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Assessment of Livestock Feed and Fodder in Gujarat

S. S. Kalamkar, H. Sharma & M. Makwana

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Foreword

Gujarat state has made rapid strides in its agriculture sector including the agribusiness sub sector during recent past. Agriculture in Gujarat has been transforming over time from traditional to high value added commercial crops which can be seen from a shift in its cropping pattern from food grains crops to high value cash crops such as oilseeds, fruits, vegetables and spices. The trend in shifting of cropping pattern paved ways for many ancillary industries in the areas of processing, packing, storage, transformation, etc. Agricultural growth in the state is favored by the prevailing eight agro-climatic zones, enterprenuring farming community, policy support from the government, wealth of livestock population, extended coast line and contribution by the agricultural scientist and dedicated NGOs.

About two third of population of Gujarat lives in rural areas and depends for its livelihood on agriculture and the rural non-farm sector that is interlinked with agriculture. Gujarat is traditionally known for its institutions like farmers' cooperatives and other state originations. The Amul model has helped India to emerge as the largest milk producer in the world. Gujarat is a leading state in terms of terms of its quality milch animals and milch production. Gujarat harbours some of the elite breeds of livestock like Gir and Kankrej, Mehsani, Surti, Jafrabadi and Banni buffaloes, Kathiwadi horses, etc. which have high milk yields. Gujarat ranks third position in terms of milk production in the country with the milk production of 122.62 lakh tones which is about 8 per cent of entire country. Major share of motive power of agriculture comes from livestock. Livestock keeping- an integral part of farming system as land, labours and water can be efficiently utilized. An intensive animal vaccination program was launched in all the villages at the '*Krishi Mahotsav'* held since four years, so as to focus on disease management and the rearing of healthy livestock In addition to vaccinating the livestock, animal health camps were also held.

Though India is the highest milk producer country in the World but milk production per animal per year is very low. Deficiency in quantity and quality of fodder is one of the major cause of this low productivity. The animals need proper feeding to meet their nutrient requirement to express their full genetic production potential. Deficiency of green forage is mainly due to non-availability of land for fodder cultivation. India has vast tracts of grazing land, most of which has fragmented or become degraded due to lack of appropriate policy interventions and management inputs. Fodder are cultivated or grown naturally on degraded and marginal lands with minimum inputs, in terms of fertilizers water and operational energy. Moreover, in case of forages, regional and seasonal deficiencies are more important than the national deficiencies, as it is not economical to transport the forage over long distances.

The marginal and small farmers own only 44 per cent of the agricultural land while they own 80 per cent livestock assets. Quite logically, if the income of the farmer is to be doubled by 2022 as per the vision given by the Hon Prime Minister in 2016, then livestock is perhaps the best and most available assets to enhance farmers

income due to higher availability of the livestock as compared to land as an asset for income generation. While overall productivity of livestock has been low in past, because of inadequate nutrition from green fodder, along with dry residue and protein concentrate. As per NIANP (ICAR) estimate, there is shortage of up to 36 per cent of green fodder and protein concentrates besides up to 23 per cent shortage of dry fodder. In view of same, the Ministry of Agriculture and Farmers Welfare, Government of India entrusted this study to our Centre. The study is based on both primary and secondary level data. The study came out with important and relevant policy implications which would help to plan to increase the area under fodder cultivation and milk production in the country and also doubling the income of the dairy farmers.

I am thankful to authors and their research team for putting in a lot of efforts to complete this excellent piece of work. I also thank the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India for the unstinted cooperation and support. I hope this report will be useful for policy makers and researchers.

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The study would not have reached to this stage without the active co-operation of the respondent milk producers from selected villages in Gujarat who provided all the required data for the study without any hesitation and expectation. We thank each one of them for their invaluable support.

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List of Abbreviations

Av.	-	Average
CAGR	-	Compound Annual Growth Rate
CB	-	Cross Breed
CP	-	Crude Protein
DADF	-	Department of Animal Husbandry, Dairying and Fisheries
DCS	-	Dairy Cooperative Society
DES	-	Directorate of Economics and Statistics
Dist.	-	District
DM	-	Dry Matter
FAO	-	Food and Agriculture Organization
FASR	-	Food & Agribusiness Strategic Advisory &Research
GCA	-	Gross Cropped Area
GDP	-	Gross Domestic Product
GOG	-	Government of Gujarat
GOI	-	Government of India
GSDP	-	Gross State Domestic Product
GVA	-	Gross Value of Agriculture
GVO	-	Gross Value of Output
ha	-	Hectare
HH/hh	-	Household
HYV	-	High Yielding Variety Seeds
IGFRI	-	Indian Council of Agricultural Research
kg	-	kilograms
LRP	-	Local Resource person
LTPD	-	Litres per day
mha	-	Million hectares
MOA	-	Ministry of Agriculture
mt	-	Metric Tonnes
NATP	-	National Agricultural Technology Programme
NCAER	-	National Council of Applied Economic Research
NCDFI	-	National Cooperative Dairy Federation of India
NDDB	-	National Dairy Development Board
NDP	-	National Dairy Plan
NITI	-	National Institution for Transformation India
Nos	-	Numbers
NSDP	-	Net State Domestic Product
NSSO	-	National Sample Survey Organization
RLU	-	Ruminant Livestock Units
Rs.	-	Rupees
SAP	-	State Agriculture Plan
SAU	-	State Agricultural Universities
SC	-	Scheduled Caste
ST	-	Scheduled Tribe
TDN	-	Total Digestible Nutrients
TL	-	Truthful Seeds
VOO	-	Value of Output

Executive Summary

Assessment of Livestock Feed and Fodder in Gujarat

S. S. Kalamkar, H. Sharma & M. Makwana[1]

1. Introduction:

Animal husbandry in India is closely interwoven with agriculture. It plays an important role in the socio-economic development of millions of rural households thereby contributing importantly in the national economy. Livestock rearing is one of the most important economic activities in the rural areas providing supplementary as well as stable income round the year. This sector has also emerged as a vital sector for ensuring a more inclusive and sustainable agriculture system. Evidence from the National Sample Survey Office's (NSSO) 70th round survey (2014 & 2014a) showed that more than one-fifth (23 per cent) of agricultural households with very small holdings of land (less than 0.01 hectare) reported livestock as their principal source of income. More than 70 million of the reported 147 million rural households depend on dairy, in varying degrees, for their livelihoods. Marginal, small and semi-medium farmers with average operational holdings of area less than 4 ha own about 87.7 per cent of the livestock of India. By controlling 64 per cent of the bovine, 70 per cent of ovine, 73 per cent of caprine and 70 per cent of the poultry population, the small holders contribute substantially to livestock production. Dairying has become an important secondary source of income for millions of poor and rural households and has assumed an important role in providing employment and income generating opportunities particularly for marginal and women farmers. This is the sector where the poor contribute to growth directly instead of deriving benefits from growth generated in other sectors of the economy. This sector has created a significant impact on equity in terms of employment and poverty alleviation as well. It cannot be merely a co-incidence that the level of rural poverty is significantly higher in states where livestock sector is underdeveloped.

2. Need for the study

Dairy Industry in the country has shown spectacular growth during the last few decades. With an expected production of about 188 million MT of milk by the end of 2018-19, it is estimated that annual requirement of green fodder will be to the tune of 1,100 million MT and dry fodder to the tune of 610 million MT. The current availability of green and dry fodder, however, is estimated at 500 million MT and 380 million MT respectively. Efforts to increase livestock productivity / production is constrained by feed /fodder shortages. The shortages tend to be even more serious during natural calamities. To improve the availability of fodder, there is very little scope to increase the area under fodder cultivation, particularly in view of the growing demand of human beings for food, fiber and shelter. It is therefore necessary to increase the availability of fodder by increasing the productivity of available forage resources per unit area, improve the efficiency of fodder utilization and minimize the fodder wastages to increase and thereby reduce the gap between demand and supply. The present average green fodder yield of 40 MT/hectare/year of cultivated land and 0.75 MT/hectare/year for common grazing land are too low and there is huge potential to improve their productivity through adoption of latest technologies.

The country's estimated demand for milk is likely to be about 200 million tonnes in 2021-22 (NDDB, 2014 & 2014a). To meet the growing demand, there is a need to increase the annual incremental milk production from 4 million tonnes per year as was the case for the last

[1] Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat

10 years to 7.8 million tonnes in the next 8 years (total 210 million by 2021-22). To meet the growing demand, it is necessary to maintain the annual growth of over 4 per cent in the next 15 years. Quantum jump in milk production is possible through increase in productivity, and linking small holders to dairy cooperatives/producer groups/SHGs with forward linkages having milk processing facilities. Adequate availability of feed and fodder to livestock is vital to increase their productivity and also to sustain ongoing genetic improvement initiatives. The supply of feeds has always remained short of normative requirement. The situation is further aggravated in Rajasthan and Gujarat where considerable area falls in arid and semi-arid zones. Keeping this background, the study examines demand, supply, and a deficit of feed and fodder production in the Gujarat.

3. Data and Methodology:

The study is based on both, the secondary and primary level data. The study is based on both secondary and primary level statistics. The secondary data on livestock population of all selected states are compiled from published sources. To understand and analyze the demand for and supply of feed and fodder, primary data were collected from the field level through a sample survey method. As per the sampling framework, data were collected from three selected districts from three regions of the state, i.e. Banaskanatha (North Gujarat), Surat (South Gujarat), and Panchmahal (East Gujarat). The reference period of the study was 2019-20 agricultural year.

4. About Study Area:

Gujarat has been consistently clocking impressive agricultural growth rates. This has been possible because the government has focused on improving not only irrigation, quality of seeds and power but also subsidiary sectors like animal husbandry. The growth of the animal husbandry sector has resulted not only in increased milk production but has also provided a boost to the overall agro-economy of the state. The livestock sector in Gujarat has achieved a remarkable success during last six decades due to collective efforts of government organisations, non-government organisation and the milk producers. Gujarat is one of the leading states in terms of milk production. The cooperative sector has been the key driver of the tremendous increase in Gujarat's milk production. It is not a surprise that Gujarat, the birthplace of India's white revolution, has a thriving milk cooperative sector. The largest dairy co-operative in India, Amul, is based in Anand, Gujarat. 'Amul' pattern is well known & accepted by all states in India besides some of the countries in the world.

Animal husbandry has played a significant role in boosting the agrarian economy of the state. It is not only a subsidiary source of livelihood in rural Gujarat, it is a major economic activity, especially in the arid and semi-arid regions of the state. Thus, this sector plays a vital role in the rural economy of the state and has significant impact on employment generation for marginal, sub-marginal and landless farmers. Out of about total 102 lakhs household, about 43 lakh households have livestock in Gujarat as a primary or secondary source of income. Milk contributes around 20 per cent to the agricultural GSDP of Gujarat and is one of the biggest sectors for supporting livelihood in the state. Share of milk in livestock output at constant prices was about 86 per cent, which was not only the highest contribution but also was a noticeable share in the total livestock output.

Gujarat State has secured a remarkable position in the country as far as livestock wealth and development are concerned. As per Provisional figures of the 20th Livestock Census (2017) of India, 26.9 million livestock (5.02 % of all India) population was in the state of Gujarat. An increase in livestock population from 23.51 million in 2007 to 27.12 million in

2012 was observed and then declined between 2012 and 2017. In fact, the share of Gujarat in all India total stock of livestock increased by 0.86 percent points during 2007 to 2012 and then declined by 0.28 percent points in 2017. As per Livestock Census 2012, among various species in Gujarat livestock, buffalo comprised of the highest share (38.28 per cent) in total livestock population followed by Cattle (36.80%), Goat (18.28 %) and Sheep (6.30 %), besides marginal share of other livestock species such as Camel, Mules, Donkeys, Horses and Ponies. Banaskantha (9.38 %) had the highest number of livestock population followed by Panchmahal (7.41%), Kachchh (7.14%), Sabarkantha (6.8%), Dahod (6.41%) and Vadodara (6.13%). These six districts together accounted for 44 percent of total livestock population in the state in 2012.

Gujarat is a leading state in terms of its quality milch animals and milk production. Gujarat ranks third among the milk producing states in India, with 144.93 lakh MT in 2018-19, an increase from the 30.9 lakh tonnes in 1983-84. Despite of increase in milk yield, there is still a wide scope for improving milk yield of milch animals. The reason cited for this is inappropriate feeding as well as inadequate supplies of quality feeds and fodder in addition to the low genetic profile of the Indigenous breeds. It is not possible to achieve higher productivity in milching animal by merely increasing its genetic potential. Due attention needs to be given to proper feeding of milching animals. There is no shortcut to sustain livestock husbandry, without addressing the development of fodder and feed resources.

As such there is lack of time series dataset regarding area under forage and fodder crops in India. While GOG 2018 (SAP & SIDP) report has highlighted area under forage crops in Gujarat which was estimated to be 2.32 lakh ha in the year 2017-18 in Gujarat. Out of the total area under forage crops in Gujarat, about one fourth of total area was in Banaskantha district followed by Mehsana having about 10 per cent of total area in the State. Other districts, having around 5 per cent area under forage crop, were Vadodara, Sabarkanta, Kachchh and Kheda. As against the estimated animals' requirements, feed resources available in Gujarat are lower. During the period 2003 to 2011, shortage of fodder was observed in the state. In context of dry matter, a reduction was observed from 137 per cent of the requirement to 66 per cent; total digestible nutrients from 200 per cent to 73 per cent while the crude protein availability increased from -98 per cent to a surplus of 19 per cent.

5. Findings from Field Survey:

- The various socio-economic factors for instance size of family, education and training of dairy producer, availability of land and off farm income, experience in dairy, etc have direct influence on dairy farmers' decision to whether they want to expand and improve their dairy operations. Average age of the selected household head/respondent was around 46 years of which almost half of them found to be illiterate. The remaining half of the household respondents were educated mostly up to the highest level of high schools except few of them were found graduated. Out of the total selected respondents, almost 46 per cent were from backward classes, followed by around 28 per cent from Scheduled Caste, 14 per cent from Schedules Tribe and rest of them belongs to open category. Most of the selected households respondents were male (92 per cent) and very few (8 per cent) were female respondents.
- The selected households had relatively higher experience in dairy business (20 years) followed by farming (18 years) and sheep and goat rearing (10 years). The average family size was found to be 6.66 persons and the highest share of family members were found to be primarily engaged in dairy business (44 per cent) followed by 36 per cent in farming and rest of them were in sheet and goat farming. The main occupation of the selected households was agriculture comprised of cultivation of land as a farmer along with supportive allied activity of animal husbandry and dairying. Agriculture was the primary occupation of 55 per cent households followed by animal husbandry

and dairy (22 per cent) and around 12 per cent were depends on labour activities. Own farm establishment and self employment were other major sources of occupation. The annual average income of the selected households was estimated to be Rs. 105756/- followed by Rs. 78705/- from dairy, Rs 6610/- from sheep and goat rearing. Around 73 per cent of the selected households were found be a member of social and cooperative organisations.

- On an average, operational land holding was estimated to be marginal size of holdings having 0.91 ha of which 92 per cent land was irrigated. It was very surprising and pleasant to note that almost 44 per cent of total operational holdings was devoted to fodder crops, while same was very significant in case of land under rainfed condition (72 per cent) as compared to 42 per cent land was under fodder by irrigated land holders. The groundwater the main source of irrigation followed by surface sources such as canal and tank.
- The cropping pattern of the selected households indicates that highest area under fodder crops was recorded during kharif and rabi season. Besides, during kharif seasons, supportive crops which by product can be used as fodder crops such as maize, bajra, moong, urad and groundnut were grown. The fodder cultivation is found to be relatively less profitable than other crops.
- The details on fodder and feed fed to the animals indicate that the more than 93 per cent selected buffalo and Cattle had average age of more than 2 years while around two fifth of sheet and goats were of same age. The average value of sheet and goat for the age of 2 years and above ranges between as high as around Rs. 6821/- and Rs. 6593/- in Banaskantha and as lowest as Rs. 1020/- in Panchmahal district and Rs. 1873 in Surat district, respectively.
- The average value of the buffalo, crossbreed cattle and Indigenous cattle for the age 2 years and above ranges around Rs. 48000/- , followed by Rs. 39000/- for crossbreed cattle and Rs. 30000/- for indigenous cows. The lowest value of Indigenous cows was reported to be in Banasskantha and Panchamal district than Surat. The average value of animals as per stage of life i.e. heifer not pregnant, heifer pregnant, dry and mulching animals.
- The details on the fodder and feed fed to the milch animals indicate that the average feed and fodder consumption of milch animals was ranges between 14- 16 kg of green of fodder followed by 12-14 kg of dry fodder, 2-3 kg of concentrates and very few quantity of the supplements were fed to the adult animals. The quantity of feed and fodder fed to the animals were significantly high for milch animals followed by the heifer pregnant, dry animals and rest of them. Besides stall feeding, the animals were also taken out for grazing for few years on each day. The small ruminants were mostly fed outside by taking out for grazing and very few of the households had fed them with the dry fodder and some concentrates. On an average, animals were also taken out for grazing for 7-8 hours on each day.
- The total requirement of feed and fodder using the standards given by the NATP database and as per the available data of livestock census of 2012 was to be 85062 tonnes of green fodder, 415411 tones of dry fodder and 289746 tones of concentrates per day. With respect to green fodder availability, the production is estimated through a potential production per unit hectare from the land classification data of the State of Gujarat for the year 2016-17 and was estimated to be 71277 tonnes. The main crops residues available for livestock in the state are Bajra, Paddy, Wheat, Pulses, Oilseeds and Sugarcane. The percent gap between the requirement and availability has been computed which indicate that State is deficit in dry fodder followed by availability of concentrates. The green fodder was estimated to the by 30 per cent than requirement.

- The major sources of livestock feed reported by the sample households are crop residues was major source of the livestock feed followed by grazing land. Half of the respondents depend on the improved forage and pastures, household left over and tree legumes grown as hedge. Very few household have reported use of feed preserved feed in storages. Very few households have cattle shed and majority of them are kuccha in nature of which few are within house. While in case of shed for sheep and goat, very few of same of kaccha nature.
- As dairy activities are carried out as complimentary activity to agriculture activities, the labour use pattern by the selected sample households indicate the significant involvement of female in dairy activity (buffalo, crossbred cows and indigenous cows) while in case of sheet and goats, male were engaged may be mostly for grazing them on the field. The time spent on management of dairy business for the stall feed animals was estimated to be around 2-3 hours per day while same was about 3-5 hours for small ruminants. The net returns realised by the sample households shows that the highest milk yield realised by the sample households from buffalo (9.22 lit/day) followed 5.82 lit/day from buffalo and 5.17 lit/day from indigenous cows. While the milk yield of small ruminants animals was reported to be less than a litre per day. Therefore, there is a huge scope to enhance producers' income from dairy by enhancing animals productivity, improving management practise, and ensuing remunerative prices.
- The details on constraints faced by the sample households indicate that the top most constraint faced as expected was small size of land holdings and therefore selected households cannot afford to put more land under fodder seed/crop production as they need to grow food grains and commercial crops. The other major constraints reported are no provision of quality seed by society on credit & Non availability of quality fodder seed in market; High Cost of Cultivation/Production and Low return on fodder production; non-availability of Grazing lands; and non availability of adequate irrigation water.
- The adoption of post harvest techniques plays important role in conservation of dry and green fodders for long period to be sued during off seasons. It was very strange to note that despite of the fact that fodder availability has direct relation with milk productivity as well as health of the animals, almost all the households had not adopted any post harvest technique, which indicate failure of the agricultural extension mechanism/department of animal husbandry in training the farmers for such techniques (e.g. hay making, silage, etc). The major reasons for non adoption of these post harvest techniques were highly expensive to adopt the post harvest techniques (55 per cent), followed by lack of awareness on production and post harvest management (29 per cent) and considered it inferior in comparison to fresh one (14 per cent) and more laborious (2 per cent).
- It was strange to note that hardly 3 per cent of total households have reported that they have benefited from government and dairy cooperative having availed cattle shed subsidy, fodder seed and loan of purchase of livestock as well as free medicine and availability of feed at dairy cooperative. Almost 97 percent of households reported that they did not received any support from the government net or dairy. The top three suggestions made by the selected households were availability of quality seed in time, seed availability at subsidised rate.

6. Conclusions and Policy Recommendations:

- Animal husbandry plays a vital role in Gujarat's rural economy contributing 5.32 per cent to the state GSDP in 2013-14, while the contribution of agriculture to total GSDP was 16.83 per cent. Milk contributes around 20 per cent to the agricultural

GSDP of Gujarat and is one of the biggest sectors for supporting livelihood in the state. This suggests that public investment in the livestock sector should be enhanced to help the smallholder livestock producer, which derives their larger share of income from the livestock sector.

- Dairy industry can serve as a cushion in the form of continuous flow of income as an industry complementary to the agricultural industry. While both agriculture and dairy industry if simultaneously operate it can improve not only farmer's income but also compensate for unexpected losses faced due to agriculture especially for poor small and marginal farmers. Besides such complementarily protects against seasonal and disguised unemployment and acts as a shield to protect farmer against the negative impact of climate change on agriculture.

- Shortage of quality dry fodder and concentrates is major constraint for livestock sector growth. The gap between the requirement and availability of feed and fodder is increasing due to decreasing area under fodder cultivations and reduced availability of crop residues as fodder. Also there is continuous shrieking of common property resources leading to over grazing on the existing grass land. Therefore, there is a need to work out the strategies for sufficient good quality feed and fodder for efficient utilisation of genetic potential; of the various livestock species and for sustainable improvement in productivity.

- Improvement in nutritional rationed balanced diet can create a positive impact on yield thereby improving net income and optimum use of available fodder and feed with households. Ration Balancing Program (RBP) results in better health of animal, improves the milk composition and the yield, improves conception rate and thereby lactation cycle improves due to reduction in the dry rate. Hence it is suggested that if the local educated youth of the village are involved in the form of Local Resource Persons (LRPs) it would result in the optimum utilization of the locally available resources in the form of fodder and labor as also the rural employment rate will improve. In the process such positive interventions would have multifold effect in net dairy income and reduction in the quantity of BEP through reduction in cost and improvement in income through improved quality of milk. Such benefits can be assured through proper assessment mechanism form RBP.

- Fodder forms a major component of the variable cost in the dairy industry. If the feed and fodder cost is reduced it can result in improvement in net income and reduce the BEP quantity.

- Fodder is the major component of the variable cost. Hence fodder community farming farms should be encouraged, benefits assessed, and should be effectively communicated to the dairy farmers. Co-operative farming of fodder particularly on the barren land of the village can assure sufficient local availability of the fodder and thereby reduce the variable cost, create a positive impact on net income.

- The co-operative structure is very weak in Saurashtra and Kachchh regions of the state. Therefore, presence of Milk Producer Company's sales & distribution network is spread across Saurashtra & Kutch region support the dairy development in this regions. Therefore, there is a need to support the MPCs in all the areas for balanced development of dairy sector.
