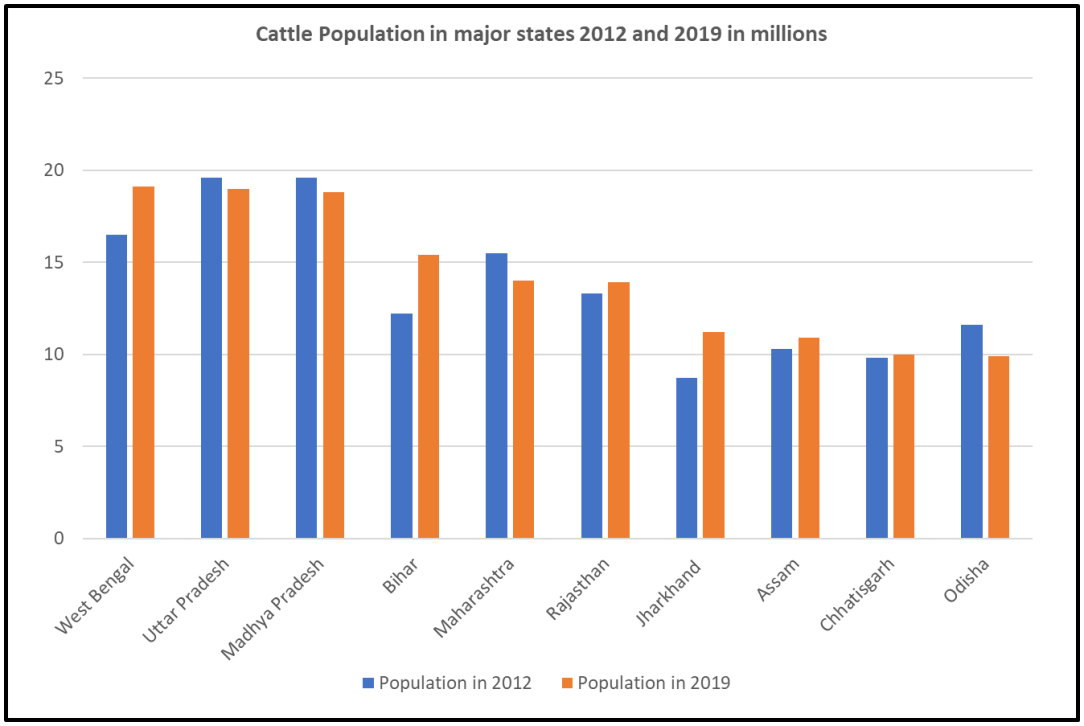


Fig 5: Cattle population among top 10 states between 2012 and 2019 (Source: Livestock census 2012 and 2019)

The second section focuses on buffalo population. The total buffalo population in India is 109.85 million as of 2019. Buffalo constitute 20.5% of the total livestock population in 2019. The total buffalo population has increased by 1.1% compared to the 2012 census. *Figure 6* describes the total buffalo population divided among the category of male-female and milk, dry and milch category. When compared to the total buffalo population between 2012 and 2019 livestock census, it is clearly understood that the total population has only increased marginally from 108.7 to 109.85 million, i.e., an increase by 1%. However, there has been a significant gender wise change in the population of buffalo that was observed between the two censuses. The total population of male buffalos have decreased from 16.1 million to 9.28 million (decreased by 42%) and the population of female buffalos have increased from 92.6 million to 100.57 million (increase by 8.6%). Milch (dry + Milk) buffalo population has increased marginally by 0.2% in which the in-milk has increased by 4.3% and dry category decreased by 10.2%. The buffalo population in rural area has increased marginally by 0.7% and urban area has increased by 8.9%.

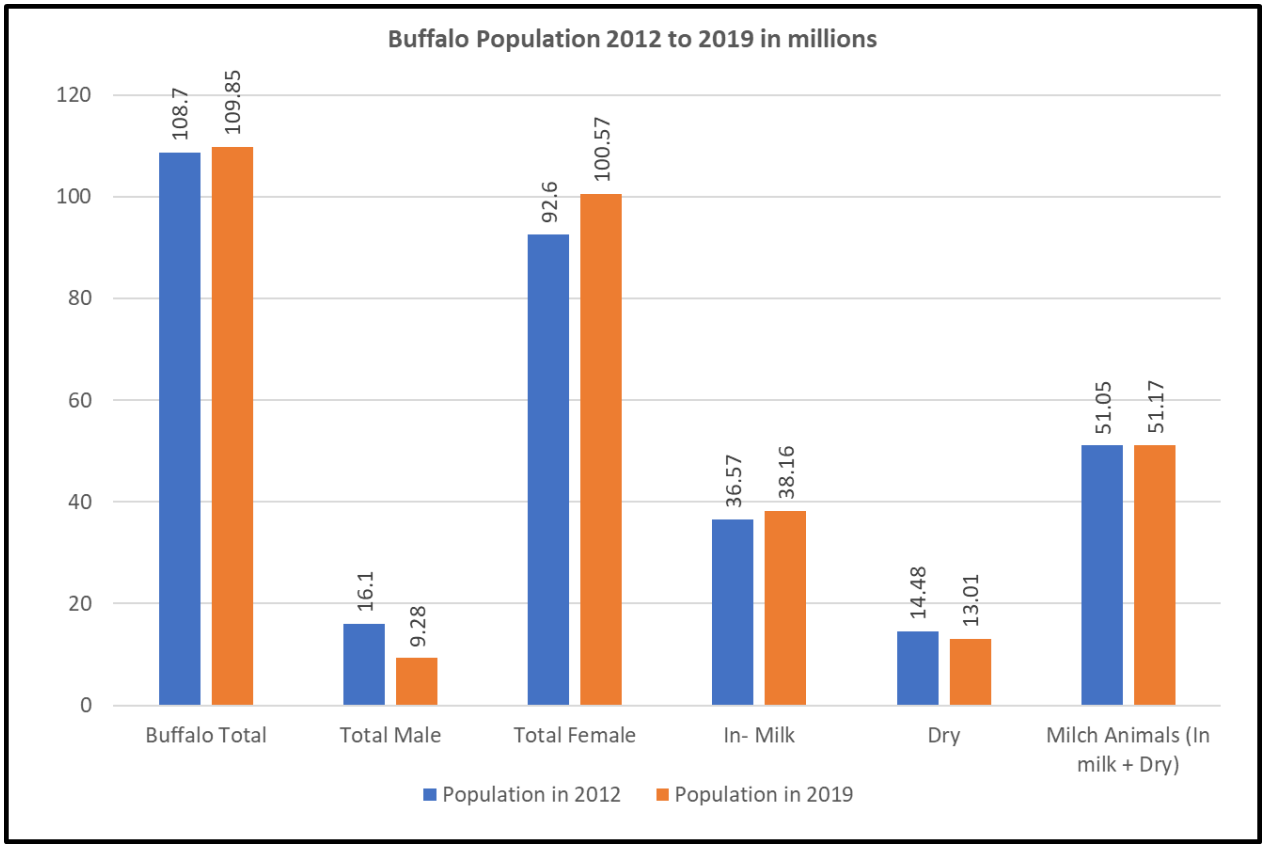


Fig 6: Buffalo population between 2012 and 2019 census (Source: Livestock census 2012 and 2019)

When comparing the state wise buffalo population for the top 10 states as per the 2019 livestock census, it is evident that top ranked state that is Uttar Pradesh is leading the population statistics in buffaloes by a very large margin compared to Rajasthan that is placed in the second position. The total population of buffalos in Uttar Pradesh as per the 2019 census is approximately equal to the combined population of the next 3 states with the highest buffalo population. Hence in the buffalo category Uttar Pradesh is the major market contributor.

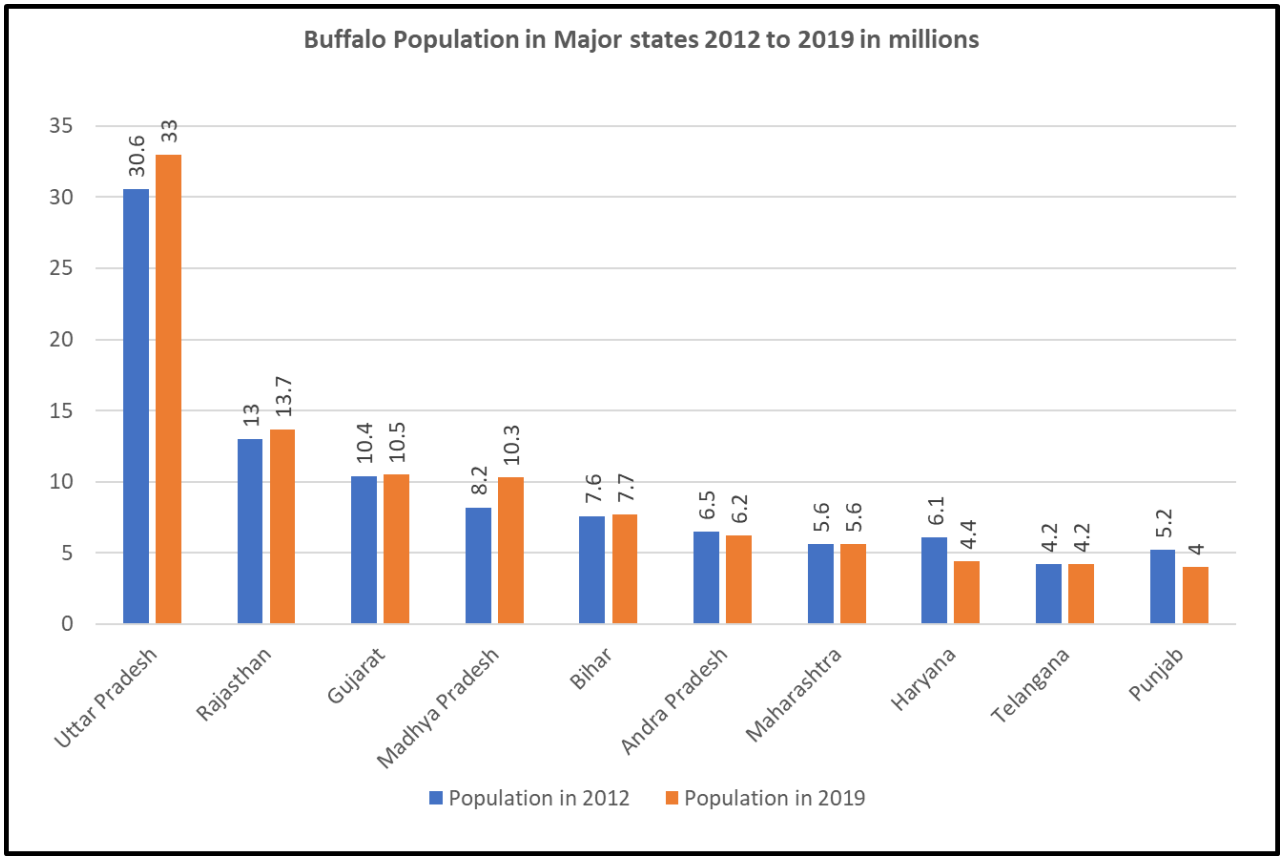


Fig 7: Buffalo population among top 10 states between 2012 and 2019 (Source: Livestock census 2012 and 2019)

6. Dairy Production in India

Since the first section covered the population trend in cattle's and buffalo species sector of the livestock, in the next section the thesis focus on understanding the trend in milk production within India. Since bovine species are mostly the contributors to milk and since India is the world's largest milk producer in terms of total weight of milk produced, the significance of milk towards gross value addition from livestock is significant and hence the thesis concentrates its focus on milk productivity.

Table 2: Top 10 milk producer countries in the world (in million tons)
(Source: National Dairy development board)

Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2018
India	20.8	25.6	31.56	44.02	53.68	65.37	79.66	95.62	121.85	155.69	187.96
United States of America	53.07	52.34	58.24	64.93	67.01	70.46	75.95	80.28	87.52	94.64	98.72
Pakistan	7.45	8.19	9.01	10.86	14.72	19.01	25.57	29.44	35.49	41.59	45.79
China	1.96	2.37	2.93	4.76	7.04	9.46	12.37	32.02	41.16	36.28	35.6
Brazil	7.42	10.05	12.06	12.57	15.08	17.13	20.53	25.53	30.96	34.86	34.11

From the data represented in *table 2*, it is understandable that India leads the milk producer rank at the top position by a margin of nearly 90 million tons and the second ranked country in the list in 2018 was United States of America and USA itself only produces 98 million tons of milk. The milk production in India has increased by nearly 803% between the 48 years period from 1970 to 2018. Hence the prominence of India in global milk market in terms of size is established.

Studying the trend in total milk production in India from 2010 to 2019, the data states an increase in production by approximately 54 %, from 121.8 million tonnes to 187.7 million tonnes. During the same period the per capita milk availability has also increased from 281 to 394 grams per day.

This improvement in milk production is correlated to the increase in the productivity as well as the increase in the absolute number of bovine species especially cattle's and buffalos.

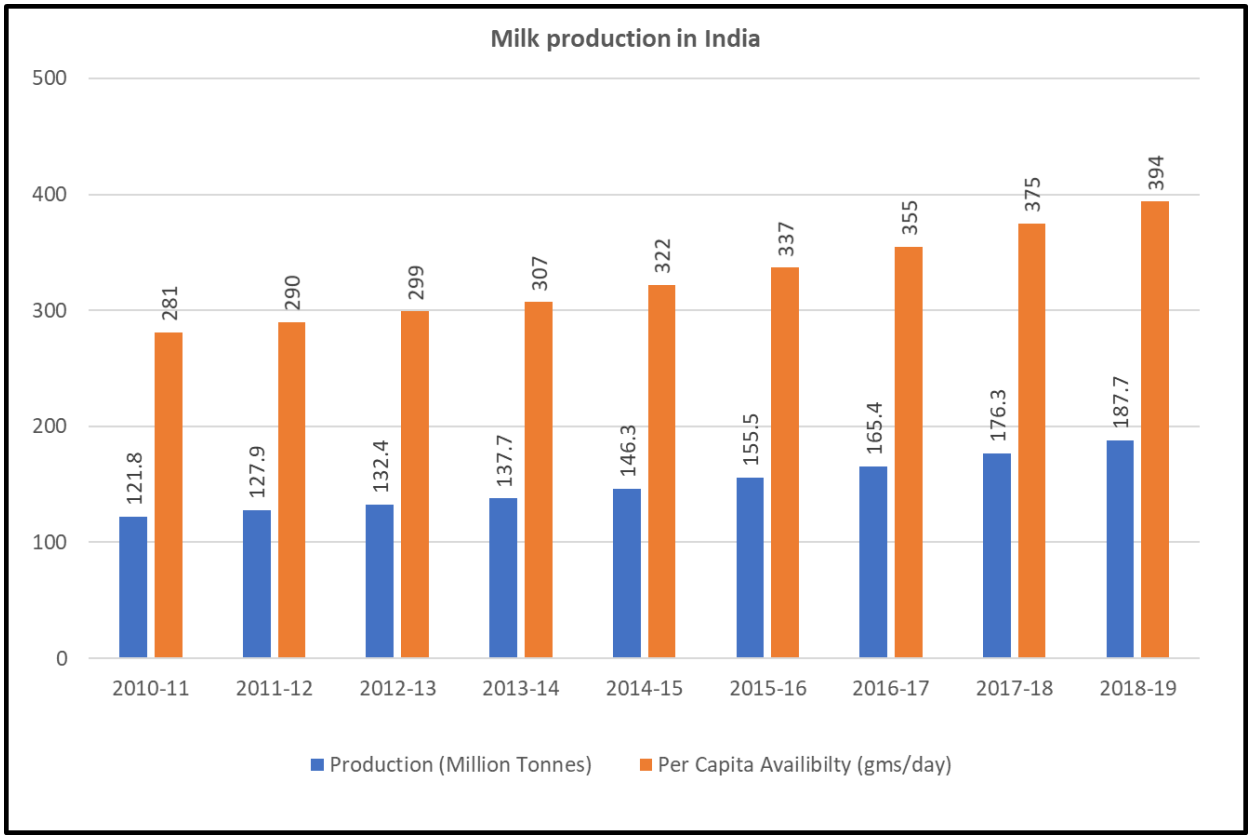


Fig 8: Milk production in India over the years 2010 to 2019 *(Source: National Dairy development board)*

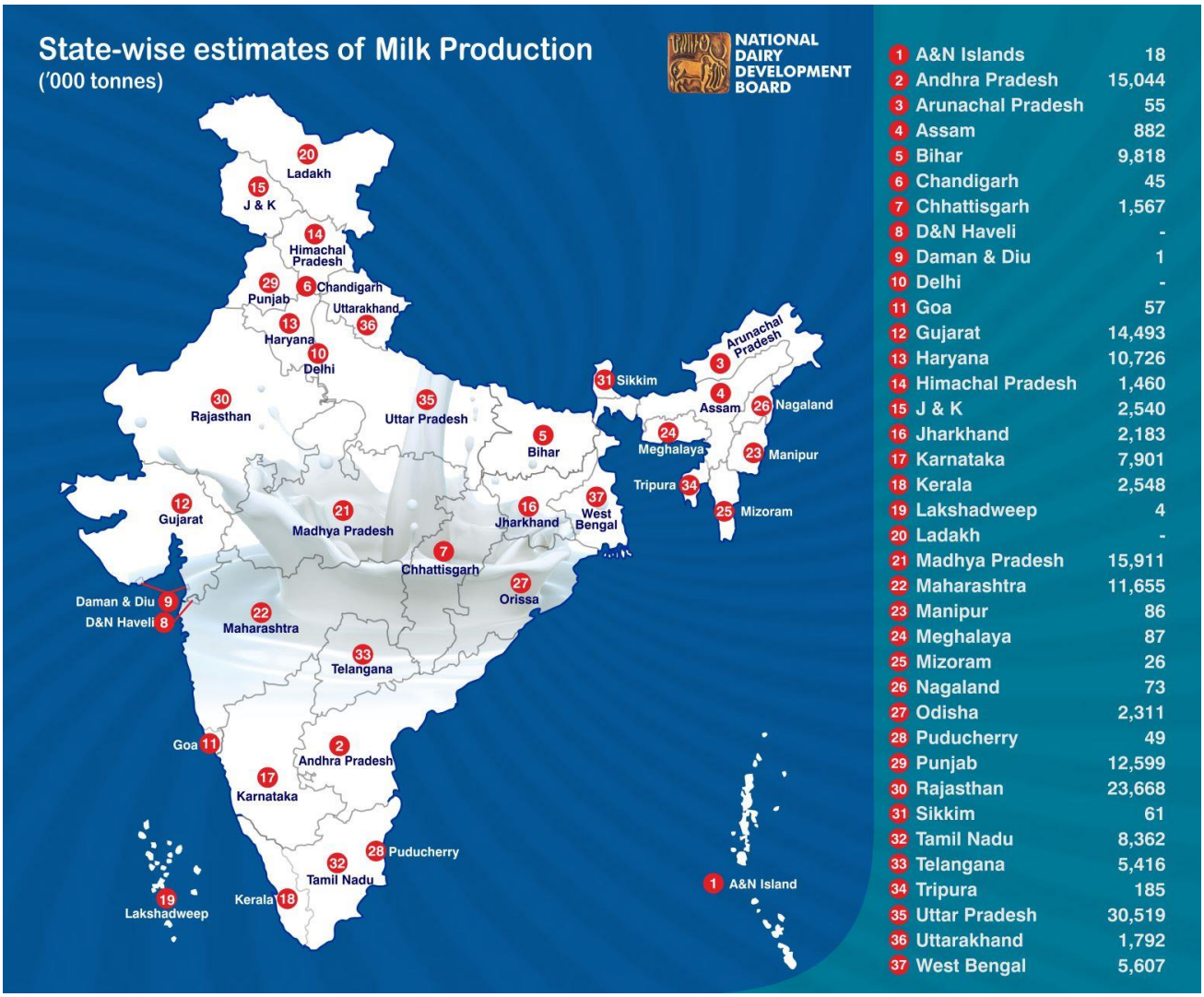


Fig 9: State-wise Milk production in India in 2019 *(Source: National Dairy development board)*

Now the total value of milk production between 2011 and 2019 is represented in *figure 10*. The data represents that the value has more than doubled from approximately Rs. 3,20,000 crores to Rs. 7,70,000 crores. This is an indicator to the growing importance of milk in improving the income as well as helping farmers diversify their income source.

Even though the total milk production in India is the highest in the terms of total weight world, the per capita consumption is not the highest. The per capita consumption in India is approximately 106.06 kg per year and the top per capita consumer countries are Sweden with 304 kg per year and Kazakhstan with 270 kg per year (*UN Food and Agriculture organization*). Even with a very high total production the second largest population is not able to be feed

with a above average quantity of milk. The availability issue is not only due to lack of production but also the income disparity among the different sections of the society. The cooperative initiatives by the Central government as well as many of the state governments have taken up many incentive and promotion schemes to improve household livestock rearing to suffice for the household consumption of milk and associated products. Easy capital availability for livestock rearing and low interest loan facilities through Self Help Groups are yielding results to promote livestock rearing but the pace needs improvement.

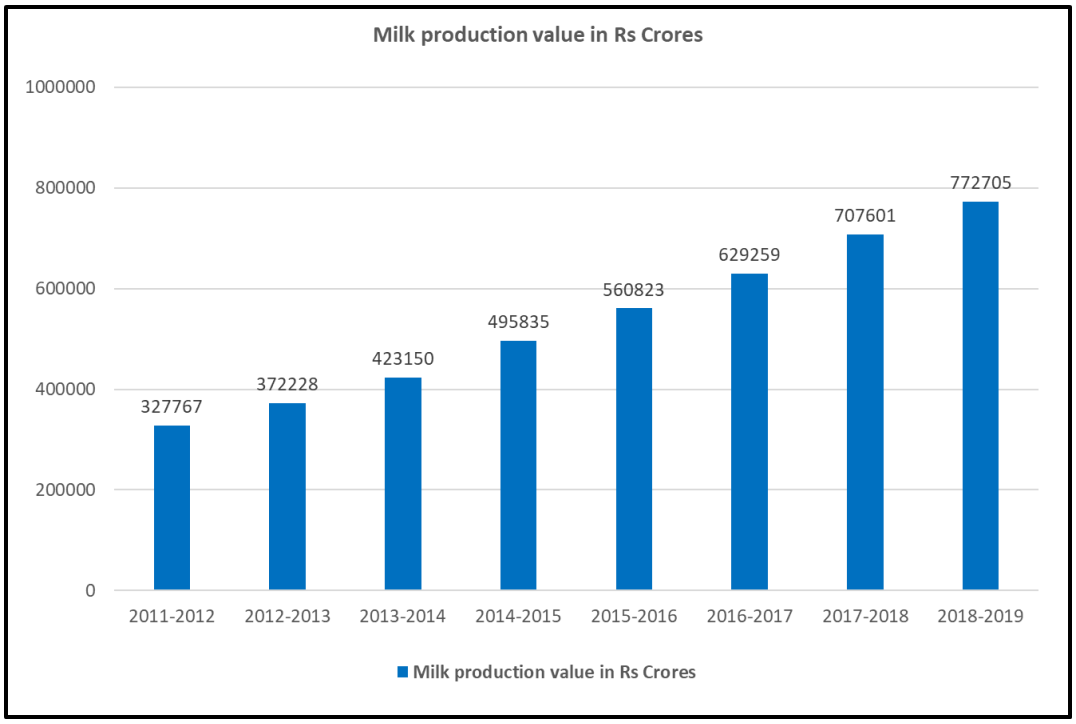


Fig 10: Milk production value of India from 2011 to 2019 *(Source: National Dairy development board)*

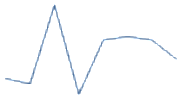
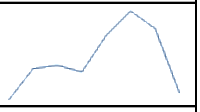
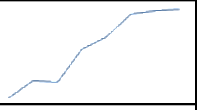
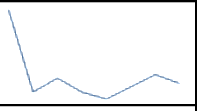
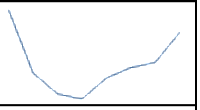
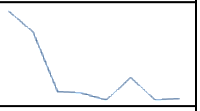
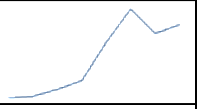
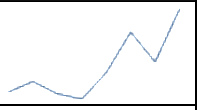
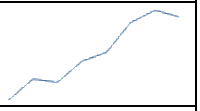
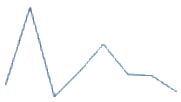
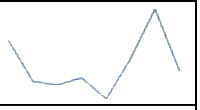
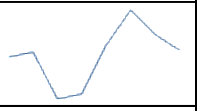
7. Export of livestock from India

The previous section has given an insight into the milk production capability of India and how the productivity has increased over the years. India being the worlds largest milk producer has the ability to not just cater to the domestic market alone but also be a major supplier of milk and other value-added milk products in the global export market.

In this section of the thesis, the export capacity and growth in value of export from India during the period of 2013 to 2020 is detailed. The data is represented for HSN code 04 which is the chapter code that includes dairy products and its processed derivatives.

The first step involves mapping the major export destination from India under HSN 04 and followed by understanding the global top importers which are the potential markets for dairy products and also identifying the top exporters in the global market who are the potential competitor for India in the export of dairy products.

Table 3: India's export of Dairy products under HS chapter 04 from 2013 to 2020 is depicted below *(Values are in thousand USD)*

Importers	Export 2013	Export 2014	Export 2015	Export 2016	Export 2017	Export 2018	Export 2019	Export 2020	Trend in export
United States of America	67918	65091	111528	58847	90091	92762	90895	78842	
United Arab Emirates	54148	41806	33757	34449	38329	49537	42226	43146	
Oman	22383	28956	29735	28367	35694	41159	37187	23889	
Bhutan	794	5163	4575	12493	15369	20811	21684	22347	
Saudi Arabia	53922	15648	22055	14917	12052	18062	23746	19199	
Singapore	18080	10014	7449	6795	9493	10843	11486	15069	
Bangladesh	98153	77383	20593	18587	12535	33203	11977	13595	
Qatar	2515	2722	3367	4235	8152	11523	8904	9880	
Australia	2927	3642	2739	2427	4258	7024	4957	8689	
Maldives	3352	4714	4460	5722	6360	8117	8988	8534	
Nepal	9116	18835	7705	10683	14271	10557	10201	8395	
Indonesia	10924	6997	6672	7377	5384	9284	14034	8136	
Kuwait	5736	5990	3622	3904	6324	8148	6866	6118	
Viet Nam	3178	3142	2695	3172	4496	5038	4787	5184	
Russian Federation	9560	4102	77	3440	5418	3486	6060	3875	

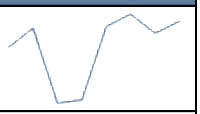
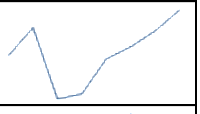
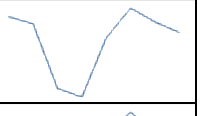
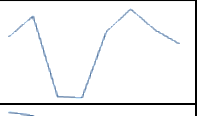
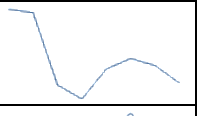
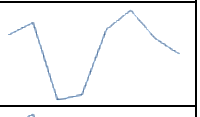
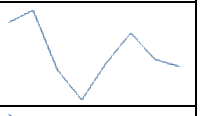
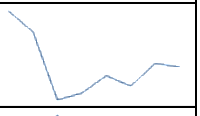
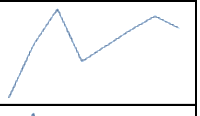
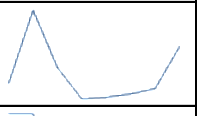
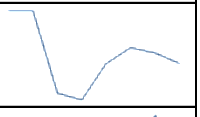
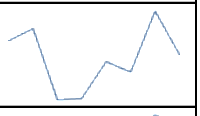
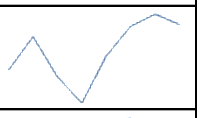
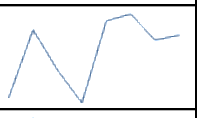
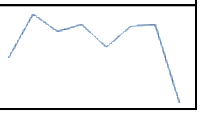
(Source: Trademap)

The data represented in *table 3* represents top markets to which Indian exports its dairy products and its export value from 2013 to 2020. From the data, it is evident that the top trade partner for India is United States of America, United Arab Emirates, Oman, Bhutan, Saudi Arabia as well as several countries in the middle east as well as some of the neighboring countries and some of the countries from the southeast Asian region.

The next step was to study the top importers in the world for the products under HSN 04. This data will be a representative to the major global markets that are potential markets for Indian exporters of dairy product can venture into. *Table 4* presents this data. An observation when studying the top importers for HSN 04 was that majority of the top importers are various countries located in the European region. Countries such as Germany, Netherlands, France, Italy, Belgium are top global importers in terms of value.

Table 4: Top importers in the world and their import value trend between 2013 – 2020

(Values are in thousand USD) *(Source: Trademap)*

Importers	Import 2013	Import 2014	Import 2015	Import 2016	Import 2017	Import 2018	Import 2019	Import 2020	Trend in import
Germany	8854456	9279740	7569431	7630277	9323843	9610978	9144090	9429851	
China	5245216	6490639	3303849	3516359	5068873	5601464	6352140	7288743	
Netherlands	4745928	4661256	3829064	3709360	4478462	4873690	4675469	4541433	
France	4402937	4683521	3571084	3543287	4476375	4804506	4496887	4303079	
Italy	5380862	5309654	3964326	3695417	4244260	4439066	4302207	3984286	
Belgium	4195080	4361028	3353817	3424761	4275511	4532640	4151152	3951532	
United Kingdom	4375904	4519098	3829942	3501563	3910792	4244542	3948360	3872415	
Russian Federation	4407646	3824191	1963322	2135136	2630066	2334856	2966997	2873050	
United States of America	2300439	2603318	2820395	2508090	2601450	2692676	2774123	2702095	
Saudi Arabia	1965720	2498524	2079898	1850631	1861764	1883097	1921938	2225384	
Spain	2479911	2477720	1877449	1823345	2093880	2202064	2170083	2092547	
Mexico	1945722	2002635	1639553	1650957	1838250	1786144	2100122	1870595	
Japan	1615516	1789547	1576573	1437645	1689722	1851390	1920424	1859869	
United Arab Emirates	1463353	1778903	1588084	1438793	1816500	1851023	1726308	1747003	
Hong Kong, China	2021868	2411583	2253738	2312766	2116109	2292241	2312642	1635392	

Among the top importers not all countries are importing completely for their domestic market demand, some of the countries will be importing milk and then performing some value

addition to make then of more economic value and then subsequently will be exporting to other markets. To identify if a country is importing dairy products for their market consumption or if they are importing it for further exports can be identified by a simple calculation called the Balance of Trade (BOT).

BOT is a measure of the difference between the import value and the export value under one particular product code. When the BOT value is negative, it represents that the value of imports is more than the exports and subsequently when the BOT value is positive then the export value is more than the import value. Now, BOT negative markets are of particular interest since they provide an opportunity to export a larger basket of primary as well as value added products from India. These markets are the potential export destination Indian dairy exporter need to focus on improving their export share.

Table 5 represents the top 1 BOT negative countries in terms of the import value under HSN 04. Among the top 10 BOT negative countries, India has trade with United Arab Emirates, Russia and Saudi Arabia and these countries are among the top 10 export destinations for Indian dairy products.

Table 5: Major Balance of Trade negative importers

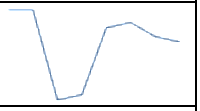
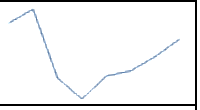
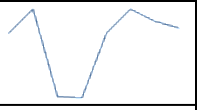
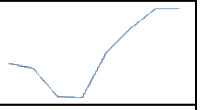
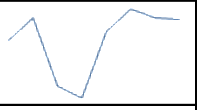
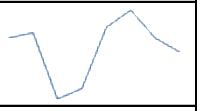
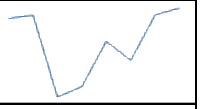
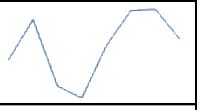
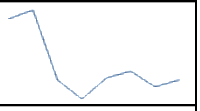
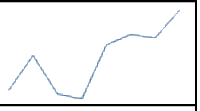
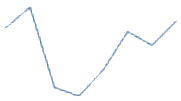
Country	Balance of Trade in 2020 *(in thousand USD)*
China	(6,711,747)
United Kingdom	(1,680,218)
Russian Federation	(2,569,485)
Saudi Arabia	(1,145,897)
Spain	(306,426)
Mexico	(1,571,973)
Japan	(1,778,020)
Hong Kong, China	(1,074,394)
United Arab Emirates	(1,019,363)
Algeria	(1,271,759)

(Source: Trademap)

Table 6 depicts the data of top global exporters for HSN 04, and this is the list of countries who are the competitors to Indian exporters of dairy products.

Table 6: Top Exporters in the World and their export value trend 2013 – 2020

(Values are in thousand USD)

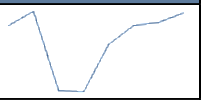
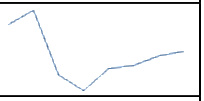
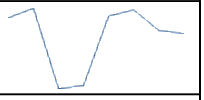
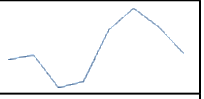
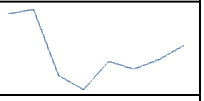
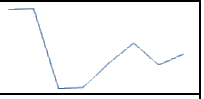
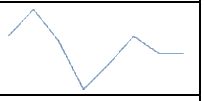
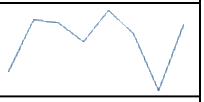
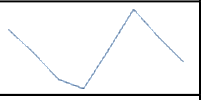
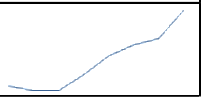
Exporters	Export 2013	Export 2014	Export 2015	Export 2016	Export 2017	Export 2018	Export 2019	Export 2020	Trend in import
Germany	11950270	12394298	9208331	8797405	10386510	10530547	10536248	10642583	
New Zealand	11158323	12242240	8283328	8013916	10232498	10186338	10645288	10641677	
Netherlands	10340709	10383531	7923521	8071563	9861339	10006465	9619938	9501120	
France	8365361	8865039	6922129	6582452	7115893	7261745	7075954	7216460	
United States of America	5770114	6164740	4448509	3904739	4476973	4615200	4955623	5417059	
Belgium	4106206	4418709	3287756	3256033	4105271	4435990	4260148	4176106	
Italy	3246745	3405346	2948721	3107343	3545331	3879306	4140138	4136313	
Ireland	2484993	2420381	1968903	1928837	2676455	3048835	3386995	3379727	
Poland	2514577	2764501	2027257	1886469	2620022	2868354	2769627	2751637	
Denmark	2702452	2738635	2284495	2351855	2773813	2905696	2707086	2606206	
Belarus	2343208	2366542	1784595	1859123	2180764	2046893	2367532	2420773	
United Kingdom	2031023	2332440	1842002	1744937	2144276	2399472	2424353	2192197	
Australia	2273204	2342804	1842714	1702113	1852003	1899882	1794950	1840001	
Spain	1416567	1575750	1399007	1377505	1623680	1674968	1654604	1786121	
Austria	1527939	1607162	1317612	1289440	1383957	1515690	1465895	1554294	

(Source: Trademap)

The major competitors are New Zealand, Germany, Netherlands and followed by some European countries and United States of America.

Since the major export destinations for dairy products and the major global competitors for Indian dairy exports were discussed previously, the next step is to detail the product wise growth in import value. This table also represents the data from 2013 to 2020. Table 7 depicts the top imported products under HSN 04 globally.

Table 7: Top Imported products globally under HS 04 *(in USD Thousands)*

Product HSN code	Product description	import 2013	Import 2014	import 2015	import 2016	import 2017	import 2018	import 2019	import 2020	Trend in imports
'0406	Cheese and curd	32242501	33430759	26965806	26777096	30672891	32242659	32461216	33232744	
'0402	Milk and cream, concentrated or	24661333	26566488	18070630	15961983	18872859	19213079	20438383	21203975	
'0401	Milk and cream, not concentrated nor	9452964	9746759	7516804	7604106	9493891	9669246	9113278	9035587	
'0405	Butter, incl. dehydrated butter and ghee, and	8244533	8553935	6717068	7051689	9921818	11213444	10094884	8606441	
'0404	Whey, whether or not concentrate	5812818	5965187	4141914	3759581	4549312	4325539	4584674	4957608	
'0403	Buttermilk, curdled milk and cream, yogurt,	4955003	4978802	4237637	4246493	4462952	4656902	4448071	4557756	
'0407	Birds' eggs, in shell, fresh, preserved	4336583	4675285	4280502	3671639	3989326	4334657	4111960	4119891	
'0409	Natural honey	2081269	2338420	2324937	2228783	2390996	2269616	1984139	2318165	
'0408	Birds' eggs, not in shell, and egg yolks, fresh,	1134692	1056513	967435	937916	1066857	1201498	1105379	1024420	
'0410	Turtles' eggs, birds' nests and other edible	396342	358875	361635	475676	627685	713715	756589	982664	

(Source: Trademap)

The import value growth in the crude form is only representative about the growing demand for each product category. Since the thesis is mostly interested in studying the implications from an Indian market perspective, the calculation of Revealed Comparative Advantage is a useful parameter.

Revealed comparative advantage (RCA) is an index that is defined as the ratio of the country's total export for a particular commodity under a 6-digit HS code level in the total export of the commodity from the same country at a 2-digit HS code level, compared to the same ratio at the world level. When the RCA value is greater than 1, then it is indicative that the export growth from India in that particular product category is growing at a much higher rate compared to the global demand growth. Now, this is a very positive indicator to the growing market acceptance and demand for Indian export products as well as a promotor to exporters looking to improve their product portfolio since the products with higher RCA are less risky in export markets.

The equation to find RCA is a below:

$$\text{Revealed Comparative Advantage} = \frac{\dfrac{\text{Export value of India at 6-digit level}}{\text{Export value of India at 2-digit level}}}{\dfrac{\text{Export value of world at 6-digit level}}{\text{Export value of world at 2-digit level}}}$$

Table 8 is depicting the RCA value for India for the products under HSN 04. From the information presented in the table, the highest RCA value for products under milk category is for product with HSN code 040229 and 040590.

Now since the product which shows high RCA is identified, in the next step the top importer countries for this product and the top exporters that are currently present in this product category are discussed.

Table 9 represents the top importers under HSN 040229 and *table 10* describes the top exporters for the same product category. Similarly, t*able 11* represents the top importers under HSN 040229 and *table 12* describes the top exporters for the same product category.

Table 8: Revealed Comparative Advantage (RCA) of India among different export products under HS 04

(Source: Trademap)

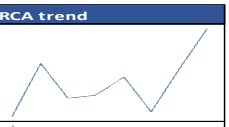
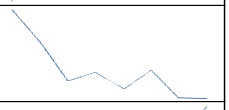
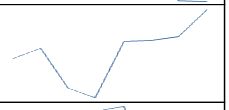
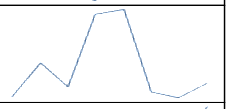
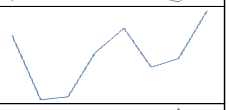
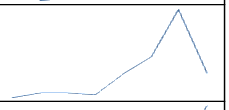
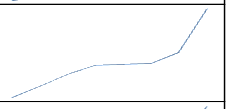
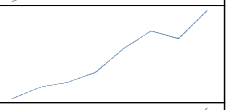
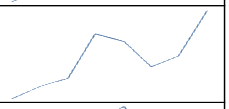
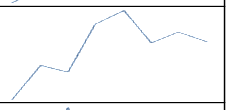
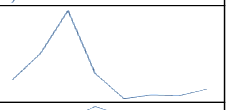
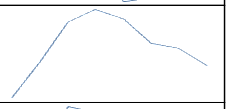
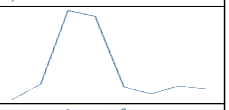
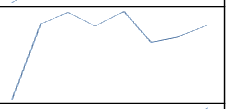
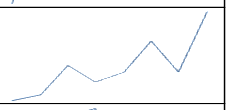
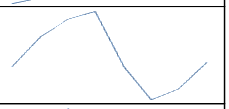
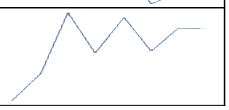
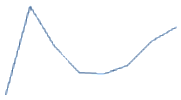
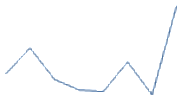
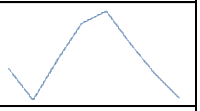
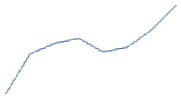
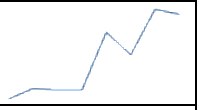
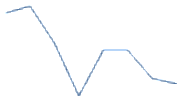
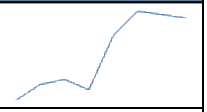
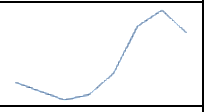
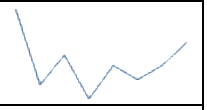
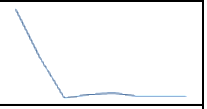
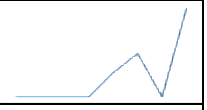
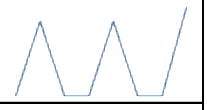
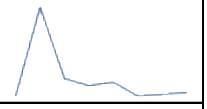
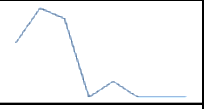
Code	Product label	RCA 2013	RCA 2014	RCA 2015	RCA 2016	RCA 2017	RCA 2018	RCA 2019	RCA 2020	RCA trend
'040120	Milk and cream of a fat content by weight of > 1% but <= 6%, not concentrated nor containing ...	0.082984	0.292066	0.152662	0.166139	0.239055	0.101633	0.266171	0.430781	
'040210	Milk and cream in solid forms, of a fat content by weight of <= 1,5%	6.433018	4.143795	1.5671	2.219918	1.079082	2.345275	0.453093	0.44357	
'040229	Milk and cream in solid forms, of a fat content by weight of > 1,5%, sweetened	3.838555	4.530091	1.824092	1.177592	4.993082	5.111291	5.361282	7.260892	
'040299	Milk and cream, concentrated and sweetened (excluding in solid forms)	0.070843	0.431114	0.175394	0.945799	0.999598	0.122249	0.065584	0.215106	
'040390	Buttermilk, curdled milk and cream, kephir and other fermented or acidified milk and cream, ...	0.174712	0.040121	0.045112	0.137584	0.189531	0.107228	0.126179	0.226971	
'040510	Butter (excluding dehydrated butter and ghee)	0.275473	0.422174	0.398372	0.346539	0.98771	1.483827	2.907745	0.994772	
'040590	Fats and oils derived from milk, and dehydrated butter and ghee (excluding natural butter, ...	1.856836	3.112786	4.38771	5.31827	5.48083	5.607142	6.771686	11.62297	
'040630	Processed cheese, not grated or powdered	0.16356	0.319394	0.384559	0.516812	0.861869	1.100798	0.990234	1.390486	
'040690	Cheese (excluding fresh cheese, incl. whey cheese, curd, processed cheese, blue-veined cheese ...	0.039981	0.082332	0.113631	0.27274	0.245346	0.153212	0.19341	0.358332	
'040711	Fertilised eggs for incubation, of domestic fowls	0.521529	1.529782	1.321635	2.711915	3.142686	2.168444	2.487273	2.201749	
'040719	Fertilised birds' eggs for incubation (excluding of domestic fowls)	1.838721	4.355927	8.394521	2.502147	0.188036	0.55174	0.391192	1.095151	
'040721	Fresh eggs of domestic fowls, in shell (excluding fertilised for incubation)	1.048223	1.833594	2.680177	2.962436	2.742422	2.226688	2.107927	1.73383	
'040790	Birds' eggs, in shell, preserved or cooked	0.350418	1.195992	5.383851	5.004827	1.034825	0.636941	1.075315	0.93889	
'040811	Dried egg yolks, whether or not sweetened	9.176234	35.97254	40.01605	35.17318	40.4317	29.20232	31.1691	35.32975	
'040819	Egg yolks, fresh, cooked by steaming or boiling in water, moulded, frozen or otherwise preserved, ...	0.034216	0.213265	1.243277	0.656011	1.018923	2.10787	1.026186	3.143474	
'040891	Dried birds' eggs, not in shell, whether or not sweetened (excluding egg yolks)	17.21634	21.50417	24.04829	25.27834	17.17089	12.51166	14.02576	17.9286	
'040900	Natural honey	4.623716	6.723366	11.47044	8.294079	11.07228	8.393004	10.19867	10.14622	

Table 9: Top Importers of 040229 Milk and cream in solid forms *(in USD Thousands)*

Importers	Import 2013	Import 2014	Import 2015	Import 2016	Import 2017	Import 2018	Import 2019	Import 2020	Trend in imports
China	14197	5257	37244	28431	48776	72710	76773	79857	
France	40781	61655	52323	46140	45587	47654	53483	56643	
United Kingdom	21810	28405	20573	18076	17366	24899	16581	39068	
Saudi Arabia	63666	28062	72647	113967	129718	91081	58610	29434	
Germany	826	12466	15657	16996	13076	14594	19690	27234	
Australia	8662	10956	10375	10659	23236	18343	28278	27022	
Netherlands	58809	62871	42916	16007	40006	39488	25015	22394	
Mauritius	13489	19712	10723	12893	12010	14226	11201	19056	
Italy	5544	4127	3842	13291	14717	16064	21146	18350	
Spain	22452	23616	11039	9870	14686	15381	9853	15934	

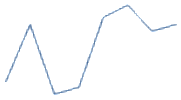
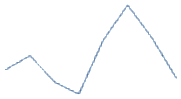
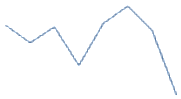
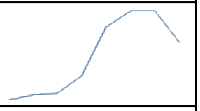
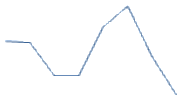
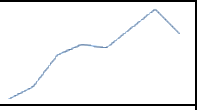
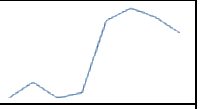
(Source: Trademap)

Table 10: India's export of 040229 Milk and cream in solid forms *(in USD Thousands)*

Importers	Export 2013	Export 2014	Export 2015	Export 2016	Export 2017	Export 2018	Export 2019	Export 2020	Trend in Exports
Bhutan	702	1838	2170	1400	5382	7163	6898	6558	
Nepal	950	596	205	430	1306	3241	3938	2982	
Afghanistan	316	114	192	78	167	130	165	225	
United Arab Emirates	3438	1546	0	189	204	89	107	92	
United States of America	0	0	0	0	13	24	0	48	
Ghana	0	0	0	0	0	0	0	23	
Hong Kong, China	0	5	0	0	5	0	0	6	
Singapore	1	90	19	11	14	1	3	4	
Bangladesh	1419	2377	2062	0	419	0	2	2	
Malaysia	397	1	0	0	0	4	2	2	

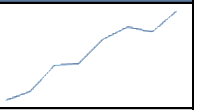
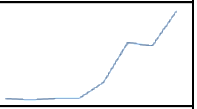
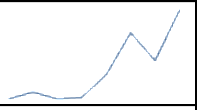
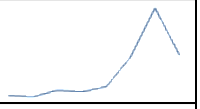
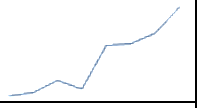
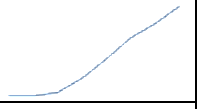
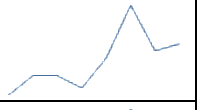
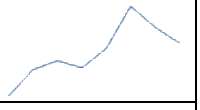
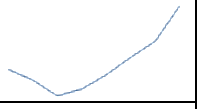
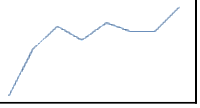
(Source: Trademap)

Table 11: Top importers of product 040590 Fats and oils derived from milk *(in USD Thousands)*

Importers	Import 2013	Import 2014	Import 2015	Import 2016	Import 2017	Import 2018	Import 2019	Import 2020	Trend in imports
China	80030	148830	64745	72529	155874	171716	139335	147416	
Italy	155241	173449	137111	121352	194975	243539	197811	143739	
Belgium	240232	213332	236001	180292	240763	268466	231209	138656	
Philippines	56378	62963	64638	83860	138190	155461	155621	119735	
Germany	94184	94229	66888	71915	141156	159726	118200	102900	
France	160728	158602	120230	120915	177719	202165	143908	98866	
United States of America	25362	36874	65068	75135	70983	89825	107353	84335	
Saudi Arabia	35115	43660	34816	37545	77005	84189	78807	70765	
Russian Federation	85085	71559	21886	33511	39491	35861	53005	64852	
Viet Nam	67692	61554	37774	39429	64490	77974	76661	53217	

(Source: Trademap)

Table 12: India's major export market of product 040590 Fats and oils derived from milk *(in USD Thousands)*

Importers	Export 2013	Export 2014	Export 2015	Export 2016	Export 2017	Export 2018	Export 2019	Export 2020	Trends in Exports
United Arab Emirates	13265	14103	16360	16488	18717	19812	19423	21352	
United States of America	1233	1051	1341	1366	3195	8610	8057	12695	
Australia	2050	2596	2069	2202	3799	6789	4825	8543	
Saudi Arabia	2013	1840	2670	2430	2994	6422	11958	6499	
Singapore	2688	2842	3290	2976	4630	4733	5149	6179	
Qatar	819	845	994	1780	2775	3876	4622	5594	
Oman	2129	2939	2949	2440	3757	6056	4072	4304	
Kuwait	998	1722	1945	1737	2289	3449	2843	2447	
Malaysia	736	564	278	391	655	963	1242	1891	
Bahrain	736	1141	1330	1215	1355	1287	1289	1499	

(Source: Trademap)

Table 9 picks the top importer for product 040229 and it is evident that a number of European countries along with China, Saudi Arabia and Mauritius are the top importers. *Table 10* shows the top Indian export destination for 040229 product category, but none of the top importers are currently among the top Indian export destination. This opens a large opportunity for Indian exporters.

Similarly, *table 11* represents the top importers of product 040590 and the list is dominated by European countries along with China, United States of America, Saudi Arabia and Russia. But one interesting observation is the presence of Philippines and Vietnam in the top importers list. Now when comparing this data with *table 12* which depicts the top export markets of India under HSN 040590, it can be understood that many of the top importers are not being catered to by India. This opens up the opportunity for exporters to delve into these markets.

8. Government Policies in Livestock sector

Government of India has been always keen in improving the overall farmer income in India and in the year 2016 formulated an ambitious plan to double the overall farmer income from the level in 2016 to double by the year 2022 and the involvement of animal husbandry is critical in achieving this milestone.

The department of animal husbandry and dairying had come up with the National Livestock Mission which intends to achieve the objective of generating employment opportunities through entrepreneurship in small ruminants, poultry and other livestock rearing and thereby increase the overall productivity of the sector. The strategy aims at improving productivity through breed improvement through cross breeding techniques and also promoting the highly productive Indian breeds to increase the production of meat, eggs, wool and fodder. The initiative focusses on Farmers producers organisations, self-help groups initiatives and MSME sector to improve the market supply as well as the export capabilities of livestock sector.

Rashtriya Gokul mission was launched in the year 2014 mainly aimed at developing and conserving the indigenous varieties of bovine breeds and thereby improving the milk production and overall productivity through scientific means which will include superior nutrition and farm management. One of the highlights of this initiative was the Gokul grams which are cattle development centers which were established for the development of the indigenous breeds. The mission had also established National Kamdhenu Breeding center and also introduced an e-market portal called 'E-pashu Haat' which will connect breeders and farmers. The government had also established the National Bovine Genomics center for indigenous breeds and also encouraged the use of advanced reproductive techniques such as In-vitro fertilization, multiple ovulation embryo transfer and artificial insemination.

The livestock sector especially the traditional farmers are often largely affected by common livestock diseased such as foot and mouth disease, goat/sheep plague, brucellosis, swine fever etc. The prevalence of these diseases are an obstacle for the growth on production and the subsequent economic growth which in turn leads to huge economic loss nationally. To improve this condition and help the farmers reduce their loss, the livestock health division have initiated the Livestock Health and disease control scheme, which is a centrally funded scheme launched by the department of dairying and fisheries since 2010. Under this scheme efforts are being made towards the prevention, control and containment of animal diseases of economic significance. The department regularly published action plans and guidelines for several public enterprises which will assist farmers tackle these diseases among their livestock population. The scheme also provides monetary assistance in case of widespread disease contamination in certain regions.

As it is understandable from the data regarding the trends in population among the major livestock species within India, we can clearly state that the government initiatives are yielding results for sure and is also resulting in improving the total milk productivity in India, thereby has made India the largest milk producer in the world.

Some of the challenges faced by livestock sector in India is due to the frequent disease outbreaks among the livestock population such as foot and mouth disease and influenza which spread at a fast rate among the holdings and can be fatal at times. Even though India is the largest milk producer the annual milk yield from Indian cattle is estimated to be only 1172 Kg of milk which only approximately 50% of the global average (*Source: Department of Animal Husbandry, Government of India*). Other challenges include lack of infrastructural capabilities in many of the rural regions in India and the limited information regarding the credit facilities that small scale farmers can avail from public sector and cooperative sector banks. The infrastructure development is capital intensive in itself and needs significant fund allocation from the public sector and this is a bottleneck in a capital deficient economy like India.

An area of development is the need for promoting export orientation in dairying sector especially since the government is focusing on improving the livestock holding in the country and this will in turn lead to greater production surplus, which if utilised for export purpose will result in large scale income generation and valuable forex influx for the country. This export promotion can be clubbed with Production Linked Incentive scheme under central government.

9. Conclusion

From studying the 20th Indian Livestock census published in the year 2019, the thesis describes the trend in the population statistics of all major livestock species category both in the country level as well as in the state-wise level. Some of the prominent observations are as below:

- The total livestock population has shown a growth of 4.8 % to the earlier 2012 census and currently stand at 536.76 million in total
- Total bovine population has shown a growth of 1.3% to the previous census and stands at 303.76 million
- The total buffalo population stands at 109.85 million, an increase of 1.1% to the 2012 livestock census

The total livestock distribution is also pictorially represented in *fig 1* and helps understand that more than 80% of the livestock population is accounted by cattle's, buffalos and goats. deep diving to compare the 2019 data with the 2007 livestock census, it is evident that the livestock population has only grown marginally by 1.3%, which is depicted in *fig 2*.

Further to understand the population trend among the top 10 major livestock holding states through *fig 3*, it is understandable that states such as Madhya Pradesh, Bihar, Andra Pradesh and Telangana have shown a bigger growth in their absolute numbers compared to the biggest holders such as Uttar Pradesh and Rajasthan.

Studying *fig 4*, which details the breed-wise distribution of cattle population compared between 2012 and 2019, one can comprehend that the population of female cattle in both

exotic/cross-bred and indigenous category has shown a growth from the 2012 census. However, the population of male cattle in both exotic/cross-bred and indigenous category has shown a decline. The total milk producing cattle's have grown by 19% and reached 52.29 million (*Source: Livestock census 2019*).

Among the Indian states, West Bengal, Uttar Pradesh and Madhya Pradesh are the top three states in terms of total cattle population, *fig 5*. However, states of Uttar Pradesh and Madhya Pradesh have shown a marginal decline in the absolute number of cattle's when compared with the tally as of 2012 livestock census.

In the next stage of study, the population trend of buffalo species is studied which is the next major contributor to livestock population. *Fig 6* depicts the population trend of buffalo population between 2012 and 2019 census. Even though the total buffalo population has only shown a marginal growth of 1% the total female buffalo population has shown a growth of 8.6%. The trend that was observed among the cattle population where the female population has shown a growth and the male a decline was also to be observed among the buffalo population. Among the top states as per the buffalo population (*fig 7*), Uttar Pradesh leads the peers by a substantial ground whereas states of Punjab and Haryana even though they retain their position among the top 10 have seen a decline in their absolute numbers from the 2012 census.

From analyzing the livestock census of 2019 versus that of 2012 it is evident that there has been a considerable increase in most of the livestock categories and this has played a significant role in both improving the income of households as well as improving the productivity of Indian livestock sector derived products. The detailed analysis of the productivity of livestock sector mainly focusing on the bovine species category was performed.

The bovine species category which mainly comprise of cattle's, buffalos, sheep and goat play a pivotal role in delivering the dairy products which have great nutritional value, and these species also provide raw materials to industries such as textile, leather, cosmetics etc.

India is currently the largest producer of milk in the world and a major portion of this production is used to meet the demand of the domestic market. As the government takes steps to improve the productivity and population of livestock sector, India will be in a much better position in terms of production surplus that Indian farmers will have to look at various options available in terms of different value-added products that dairy products can be transformed into so as to fetch farmers grater profit margin, and this will also open doors for India to be a top global exporter of dairy products. However, delving into the foreign market is a tricky game altogether.

Before deciding on the steps that are to be taken, the thesis undertook an analysis to understand the total milk productivity in India and trend that was observed for the 2010 to 2019. *Fig 8* depicts the total milk productivity of India and also the per capita availability over

the same period. As it is clearly noticeable India's total milk production has been increasing constantly over the last 1 decade and currently India is the largest milk producer in the world. However, the per capita availability of milk is not significantly high and is only approximately 50% of what is observed in many of the developed countries (*UN-FOA, 2017*). This is primarily due to the very large population in India and also partly due to the lack of awareness among many rural households about the need to include milk and other milk derived products to their diet to ensure sufficient nutrient supply especially to the younger population. One solution to this problem is to promote milk related products supply through PDS system in India atleast among the BPL and Antyodaya section of the society. *Fig 9* shows the state wise production of milk within India. Uttar Pradesh is the largest milk producer in India with approximately 30.5 K tonnes in 2019. This is in conjugation with the fact that Uttar Pradesh is a state that holds one of the top 2 positions both in cattle and buffalo absolute numbers. So, from this it can be understood that the increase in absolute numbers was the right step to be taken for improving the total production of dairy products.

Since the potential of dairy products to boost India's foreign exchange was clear, the thesis deep dived into studying the Indian export scenario under HSN code 04 which includes dairy and associated products. Firstly, India's export of products under this chapter code was studied and the trend from 2013 to 2020. *Table 3* shows this trend, and it is clearly understood that there is mixed trends observable. Some export destinations such as Bhutan, Australia, Maldives and Vietnam have shown a continuously rising export value whereas there are some destinations where the value has shown great fluctuations. Now in the next step the study focuses the global dairy market as a whole and understand who the top importers in the world are. *Table 4* depicts this information, and it can be concluded that most of the top importers are not present in the subsequent Indian list, hence the need to understand the possible markets which are yet to be delved into for Indian products.

Now, among the top importers we were more interested in those countries which has a negative balance of trade (BOT) value. Balance of trade is the absolute difference between the imports from exports. So, if the BOT is negative for a country, then that particular country will be importing that particular product more than it exports. So, from this we had concluded *table 5* which has the list of top 10 BOT negative countries for dairy products.

An interesting observation is that among the list of top BOT negative countries, India already has Saudi Arabia, United Arab Emirates and Russia among its top export destination. This is a positive datapoint, and also showcases the potential markets that Indian exporters can potentially delve into. The information regarding BOT negative country is represented in *table 5.*

To understand the positions of top exporters in the world for HSN code 04, *table 6* tabulated the top 10 countries and their export value trend from 2013 to 2020. As it is clearly evident that the total value exported by top countries such as New Zealand, Germany and Netherland are nearly 30x that of the Indian export value. This shows the gap or the lacunae that India

exporters have to fulfill even though India is the world's largest milk producer. But there is also another side to this datapoint which is due to the enormous size of the Indian domestic market and its milk demand along with the characteristics of Indian milk when compared to the fat enriched milk that is marketed by the other countries.

The largest exporter under HSN 04 is New Zealand and the major markets to which they export their goods include China, Australia, United States of America and Japan. The next largest exporter is Germany and their export market include Netherlands, Italy, France and Austria. The third largest exporter is Netherlands, and their export markets include Germany, Belgium, France and United Kingdom. One common observation we had regarding the major global import markets for HSN 04 goods were concentrated withing the European Union countries and from analyzing the Indian export markets we could understand that Indian markets are not reaching these markets to be a major competitor within these geographies. This is a key observation and hold significant role in the potential growth of Indian dairy products.

A similar observation is that, since European Union countries have the highest form of trade union amongst them in the form of a monetary union there are immense perks for internal trade which will be difficult for India to match. But one possible prospect is United Kingdom which has exited from European Union and is back to being an independent country in that region and since UK is also a large importer of Dairy products and the prospective trade agreement that India is trying to form with UK could play a significant role in shaping the dairy product export to UK market.

To conclude on the markets zeroed in on is United Kingdom and forming a possible agreement with the European Union as well. Also, Indian exporters are extremely fortunate since the Directorate General of Foreign Trade (DGFT), Ministry of commerce, Government of India is currently in the process of finalizing numerous free trade agreements with United Arab Emirates, United States of America, Israel, South Korea, Japan and numerous other countries. Once these Free Trade Agreements (FTAs) come into effect it will immensely help in reducing the import tariff for Indian products in these markets which will finally result in improving the price competitivity of Indian products in these markets thereby making them lucrative for Indian exporters.

Later, the thesis shifts its focus to understanding which products are showing the highest potential for export. *Table 7* summarizes the import value of products under HSN 04 at 6-digit level. It is understood that the demand for most of the products have been fluctuating over the last 8 years and hence the need to diversify and broaden the export product basket.

To deep dive and understand how the Indian exports at a 6-digit level was performing compared to the global trend over the last 8 years, the revealed comparative advantage of India at the 6-digit level was calculated, and this is represented in *table 8*. From the study, the following products under the milk category to have shown the highest RCA value:

- 040229 - Milk and cream in solid forms
- 040590 - Fats and oils derived from milk

A high value of RCA, which is greater than 1 is an indicator to the fact that the Indian export for that particular product has grown at a higher rate than the growth of the global market demand and this correlates to the fact the Indian exports have grown in terms of value or has ventured into newer markets and in turn shown a stronger growth than the global average growth.

Table 9 picks the top importer for product 040229 and again it can see that a number of European countries along with China, Saudi Arabia and Mauritius holds the top ranks. *Table 10* shows the top Indian export destination for 040229 product category, and none of the top importers are currently among the top Indian export destination. This opens a large opportunity for Indian exporters.

Similarly, *table 11* represents the top importers of product 040590 and the list is dominated European countries along with China, United States of America, Saudi Arabia and Russia. But one interesting observation is the presence of Philippines and Vietnam in the top importers list. Now when comparing this data with *table 12* data which depicts the top export markets of India under HSN 040590, again many of the top importers are not being catered to by India. This again opens up the opportunity for exporters to delve into these markets. Among these the Vietnam and Philippines are of particular interest due to the ASEAN trade agreement that India is part of, and this provides import tariff benefits to Indian exports to these countries. Hence, we should promote exporters to try to establish their presence in Vietnam and Philippines.

When analyzing the central government schemes under the larger umbrella of doubling the farmer income in India, it is understandable that the schemes such as national livestock mission, animal husbandry infrastructure development, Rashtriya Gokul mission, livestock health and disease control have improved the absolute population of major species in the livestock sector such as the bovine sector and poultry. But, as mentioned earlier the status of India being the largest global producer of milk is to be utilized to stamp India as a supplier of dairy products to the global market and for this there is need to incentives and promote export orientation in livestock sector.

Summarizing the thesis, the study has been able to clearly understand that there has been a positive trend in population growth of most of the species under livestock sector and this trend has been positively reinforced by the various schemes undertaken by the government of India. One potential policy implication could be to facilitate the growth of livestock derived products such as dairy products to be promoted for export to international markets and can concentrate on the few markets such as United Kingdom, Vietnam and Philippines. Also the need to spread the awareness among the rural population especially those who are associated with agricultural income about the availability of easy credit options at low interest rates will motivate the farmers to start livestock rearing along with agriculture. Also the

government needs to ensure that the livestock disease control and prevention is given utmost importance since the prominence of these diseases which are extremely contagious will have great financial implication to especially the poorer households and if the government assistance to mitigate these diseases are not provided at a routine basis through the animal husbandry department then the farmers may turn apprehensive towards venturing into livestock sector. The thesis believes that these steps will immensely contribute towards the greater prosperity of the household associated with the livestock sector and also encourage more farmers to consider diversifying their agriculture by including livestock rearing.

10. Reference

- George. P. S. (1996) Dairying and Livestock Economy of India - A Review. *Indian Journal of Agriculture Economics*, Vol 51, Nos. 1 & 2, Jan- Jun 1996.
- Pratap. S. B. Economic Contribution of Livestock subsector in India.
- Dikshit A.K. and Birthal P. S. (2010) India's livestock feed demand: Estimates and Projections. *Agricultural Economics Research Review*, Vol 23, January – June 2010, pg. 15-28.
- Mishra. S. N. (1995) India's Livestock Economy: A perspective on Research. *Indian Journal of Agricultural Economics*. Vol 50, No. 3 July – Sept 1995.
- Thornton. P. K. (2010) Livestock production: recent trends, future prospects. *Philosophical Transactions of the Royal Society*, B. 2010, 365, 2853-2867.
- Sonavale. K.P. Shaikh. M. R. Kadam. M. M. Pokharkar. V. G. (2020) Livestock Sector in India: A critical Analysis. *Asian Journal of Agricultural Extension, Economics and Sociology*. 38(1): 51-62, 2020.
- Herrero. M. Grace. D. Njuki. J. Johnson. N. Enahoro. D. Silvestri. S. Rufino. M. C. (2013) Role of Livestock in Developing Countries. *Animal* (2013), 7:s1, pp 3-18.
- Upton. M. The Role of Livestock in Economic Development and Poverty Reduction. *The Pro-poor livestock policy initiative*.

The following database and online published reports have been used to extract data for the use in this thesis:

- https://dahd.nic.in/documents/statistics/livestock-census
- https://dahd.nic.in/about-us/divisions/livestock-health

- https://dahd.nic.in/SCHEME/RGM
- https://www.nlm.udyamimitra.in/

11. Annexure

Similarity Report (from next page)

Final Livestock

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