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## Research Article

# A Socio-Economic Pilot Study on Indian Peri-Urban Dairy Production<sup>†</sup>

### Abstract

While livestock rearing and dairy production on a subsistence level has been a traditional occupation in rural India, changes in policy and governance and production, both at a national and international level have had a profound effect on livestock rearing practices, production and farming systems, and the indigenous biodiversity of the country.

Changes in the dairy sector in the last 50 years have had tremendous alterations, leading to a new type of surplus market oriented dairy production system. India now leads the world in global milk production, although much of this is attributed to the high ruminant population and the yield per animal remains low.

By analysing a small group of dairy farmers in a peri-urban region, it may begin to represent the structure of dairy production in India with regards to the farmers themselves, the animals they keep, the management systems they practice and their potential for the future.

## Introduction and Aim

Farming and livestock have a long history in the Indian subcontinent. Primarily consisting of a small subsistence farming systems, livestock such as cows and buffalos were kept mainly for draught purposes and transport with milk being an ancillary product, as livestock were rarely reared exclusively, except by certain communities and were mostly kept alongside small agricultural holdings. Emerging from a long agrarian history, the Indian farming system and livestock production systems have undergone several changes in the last decades [1]. Influenced by both the colonial and post-colonial Independent years, the agriculture and dairy industries within the country strove to achieve food and milk sustainability. This led to the initially to the establishment of certain projects with international partners such as the Indo-Dutch project, the Indo-German project and the Indo-Swiss project, both for increasing milk performance and yield and also for the introduction of *Bos Taurus* species such as the Jersey, Holstein-Friesian and Brown Swiss. Changes brought about by the colonial and post-colonial era also had a profound impact on the dairy industry and in the 1970's, the Indian dairy sector emerged as a unique public-private partnership, where a privately owned cooperative was democratically organized by the farmers supplying milk to it [2].

The livestock sector continues to play an important role today, by providing employment to a large section of rural India, especially to women, who are mainly involved in the care, breeding and management of livestock [3].

The aim of this paper is introduce the reader to the salient features of livestock rearing and the dairy industry in India. Further on, to examine Operation Flood and the Dairy Cooperative system of milk procurement from rural areas, as well as to look at the genetic diversity of Indian milk producing animal; their use in the past, their current status and their projected survival in the future. It will also

critically examine certain schemes undertaken by the Government, which may have had detrimental consequences to the indigenous livestock breeds in the country.

A small sample study based on a questionnaire from a peri-urban zone in Western India, around the city of Pune has been examined, to ascertain basic facts about the Indian dairy industry, the livestock management systems with regard to number of animals and the use of the animals. This study could establish the ground for future studies in the field of dairy management, animal health and welfare and breeding and conservation.

Livestock has traditionally been an important income source for the rural poor in developing countries. In rural India, 80% of the farmers are classified as small or marginalized with 58% of the farmers have land holdings of less than 2 hectares and anywhere between where 15-20% of the farmers are landless, livestock rearing is an important livelihood [4,5].

Thornton et al. [6], broadly classified livestock systems into: landless systems (intensive and often peri-urban), livestock only systems, mixed rain fed systems (mostly rain fed cropping combined with livestock) and mixed irrigated systems (year round crop production with livestock).

India is currently the world's largest dairy producer, having surpassed the USA in the late 1990's. Milk output in India today represents more output than rice, oilseeds and wheat [7].

Production systems also develop as interplay of several factors such as agro-ecological, socio-economic and technological factors (3). Shrinkage in grazing land and the assurance of a constant market source has also contributed to the changes in the keeping system with animals kept for milk purposes over draught purposes [8].

India has the largest livestock population in the world, estimated to be around 485 million [9], for the last ten years. Domesticated

livestock diversity across India varies hugely and includes cattle, buffalo, sheep, goat, camel, horses, mithuns, yaks, pigs, ponies, mules, and donkeys [10]. After the report of Ghotge [11], the total bovine population (cattle, buffalo, mithun and yak) were estimated at 299.9 million as of 2012 and the number of milking animals (in milk and dry) were estimated at 1185.59 million, an increase of 6.95% from the previous census in 2007.

Cow breeds in India are divided into milk, draught and dual purpose animals which provide both milk and bullocks (oxen) for draught purposes. Traditionally, animals were never raised for beef in India. The increased mechanization of agriculture and the poor milk yield of the draught breeds has led to their rapid decline in recent years and the total contribution of draught animals to total power availability in the agricultural sector has declined from 61% in 1971 to 23% in 1991 [12-14].

Of the 30 native cattle breeds to India, only 4 are milk breeds, the Sahiwal, Sindhi, Rathi and Gir. The sentimental and holy value of the cow in India, plays an important role, wherein farmers are not keen to cull animals past their production years.

Buffaloes are well adapted to hot and humid climates and are a crucial part in the economy of farmers, which are primarily based on agricultural production systems. They provide high quality milk and meat and are also used as draught animals by small land holders. The domestic buffalo is primarily an Asian animal.

The best milk producing buffalo breeds in the world e.g. Murrah, Nili Ravi, Surti, and Jaffarabadi, had their origin in the North Western Part of South Asia between India and Pakistan. These breeds in addition to having a high potential for milk and fat production, are used for work, and surplus stock are used for meat production.

India in the 1950's faced a huge problem in terms of dairy development, with a very large population of animals of very low productivity [15]. The emerging milk industry in India was also under threat and India in the 1960's faced milk shortages.

Operation flood was launched in July 1970 and supported by the World Bank, World food programme and other Non-Governmental Organizations such as Oxfam, and changed the very face of the Indian dairy industry.

The milk production grew by around 4.5% per annum between the 1970's and the late 1990's.

Between 1998-99 and 2010-11, milk production has increased gradually from 74 million tons to 122 million tonnes to assert India as the largest producer in the world. Buffaloes remain the major contributor to the milk production. On the other hand, with the help of new crossbred breeds, the contribution of cattle has increased in recent years.

The price of the milk is based on two factors; one whether it is a cow's milk or buffalo milk and the second determining factor is the amount of milk, fat % and SNF (solid non-fat) %. As SNF % does not vary much, fat % becomes the important factor in determining price [16]. Since buffaloes tend to yield milk with greater fat % as compared to both indigenous and crossbred cows, a trend towards keeping buffaloes has been seen across the country.

Crossbreeding of nondescript Indian cattle on field scale started in 1964, and by 1969, had become official government policy (mainly with Holstein Friesian, Danish Red, Jersey and Brown Swiss). Artificial insemination with exotic bulls became the official government policy in dairy development, and became the lynchpin of most of the officially sponsored Animal Husbandry Programmes [17]. The decline in the indigenous cattle breeds and the rapid genetic erosion which has taken place in the latter half of the last century can be attributed to certain decisions and policies undertaken on the national level, changes to the agrarian sector with increased mechanization and the changing profiles of the socio-economic dimensions of the farmers, shrinking grazing areas and the overemphasis of cross breeding with exotic cattle breeds. The poor adaptability of crossbred animals to local agro climatic conditions, non-availability of quality feed and fodder, poor resistance to tropical disease outbreaks, reproduction problems have been a major limiting factor in their overall output [18].

High-impact ruminant diseases such as hemorrhagic septicemia, brucellosis, black quarter, sheep and goat pox, foot-and-mouth disease (FMD) and pest of small ruminants are endemic to India and pose a huge problem for farmers, veterinarians and the food and agricultural industries by affecting not only the total output of the livestock sector but also due to international trade sanctions imposed by the continued presence of these diseases. The spread of the disease from wild to domestic populations of ungulates and vice versa also poses a huge problem in disease control and management [19].

The major diseases which cause severe losses are listed below and a brief overview about the current protocol followed [20].

Foot-and-mouth disease (FMD): FMD is endemic to India, with O, A and Asia 1 being the three prevalent serotypes. Unrestricted animal movement plays a huge role in the spread and continued prevalence of the disease. 3 states in Southern India were affected by a huge epidemic of FMD in 2013-2014 despite vaccination programmes being established for almost 25 years. The constant changing antigenic variation of the endemic serotypes is said to play an important role in limiting the efficacy of vaccinations [21]. Cross bred animals have a greater susceptibility towards FMD, despite the prevalence of vaccination programmes, have largely failed, leading to a re-emergence of the disease and a collapse of herd immunity [22,23]. Disease surveillance in specific states along with mass vaccination and establishment of temporary quarantine posts in case of suspected outbreak or confirmed outbreak, with a goal to create initially FMD free zones and ultimately attain a disease free status by 2025 [20].

The hemorrhagic septicaemia (HS) is endemic to India, and after FMD has the highest economic impact on the livestock and dairy sector. The implementation of annual (biannual in endemic zones) vaccinations has led to a gradual decline of the disease across the country. Since epidemiologically, HS affects the animals at the start of the monsoon all animals are vaccinated once a year, just before the onset of the monsoon (June-July) against hemorrhagic septicemia [20].

The bovine brucellosis is endemic in India. Mass screening at village/ district/ state level along with vaccination of all female calves aged between 6-8 months where the disease prevalence is high.

Screening to maintain disease free status from Rinderpest (The World Organisation for Animal Health - OIE free since 2006), contagious bovine pleuropneumonia (CBPP) (OIE free since 2007) and bovine spongiform encephalopathy (BSE) is also undertaken as joint collaborations between the central and state governments [24].

Parasitic diseases such as amphistomonas and liver fluke are prevalent in several parts of the country. Additionally theileriosis, trypanosomosis, babesiosis and anaplasmosis are the highly prevalent haemoprotzoans. Ectoparasites such as ticks which cause hide losses and act as vectors are a problem. Additionally the indiscriminate use of antihelminthics has led to a huge increase in the resistance of various helminthes to such drugs on a herd level.

Integrated pest control based on agro-climatic zones has been recommended by the government of India to combat the threat posed by the parasites [25].

## Materials and Methods

Ten randomly selected farms were visited in the period between 21<sup>st</sup> of July 2014 – 16<sup>th</sup> of August 2014. These farms were all situated in or around the city of Pune (State Maharashtra) in western India, up to a distance of 50 km.

Pune district lies on the edge of the Western Ghats and is characterized by a hot semi-arid climate. The monsoon period of heavy rainfall is usually between June and September.

All the farmers owned milking animals i.e. either cattle or buffalos or both. This region falls under the mixed irrigated arid/semi-arid rain fed production system [6,26].

The field study which was undertaken as a collaborative study by Oxford University was socio-economic study of dairy farms in India to estimate the life cycle analysis (LCA). The farms were usually visited right before the evening milking (between 4pm and 6 pm) so that the milking techniques of the farm could be observed, along with milk collection and transport.

The field study group was comprised of three persons: Ketaki Joshi – a social science student who was onsite coordinator for the field study for the University of Oxford, Sangeeta Khapre – a barefoot veterinarian and animal health worker for a local NGO and Nayantara Ghotge – a former veterinary student who completed the trial with health status report and reproductive traits.

All the farmers were asked a questionnaire. To limit the fallout from misunderstandings and lack of literacy, the questions were posed to the farmers and the answers were filled in by the members of the field study group. The questions were asked in Marathi, the language of the region, and the answers on the questionnaires were filled in both Marathi and English. The final version is only in English. All relevant data was filled into a Microsoft Excel [27].

Data analysis was done with nonparametric statistics of the Statistica computer program [28]. Nonparametric methods are used in cases when the researcher does not know the parameters of the distribution of the variable of interest in the population. In more technical terms, nonparametric methods do not rely on the estimation of parameters (such as the mean or the standard deviation) describing the distribution of the variable of interest in the population.

## Results and Discussion

All the farm owners were male, and belonged to the same caste and religion. As yet there are no detailed farm records available in India as there is no centralized documentation system. The average productive lifespan was calculated based on the data the farmer gave us; thus the average productive lifespan for bullocks was estimated to be 17 years and for milking cows and buffaloes 15 years.

Total milk production was also difficult to gauge as all except one farm used hand milking into a pail. Each pail was estimated to be around 10 litres. Milk in Pune district was sold based on the fat percentage of the milk. Since accurate records were not accessible to assess the milk curve over the lactation period, the average yield for the last month was asked and calculated for 300 days. Certain farmers bought their animals at animal fairs, where the heifers had already been previously inseminated. As no accurate records were kept, the exact age of first service was also based on the data the farmer was able to give us. Thus based on this the average age of first service was calculated as 2.5 (30 months) years which would estimate that the age of first parturition for cows was 39-40 months and for buffaloes ~40 month.

Location of the farms. Thirty % of the farms are located within the city limits, while the remaining farms are located at a maximum distance of 40 km from the city, thus making it possible for twice daily transport milk to the co-operatives and larger market base, with incomes of higher elasticity. The proximity to the city provided the farmers with additional opportunities such as purchase of concentrates and fodder and access to better roads and infrastructure.

Each farmer is identified by a number, and the details of each are listed in Tables 1,2.

Education and age of the farmers. The education of the farmers varied across the demographic from basic education until 4<sup>th</sup> grade (age 9), middle school education until grade 8 (age 13), high school certificate examination (age 15), and a university degree (18+). However, given the low probability and allowing for an error of 10%, it can be seen that there is a difference in education levels across the sample, which can perhaps also be explained by age (Table 1).

The age of the farmers ranged from 24-60 years, with the mean age of the farmers being 40.5 years. There is a 99.8% probability that the age of the farmer does impact the sample study, possible with differences towards farming systems and production methods including adoption of new techniques.

Amount of agricultural land owned (in acres). The average land holding was 4.05 acres, with significant difference across the sample ranging from 0.5 acres to 11 acres with proven deviations.

Labour own and attached and % of own labour employed. The number of people working on the farm, directly from the farmer's family itself or employed as attached labour, was calculated yielding a mean of 3.2 people per farm. When tallied to see how many farms ran purely on their own labour it was seen that 84% of the farms had only their own labour. This was across the sample study and despite the deviations in farm size and herd size. Therefore it can be seen that

**Table 1:** Analysis of the farmers data according to education, farm size, labour (own versus attached), % of own labour.

Farm No.	Education	Age	Amount of land, acres	No. of labourers own/attached	% own labour	Total no. of animals
1.	High school	35	2	2/0	100	9
2.	High school	31	2.5	2/0	100	14
3.	Primary school	50	0.5	5/0	100	9
4.	Primary school	53	0.5	1/4	20	44
5.	M.A.	36	11	2/0	100	27
6.	High school	24	8	1/5	20	70
7.	High school	40	3	4/0	100	14
8.	Middle school	60	2	2/0	100	5
9.	High school	40	6	2/0	100	25
10.	High school	35	5	2/0	100	9
Overall mean, p-value	2/1/6/1* =0.078	40.5 =0.002	4.05 =0.002	3.2 0.598	84 <0.001	22.6 <0.001

\*No of farmers respectively having gone to primary school, middle school, high school and university quantitatively (M.A.)

**Table 2:** Number of cows and buffaloes, and some characteristics by farm

Farm No.	No. of dairy cow/buffalo	% of cows among dairy animals	300 day milk yield per cow <sup>#</sup> , kg	300 day milk yield per buffalo <sup>#</sup> , kg	% AI of cow/buffalo	Manure sold Yes/no
1	0/2	0	-	2920	yes/no	no
2	1/2	33	840	no data	yes/yes	yes
3	2/4	33	3000	1500	yes/yes	no
4	1/27	4	1500	4000	yes/no	yes
5	15/0	100	1250	-	yes/yes	no
6	20/18	53	4500	2250	yes/no	yes
7	0/8	0	-	1500	yes/yes	no
8	1/1	50	4200	2920	yes/yes	no
9	8/0	100	2310	-	yes/yes	yes
10	3/3	50	3000	no data	no/no	no
Overall mean, p-value	11.6 <0.001	42 <0.001	2,575 <0.001	2,515 <0.001	90/60 <0.001*	40/60 =0.007*

\* - Yates corrected Chi-square test was used for the comparison of observed and expected data

# - the milk yield in kg per cow/buffalo is calculated for the last year (2013/2014)

although some farms do hire attached labour, most of the farms, were run purely by the farmer and his family.

Herd size (total number of animals in each farm). The last column in **Table 1** enumerates the animals at each farm included the total numbers of cows (dry and in milk), buffaloes (dry and in milk), bullocks and calves. The average number of animals across the sample was 22.6. However, given the small probability, it can be seen that there is a 99% probability that the farms differ from each other significantly. The number of animals ranged from 5-70 across the sample group.

The number of animals currently in milk (cow/buffalo). The number of animals in milk when we visited the farm has been listed in **Table 2**. On average the mean number of dairy animals (sum of all dairy animals on the farm cows + buffaloes), is 11.6. The low probability value indicates that the variation is large across the sample size.

Percentage of cows in milk as a total of the number of animals in milk. **Table 2** indicates that 42% of the animals currently giving milk were cows, again with a huge variance across farms. Thus 56% of the animals in milk are buffaloes. Two farms (farm 1 and 7) have no cows, while 2 farms have only cows (farm 9 and 5), the other six farms were closer to the mean of 42%, averaging between 33–53%, were milking cows. Thus 2 farms in the sample group had only buffalo's viz. Farm 1 and farm 7, and all the other farms had a higher or equal proportion of milking buffaloes, indicating a preference towards buffalo rearing, this is in keeping with the trend all over the country.

300 day milk yield for cows and buffaloes. The calculated mean yield for 300 days for cows was 2,575 litres (kg weight) from the 8 farms with milking animals in the last year. For buffaloes the 300 day mean milk yield from the 6 farms in the last year was 2,515 kg. The high variation across the sample study is indicative of a huge



difference in individual farm and animal yields. The difference in milk yield can also be explained by the different breeds and management systems.

Artificial insemination (AI) in the herd (cow/buffalo). A ratio comparison between the number of times cows were inseminated versus the number of buffalo inseminations were analysed (using Yates corrected chi square test); resulting in a 90:10 ratio for cattle inseminations (AI versus natural service) and a 60: 40 ratio for buffaloes (AI versus natural service).

Breed disposition among the bovine dairy herds. Of the 8 farmers who kept cows, only 2 had purebred indigenous cattle breed, thus only 25% of the sampled farms had purebred indigenous cattle. The other cow owners had population upgraded with Holstein Friesian or Jersey.

Of the 7 farmers with buffaloes, 6 owned Mehsana and only 1 had a local breed – Pandharpuri.

Only 4 of the 10 farms had bullocks for draught purposes with breed Gir, only one of which was an indigenous Khillari Bullock. 2 of the 4 farms had draught buffaloes and the remaining farm had cross bred draught cattle bullocks. The 10 bullocks were owned by only 4 of the farmers, contributing only 4.42% to the total herd size of 226 animals. (The remaining animals include growing calves, dry cows and buffaloes and recently born calves.)

Milking units, techniques and transport. None of the farmers had specialized milking parlours and milking was always done in the stable itself. All the farmers retained small quantities of milk for home consumption. Only 1 farmer had a milking machine in the sample study. All the others used hand milking, predominantly with the thumb method, or knuckling. All the farmers cleaned the udder prior to milking, however, none of the farmers used teat dips or udder wipes either before or after milking.

Milk let down was stimulated either by restricted suckling of the calf, or by using warm water to stimulate the udder. The calves were allowed to suckle milk from one teat twice a day. Two farmers used the drug oxytocin to stimulate milk let down in buffaloes. This is despite a Government of India ban on the usage of injectable oxytocin as milk let down hormone.

The farmers claimed that it is difficult to stimulate milk let down in buffaloes. The same needle was used for all the animals, and the drug was administered intramuscularly usually in the gluteal muscle. Milk let down usually commenced 15 minutes after the injection was administered. On average 2-3 ml was given per animal.

Milking was done twice a day across the sample study and apart from a small quantity retained for household consumption 9 of the 10 farmers sold the milk to the local dairy cooperative. The milk was taken to the nearest cooperative either by the farmer, or by a private vendor who collected the milk. Farmer no. 10 kept the milk only for household consumption.

Stalling and feeding systems. All the farms practiced tie stall systems for their animals. Several of them were semi extensive, with the animals going to pasture between July and December to graze.

All the farmers fed their animals with a mixture of green fodder, wheat, paddy or sorghum straw, dried seeds, dry grass fodder, cotton and oil seed cakes and commercial concentrates either Godrej Bypro™ or Godrej Milkmore™. Additionally several farmers made a daily concentrate ration of “Aambvan” – a fresh fermented mixture of grains, pulses, husks and oilseed cakes which were mixed together and fermented for 12 hours and then fed to the animals.

Manure collection and usage. Manure was collected manually from all the farms and stored nearby. Of the 10 farms in the sample study only 4 of the farmers sold the manure, as it is presented in Table 2. Statistical test proves that significantly smaller number of the farmers wants to convert the surplus manure into money. The others used it on their agricultural land if any or as a source of fuel by drying them into cow dung pats or cakes.

The association between the manure selling and the land size, and the herd size as well was as follows. There was not an impact of land size on the manure utilization (4.25 versus 3.92 acres after sold or own utilization;  $p=0.890$ ). However, the number of animals kept at a farm influenced significantly the manure utilization (38.25 versus 12.17 acres after sold or own utilization;  $p=0.038$ ). It means that farm with larger number of animals tend to market their manure.

Veterinary services offered. All the animals were vaccinated against hemorrhagic septicemia (HS) and foot-and-mouth disease (FMD). Additionally, the local veterinarian was called for difficult calving's, downer cows etc. The artificial insemination when performed was performed by a lay inseminator or a livestock technician, who has received a diploma in Insemination techniques.

Not all the farmers were aware of management techniques and herd health principles.

Mastitis was reported as a problem on all the farms with cows, however, all the farmers who herded only buffaloes said that there were no problems with mastitis; the reasons for this were unknown. Some farmers had basic drugs for mastitis at home, and sometimes applied them without direct supervision of their veterinarian.

Several farmers also used local herbal plants to treat ectoparasites and skin ailments on their animals.

## Conclusions and Recommendations

Livestock rearing remains crucial in the rural fabric of most traditionally agrarian societies such as in India. Dairying offers returns which are different from other agricultural returns. The transition towards dairying offers employment and cash flow on a daily basis to the farmers. Additionally manure is also a useful by-product which is either sold or used to enhance agricultural soil. Returns in plant production come at the end of a cropping cycle which could be six month or more. Milk production is a livestock enterprise small scale farmers can venture into to improve their livelihoods. The intensification of livestock, through modification of traditional practices and increasing external input is widely advocated in rural development schemes, and its main objective is to increase farm household incomes. While development or a shift towards commercial systems, in small scale farm holdings is usually viewed favorable by policy makers, it should be understood in the context of

an increase in the measure of high value output goods (milk, meat, manure, hides) and a total increase in the contribution of livestock as compared to crops. Additionally, small holder dairying can often compete with large-scale farms, as it uses mainly family labour and requires few investment and is usually successful in country parts with strong dairying traditions. As our study also shows most of the farmers were small or medium farmers all of whom traditionally practiced agriculture and sustainable livestock farming.

A few farmers recently stepped into dairying after having sold agricultural land. Most of the dairy units were located in peri-urban or urban situations and markets for selling milk were easily accessible thus making dairying a preferred activity for households with poor education and offering employment options to a large number of people. The daily production and perish ability of milk require a constant labour source. Additionally, larger herd sizes which require more labor also provide employment for external labor.

Dairy development can also be linked to nutrition both for farming families and for resource poor consumers of dairy products. Consumptions of even small amounts of milk for people in nutrient deprived areas can have a profound effect on material, infant and child mortality and health rates. All the farmers retained a little milk for their home consumption and a reason often cited for stepping into dairying was to supplement nutrition of the family. Additionally, in areas of low soil fertility and high cost of chemical additives remain a constraint, the manure from dairy animals can form a critical source a nutrients and organic matter. Finally, the value of the livestock is still a fixed asset which can still help provide the farmer with a buffer zone against agricultural and external fluctuations. All of which were clearly seen in our sample study.

However, while intensification may offer better income, it may deny small farm holder the multi-functionality of livestock. The intensification while accounting for better feed conversion and product efficiency may also have drawbacks due to its singular purpose. The loss of the intangible benefits of livestock may only be felt once it has already been commoditized. The intensification of livestock may also deprive farmers of the benefits of livestock's non cash functions and may thus result in decreased resilience in small holder systems. Therefore it is critical that we keep a watch on the additional benefits of livestock rearing instead of focusing merely on intensification of production, dairy or otherwise.

From our sample study where most of the farmers were producing under small scale production systems, energy utilization was low, feed was almost always sourced locally and largely made use of agricultural crop residues and by products, and other input costs were fairly low, which is the basis of the low input model of Indian dairy farms. At the production end of the spectrum milk was also sold locally making processing and packaging costs low. In an emerging era where sourcing locally is going to become more and more important the study indicates that small scale dairy farming has answers to certain problems emerging from climate change related issues.

Our study focused on peri-urban farms which catered largely to an ever expanding urban market. While we were not in a position

to assess antibiotic usage in detail we did notice that several farmers continued to use oxytocin to maintain high level of milk production.

Intensification has negative environmental impacts such as the increased use of commercial feed and poor waste management practices. Additionally even traditional farmers face new and real challenges from prolonged droughts, climate change and the erosion of natural resources. Feed availability and costs remain a constant source of worry for small farmers as input costs go up. The location of these urban and peri-urban farming systems next to residential areas will pose questions in the near future and many may have to shift or modify in a few years as the city expands and land holdings shrink. Improving the feeding practice, digestibility and increasing the yield per animal through promoting better animal health, proper management and housing systems, and improved animal genetics, along with a more efficient and safe manure disposal can help mitigate and reduce the overall greenhouse gas emission.

## References

1. Bairwa K, Jayakumara Varadan R, Jhahria A, Meena D (2013) An Economic Appraisal of Livestock Sector in India. *Indian J Anim Res.* 47:105-112.
2. Falvey L, Chantalakhana C (eds.) (2014) *Smallholder Dairying in the Tropics*. ILRI (International Livestock Research Institute), Nairobi, Kenya. Taneja V.K., Chapter 5, Dairy Breeds and selection.
3. Rangnekar DV (2006) Livestock in the livelihoods of the underprivileged communities in India: A review. ILRI (aka ILCA and ILRAD)
4. Birlhal PS, Taneja VK (2006) "Livestock Sector in India – Opportunities and Challenges for Smallholders", In-Proceedings of an ICAR-ILRI international Workshop on „ Smallholder livestock production in India held during January 24-25, 2006 at NCAP, New Delhi, 32.
5. Hegde NG (2006) Livestock Development for Sustainable Livelihood of Small Farmers. Souvenir of the 39th Annual General Meeting and 48th National Symposium on Energising Rural India. A challenge to Livestock Industry. Manesar, Haryana. August 26: 50-63.
6. Thornton PK, Kruska RL, Henninger N, Kristjanson PM, Reid RS et al. (2002) Mapping poverty and livestock in the developing world. 124p. Nairobi (Kenya): ILRI
7. Scholten B (2010) India's white revolution: Operation flood, food and development. London: Tauris Academic Studies, 1: 7-8.
8. Teufel N, Markemann A, Kaufmann B, Zárate AV, Otte J (2010) Livestock Production Systems in South Asia and the Greater Mekong Sub-Region.
9. World Bank (1996) India - Livestock sector review: enhancing growth and development. World Development Sources, WDS 1996. Washington, DC: World Bank.
10. Indian Council of Agricultural Research (1960) Definitions of the characteristics of cattle and buffalo breeds in India. New Delhi: I.C.A.R.
11. Ghotge N (2004) Livestock and livelihoods: The Indian context. Ahmedabad: Centre for Environment Education.
12. Rao P, Birlhal P (2003) Strategic assessments and development pathways for agriculture in the semi-arid tropics; crop livestock systems in India: Research and policy issues; 1 Published by International Crops Research Institute for the semi-arid tropics Patancheru 502324, Andhra Pradesh.
13. Report of the National Commission of Cattle (2005) Indian Cattle Breeds, Origin, Characteristics and Features; Paragraph 2.2, Annexe VII (1); Department of Animal Husbandry, Dairy and Fisheries, Government of India.
14. Country Report on Animal Genetic Resources of India (2007) Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.
15. Gautam Dalal RS, Pathak V (2010) Indian dairy sector: Time to revisit operation flood. *Livestock Science*, 127:164-175.



16. Shah P (2012) Exploring the cost of milk production and potential economies of scale in a dairy cooperative; Wharton Research Scholars Journal.
17. Shah T (1987) Structural effects of India's dairy co-operatives and the technological transformation of a traditional dairy system. *Agr Admin Ext* 25: 199-214.
18. BIRTHAL PS, JOSHI PK, KUMAR A (2002) Assessment of research priorities for livestock sector in India. National Centre for Agricultural Economics and Policy Research.
19. FAO (2011) World Livestock 2011 – Livestock in food security. Rome
20. (2014) Livestock health and disease control.
21. Times of India (2014).
22. Parikh KS (1994) Milk supply behaviour in India: Data integration, estimation and implications for dairy development. Indira Gandhi Institute of Development Research.
23. Singh SN (2008) Control of foot and mouth disease under public-private partnership (PPP); The Global control of FMD - Tools, ideas and ideals – Erice, Italy 14-17, 451-45.
24. Technical guidelines.
25. Parasite control Programme.
26. Steinfeld H, Gerber P, Wassenaar T, Castel V, Rasales M et al. (2006) Food and Agriculture Organization of the United Nations, Livestock, Environment and Development (firm) Livestock's long shadow: Environmental issues and options. Rome, FAO, 16-20.
27. Microsoft (2011) Microsoft Excel [computer software]. Redmond, Washington: Microsoft
28. Stat Soft, Inc (2013) STATISTICA (data analysis software system).

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