Development of goat milk and meat value chains in Bihar and Uttar Pradesh

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Development of goat milk and meat value chains in Bihar and Uttar Pradesh

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1 Introduction

1.1 Project background

'Since this (small ruminants) is the only sector which provides direct livelihood and income generating opportunities to landless and marginal farmers and the other vulnerable sections of the society, formulation of appropriate schemes for inclusive development of this sector is essential' (Working Group on Animal Husbandry and Dairying 2011).

In 2016, an Indian Council of Agricultural Research (ICAR)-International Livestock Research Institute (ILRI) collaborative project on the 'Development of goat milk and meat value chain in Bihar and Uttar Pradesh' started. The main focus for year one of this three-year project is an assessment of the goat value chain in selected sites using value chain analysis tools. Particularly, the aim is to identify project interventions to improve productivity, processing and marketing of hygienic goat meat and/or milk through participatory discussions in multi-stakeholder platforms.

The value chain approach was selected to better understand drivers and constraints as well as stakeholders and benefits within the goat sector. Although a large amount of scientific literature exists for a wide spectrum of production topics less is documented on goat husbandry as a livelihood system.

1.2 Development trends on national level

The goat population in India in 2012 was 135.2 million heads and for the first time, goat numbers declined compared to the previous livestock census in 2007, when 140.5 million heads had been counted (Table 1).

Table 1: Livestock population in India, selected species (in million)

Species	1951	1956	1961	1966	1972	1977	1982	1987	1992	1997	2003	2007	2012
Goats	47	55	60	64	68	76	95	110	115	123	124	141	135
Change in %		+17	+9	+7	+6	+12	+25	+16	+5	+7	+1	+14	-4
Cattle	155	158	175	176	178	180	193	200	205	199	185	199	191
Adult female	54	47	51	52	53	55	59	62	64	64	65	73	77
Buffaloes	43	44	51	53	57	62	70	76	84	90	98	105	109
Adult female	21	24	25	29	31	33	39	44	47	51	55	57	
Sheep	39	39	40	42	40	41	49	46	51	58	62	72	65
Poultry	74	95	114	115	139	159	208	275	307	348	489	649	729

Source: Livestock census, Department of Animal Husbandry, Dairying and Fisheries, government of India

This decline in goat numbers is especially remarkable if one considers the following four factors theoretically favouring an increase in the number of goats:

- Goat meat is the only (red) meat acceptable to and appreciated by all religious groups in India having a non-vegetarian diet.

- With an increase in purchasing power the diversity of consumed food is increasing, with the share of high-value foods growing especially (Joshi and Gulati 2007).
- The consumption of animal-source food is increasing (Gandhi and Zhou 2014).
- Population growth in India is still significant.

However, the developments in various livestock population categories reveal a general trend towards 'modernization' and 'commercialization':

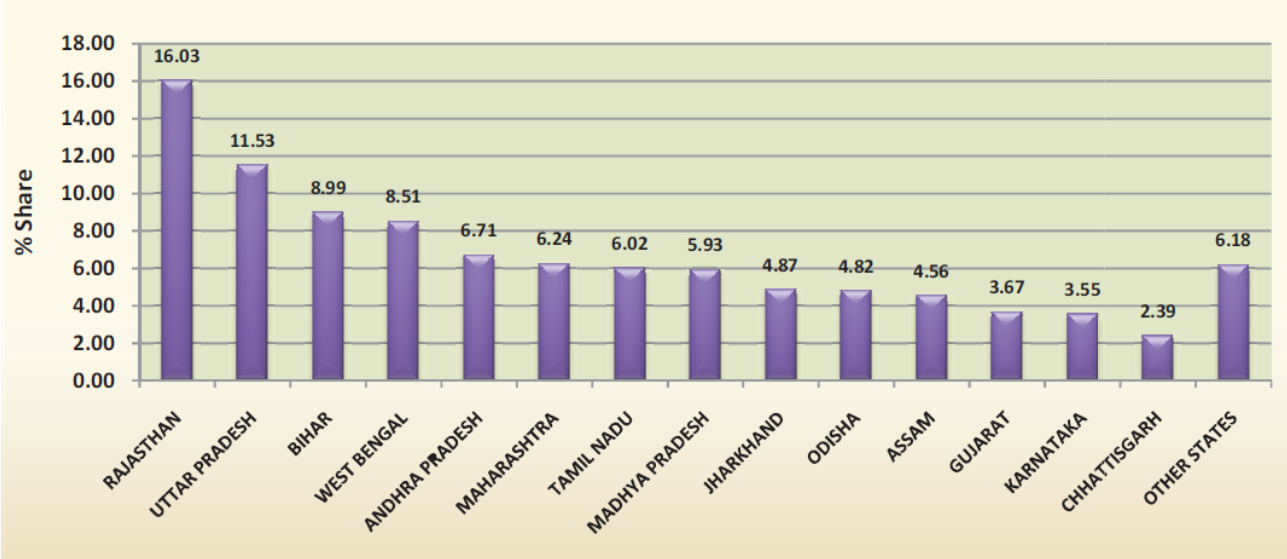
The total cattle population dropped by more than 4% between 2007 and 2012, but the number of adult females increased by more than 5%. Mechanization is increasingly substituting male cattle in the agricultural and transport sectors, while growth in consumption of milk and other dairy products has led to a considerable increase in female adult animals. In the buffalo population a similar trend prevails; the proportion of female adult buffaloes in the total population is increasing, since the demand for male buffaloes in paddy cultivation is reduced due to mechanization. Whereas the buffalo is still the main dairy animal in the country; a considerably smaller number of female buffaloes is producing about the same amount of milk as the larger number of cows. The impressive growth rate (over 12% between 2007 and 2012) in the poultry sector is another indication for the growing demand for meat and eggs. Among all animal sourced food, the growth rate of production during the 2011–13 period was highest for meat (7.87% followed by eggs (4.94%) and milk (3.54%) (Islam 2016).

All these trends point to a change in the pattern of functions the livestock sector has to fulfil: Animal traction is of reduced significance while production and demand for food of animal origin are increasing.

Although detailed consumption data is not available, price changes can serve as one indication of growing demand. Unfortunately, there is no reliable data available over a longer period of time showing food prices and inflation rates. However, for the decade 2000–10 a three-fold increase in the price of goat meat was reported (Kumar 2010), indicating considerable demand growth. How far the decrease in the goat population is determined by demand, or rather by supply-side developments is difficult to determine based on census data alone. Therefore, this study will attempt to contribute to this issue with some insights as one of its objectives.

This study focuses on Bihar and Uttar Pradesh, as these two states have large goat populations, surpassed only by Rajasthan.

Figure 1: Percentage of goats across Indian states



Source: Livestock census 2012, Department of Animal Husbandry, Dairying and Fisheries, government of India

2 Methodology

2.1 Conceptual framework

The value chain describes the sequence of related business activities or functions, from the supply of specific inputs for a particular product to primary production, sales, processing and distribution to final consumption (GTZ 2008). In other words, a value chain describes the full range of activities that are required to bring a product or service from conception, through the different phases of production and delivery to consumers and its final disposal after use. From the institutional perspective, a value chain can be defined as the organizational arrangement linking input suppliers, producers, processors, traders and distributors, and coordinating their functions (Kaplinsky and Morris 2000).

A value chain analysis is a flexible instrument and can be applied to any actor in the chain. In this case, the desired output of the analysis is the 'identification of interventions to improve productivity, processing and marketing of hygienic goat meat and/or milk through participatory discussions in multi-stakeholder platforms.' According to the original joint ICAR-ILRI project proposal from 2016, these interventions will lead to the project goal: 'To sustainably improve the socio-economic condition of goat rearers, traders, butchers and other key actors involved in goat meat/ milk value chains in selected districts of Bihar and Uttar Pradesh.' The analysis is based on quantitative and qualitative data and provides insights into structure, constraints and opportunities of a value chain. To achieve this, data collection includes the most relevant stakeholders and focusses on critical issues, with complementary perspectives from various stakeholders. The quantitative results are therefore indicative and should not be confused with a representative survey based on random sampling. Nevertheless, characterising the critical aspects along the value chain provides important information for defining project activities.

2.2 Study area

The analysis was conducted in eight blocks of four districts in two states as shown in Table 2.

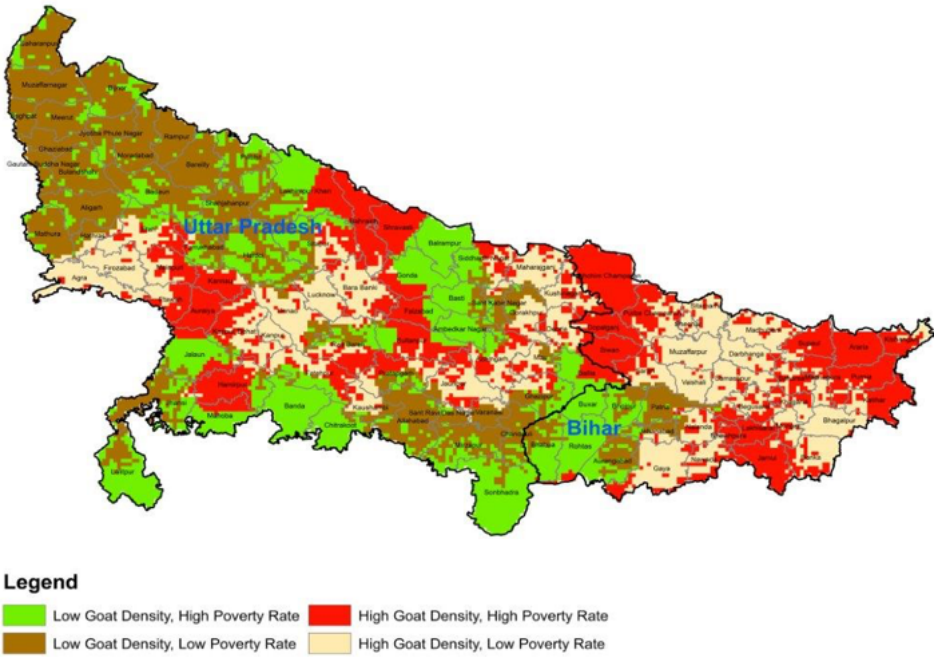
The states of Bihar and Uttar Pradesh were selected during a meeting between representatives of the Central Institute for Research on Goats (CIRG), the National Dairy Research Institute (NDRI) and the International Livestock Research Institute (ILRI) in mid-2016, based on the importance of goat production for vulnerable and marginal population groups within these states.

The districts of East Champaran and Vaishali in Bihar and Hamirpur and Unnao in Uttar Pradesh were selected by a similar group in late 2016 mainly based on poverty indicators as well as goat density: two districts with high goat and high poverty and two districts with high goat and lower poverty densities (see 8.1 Annex 1 for details and Figure 2).

Table 2: Study areas

State	Districts	Blocks
Uttar Pradesh	Hamirpur	Kurara
		Sarila
	Unnao	Sikandarpur Karan
		Sumerpur
Bihar	East Champaran	Banjaria
		Chiraiya
	Vaishali	Hajipur
		Patepur

Figure 2: Classification of districts into goat density and poverty rate categories



Blocks were selected according to goat density (total number of goats divided by total number of farming households, the sum of landless, marginal, small, medium and large farmers (census data), as well as the distance of the block to the district centre (expert knowledge). It was assumed that the district centre would also represent the biggest and most important consumption centre of goats in the district. Within each district the selection process identified one block with high goat density and long distance and another, with high density and short distance to the district headquarters.

Census data on goat populations in the areas selected for the current research project indicate considerable differences between districts and states as well as between the two states and the national level (see Table 3).

Table 3: Growth in the goat population in selected areas between 2007 and 2012

Area	18th Census 2007	19th Census 2012	Change in %
Hamirpur district	261,210	291,825	+ 11.7
Unnao district	378,600	367,779	- 2.9
Uttar Pradesh	14,792,858	15,585,615	+5.4
East Champaran district	[1]	592,601	
Vaishali district	[1]	299,125	
Bihar	10,167,009	12,153,540	+ 20.0
India	140,537,000	135,173,000	- 3.8

Source: Livestock Census 2007 and 2012, Department of Animal Husbandry, Dairying and Fisheries, government of India; [1] data unavailable

In addition, the flock composition also shows a considerable diversity on the district level. While goat flocks in Hamirpur, Uttar Pradesh have an average of 82% females, with 43% of adult female goats in milk, flocks in East Champaran, Bihar have only 62% female goats, and only 22% of adult females in milk (see Table 4). Bundelkhand, the area of southern Uttar Pradesh, where Hamirpur is located, is considered to be 'goat country' because of a relatively high availability of grazing and fallow land (Dixit et al. 2015; Dixit and Singh 2014) and a low intensity of irrigation, resulting in poor conditions for crop husbandry. This might contribute to goat husbandry being comparatively more important in this area, also resulting in above average productivity – as deduced from the flock composition (Singh et al. 2013).

There are some literature reports that goat farming is 'increasingly taken up by the peri-urban poor due to easy market access and as a source of nutritional security for the household (Ramesh 2012). Hajipur block in Vaishali district, near to the state capital Patna, seems to be such an area, where landless people could be keeping a few goats, for which they, however, would have to mostly purchase feed.

Finally, various interventions have been discussed to increase the economic gains derived from goat keeping in marginal areas (Dixit et al. 2015).

Table 4: Goat flock composition in target districts (%), 2012

Districts/ States	Male goats			Female goats					Total
	Under one year	Above one year	Total male goats	Under one year	Above one year			Total female goats	(number in '000 goats)
					In milk	Dry	Not kidded		
Hamirpur	12	6	18	16	43	16	7	82	100 (292)
Unnao	13	12	25	21	32	17	5	75	100 (368)
Uttar Pradesh total	15	13	28	21	27	17	7	72	100 (15,586)
East Champaran	19	19	38	17	22	13	11	62	100 (593)
Vaishali	19	8	28	22	24	16	11	72	100 (299)
Bihar total	17	12	29	19	24	16	12	71	100 (12,153)
India total	15	13	28	20	27	19	7	72	100 (135,173)

Source: Livestock Census 2012, Department of Animal Husbandry, Dairying and Fisheries, government of India

2.3 Data collection

Primary data was collected by researchers from ILRI and CIRG to provide an initial insight into the value chain structure, opportunities and constraints in the identified project activity areas. A variety of stakeholders in the value chain contributed to the data collection. Goat keepers were interviewed following a structured interview questionnaire, whereas other stakeholders such as traders, butchers, customers of butcher shops and animal husbandry and veterinary staff from district and block levels were interviewed using a checklist of open ended questions (see 8.2 Annex 2). In total, data from 113 goat keepers, 10 butchers, 4 meat consumers, as well as 13 veterinary and animal husbandry staff were collected from more than 40 different locations (see 8.3 Annex 3). The planned stakeholder workshop, during which villages and respondents were to be selected, could not be implemented, so that selection relied solely on local experts. Researchers from CIRG also provided valuable information and connected the team to key informants.

Secondary data was collected from district offices and from the national livestock census. Relevant literature and documents were reviewed to provide theoretical background information on development trends and the macro-economic context.

Figure 3: A woman carrying green fodder in Banda district, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

3 Input supply and services

3.1 Feed supply

According to the literature, the majority of goats in India are kept by landless, marginal and small farmers, who do not have the resources to keep larger livestock (Dey et al. 2007; Islam et al. 2016). Most of these goat keepers rely to a large extent on CPRs (common property resources) and/or fallow land for grazing their flocks almost free of charge except for labour costs. However, due to increased irrigation and cropping intensity, the availability of fallow land is decreasing; the same applies to communal land, which has continuously been privatized. In addition, forest areas, which were traditionally important for grazing, are much better controlled and protected nowadays than in the past. At the same time, the carrying capacity of the remaining communal property resources is reduced due to climate change, overgrazing and erosion. Attempts at improving forage availability on common grazing areas were not observed during this study.

Nevertheless, the study results show that by far the most important source of feeding is grazing on common property resources (CPRs) like communal grazing land, roadsides, forest areas, field bunds and fallow areas. This very often is supplemented by branches of a number of tree species such as *neem* (Azadirachta indica) or *babul* (Acacia nilotica).

Only a minority of goat owners interviewed had access to land for cultivation. Without land, goat owners have to rely mainly on communal lands to maintain their goats. Goat-owning agricultural labourers often receive fodder—either fresh green fodder or crop residues/by-products—as part of their in-kind remuneration. Especially during the dry season, grazing is often supplemented with crop residues such as chopped wheat straw (*bhusa*). As expected, most goat farmers in the (peri-)urban Hajipur block regularly bought feeds for their comparatively few goats, but this was not found in the other blocks.

It could be observed that medium-sized farmers, who were keeping both large and small ruminants, also kept their goats near the homestead in order to stall-feed all their animals with a mixture of freshly chopped green fodder and straw. The poorer goat farmers keeping only goats sometimes also kept recently-kidded does near their homes for a couple of days, bringing them their fodder. Overall however, fodder production appears to be limited to medium-sized farmers with mixed herds, growing fodder crops mainly for their large ruminants. No concentrates were fed to goats in the traditional husbandry systems encountered during the study.

Figure 4: Fodder and water troughs for goats on a farm in Banda district, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

3.2 Breeding services

The survey team did not find any breeding bucks provided by breeding centres or other institutions in any of the study sites. The vast majority of goat keepers relied on village or 'temple' bucks (also known as 'Mata ka Bakra'), the latter being donated to the village by a relatively wealthy person for the benefit of village goat farmers. These bucks don't have a permanent place to stay but are housed and fed by goat keeping households in the village on a rotational basis. Because these bucks are formally donated to a deity they have to fulfil certain minimum requirements in regard to their appearance.

The study did not find many complaints about the genetic quality of the village or temple buck. In a few cases, goat farmers asked for government support to access superior bucks through a breeding scheme. However, inbreeding may be a problem if a village or temple buck is kept long enough to mate with his offspring. It seems that farmers are aware of this issue, since quite a number of farmers use various bucks (their own, their neighbour's and the village's) for mating services.

In regard to fertility, the study found an average rate of 1.67 kids per doe per year (details in Table 7), which appears appropriate for this production system. This also indicates that the sharing of bucks on village level has not caused major disease-related fertility issues.

Unsurprisingly, the study finds a correlation between flock size and the share of bucks (for more details see Table 6). The four blocks in Uttar Pradesh, where average flock sizes are over 10, include, on average, at least one buck. On the other hand in Bihar, where average flock sizes are under five, only few goat keepers have their own buck. In urban Hajipur, none of the 13 goat keepers were keeping an adult male goat. Apparently, farmers with only a few goats view keeping and adult buck as a waste of their sparse resources.

Figure 5: Young Barbari goats at the Central Institute for Research on Goats, CIRG, Makhdoom, Farah, Mathura, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

3.3 Animal health care

Animal health care in a value chain hast two major components: The first one is the supply of veterinary drugs and equipment, the second one is the provision of animal health services.

Most respondents have access to veterinary drugs either through private shops or government structures like veterinary clinics. The quality of the drugs available and the professional advice given by the shop owners or staff at the clinic has not been assessed.

According to scientists from CIRG the following vaccinations are recommended for goats:

- Peste des petits ruminants (PPR)
- Enterotoxaemia (ET)
- Goat pox
- Foot-and mouth-disease (FMD)
- Haemorrhagic septicaemia (HS)

So far, all four vaccinations have to be given separately, since a combination vaccine is not yet available. Nevertheless, costs can be reduced if all vaccinations are administered together, at least for the initial vaccination. Later booster vaccinations have to be staggered since the vaccination intervals are different.

About half of the respondents during the survey stated that their goats have been vaccinated last year for PPR. It is however not clear how far the respondents were really aware of which vaccinations their animals had received, because reports on vaccinations were inconsistent; within the same village or block, some farmers reported having had their goats vaccinated while others were not even aware of any vaccination during the last year.

The study found that the links between goat farmers and the veterinary sector were weak. While government officials cite the lack of awareness by goat farmers as a major problem, farmers often claim that veterinary staff are providing vaccinations for goats irregularly. However, since the majority of goat farmers are from the poorer sections of society they might not always have the financial resources to pay for veterinary assistance. On the other hand, veterinary field staff indicated that attending to large ruminants, such as a high yielding buffalo cow, is probably more remunerative and therefore of higher priority than providing services for small ruminants. A potential solution would be establishing a network of para-veterinarians, serving the communities they live in. But as in many other countries, the relationship between fully qualified veterinarians and para-veterinarians appeared to be difficult, creating barriers to organizing and regulating such services to the satisfaction of all stakeholders while improving the efficiency of the sector.

In addition, various technical issues such as non-availability of vaccines or the interruption of the cold chain appear to reduce the efficiency of animal service delivery to goat keepers in the study areas.

In conclusion, the study found that most goat farmers have adequate access to veterinary drugs, but less so to veterinary services.

Figure 6: A member of a women's goat farmer group presenting an extension calendar in Banda district, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

3.4 Extension services

Establishing agricultural extension and advisory services to sustainably improve the socio-economic condition of goat keepers may be challenging when targeting the very poor, as resource-poor smallholders are rarely in a position to tackle most of their problems on an individual basis. They therefore often rely on support and strengthening of self-help organisations in addition to technical extension and advisory services.

3.5 Credit services

Although this support service has not been a specific subject within data collection for this study, it became apparent that credit facilities for goat farmers, including insurance cover for goats bought on credit, do exist in a number of goat development schemes/projects. This aspect will be explored further in subsequent investigations.

4 Production of goat milk and meat

4.1 Goat milk production

Although goat milk production figures are regularly included in relevant publications, it is often unclear how this milk is being used: either suckled by off-spring or milked for home consumption or sale. Dey (2007) for example reports that goat milk contributes 4.2% towards total milk production in India, with its contribution in Bihar goat milk apparently reaching 10.9%. It appears unrealistic that these figures can be linked to consumption, especially as goat milk seems to have an image problem, being associated with attributes such as 'unhygienic' and 'unclean', probably through being linked to the rural poor (Kumar 2010). However, the same report also specifically documents goat milk sales (Kumar 2010), highlighting its importance in certain states. In Rajasthan for instance, where goat husbandry is of greater overall economic importance and is not only limited to the lower socio-economic strata, male kids are often sold soon after weaning to maximize the amount of milk available for sale. Therefore, a limited market for goat milk appears to exist in some regions of India, mainly due to its reported dietary and health values.

However, none of the respondents in this study reported any sales of goat milk over the past year. In fact, according to the replies, goat keepers milk their lactating goats only in exceptional cases, mostly if a child has fallen ill.

Considering the level of feeding and the fact that almost all goats are kept by landless, marginal and small farmers with limited resources, it is not surprising that the study found goat milk sales to be insignificant. Based on the extensive feeding system, suboptimal animal health care and a moderate genetic potential for milk production, it is to be expected that the level of milk production is sufficient for the off-spring, but that it does not allow for regular additional off-take.

4.2 Goat meat production

Farm characteristics

Kumar (2010) states that 'about 70% of the landless, including agricultural labourers, as well as of marginal and small farmers are associated with goat husbandry. Furthermore, the landless, the marginal and small farmers together control 99% of goats in Uttar Pradesh and 80% in Rajasthan.' The difference in the last two figures indicates that where the natural potential for crop production is limited, goats are also kept by better-off farmers, since their options for rural livelihoods are also limited.

However, both Uttar Pradesh and Bihar have a high potential for crop production, and accordingly the study found the majority of goat keepers to be landless, marginal or small farmers. Table 5 shows the distribution of land ownership and the average farm size amongst the goat keepers interviewed. The data indicates that even within the study sample, considerable differences exist with more disadvantaged areas in southern Uttar Pradesh having larger farm sizes.

Table 5: Land ownership of goat keepers interviewed

District	Hamirpur		Unnao		Vaishali		East Champaran		Total
Block	Saraila	Kurara	Sikanda-pur Karan	Sumer-pur	Hajipur	Patepur	Banjaria	Chiraiya	
Farmers, total [n]	14	15	15	14	13	14	14	14	113
Landless [n]	5	4	6	5	13	11	5	11	60
Land owners [n]	9	11	9	9	0	3	9	3	53
Avg. farm size [ac]	3.3	2.0	1.5	0.6	-	0.8	0.3	0.2	1.4

Source: Survey data

Flock size and composition also varied considerably in the study area (Table 6). The largest flocks were kept in Hamirpur, followed by Unnao. In the two districts of Bihar (East Champaran and Vaishali), flock sizes were considerably smaller, which follows the farm size trend across the study area shown above. Most of the larger flocks in the Uttar Pradesh districts included at least one buck, which was not the case in Bihar.

Table 6: Average flock size and composition per household

District	Hamirpur		Unnao		Vaishali		East Champaran		Total
Block	Saraila	Kurara	Sikanda-pur Karan	Sumer-pur	Hajipur	Patepur	Banjaria	Chiraiya	
Adult female	7.4	5.9	4.8	4.6	1.3	1.9	2.4	1.4	3.7
Adult male	1.1	1.4	1.3	1.1	-	0.9	0.3	0.4	0.8
Total adult	8.6	7.3	6.1	5.6	1.3	2.8	2.7	1.8	4.5
Young female	4.6	4.2	2.9	3.4	1.8	1.2	1.1	0.6	2.5
Young male	3.6	3.1	2.5	2.2	0.4	0.5	0.9	0.6	1.9
Total young	8.1	7.4	5.4	5.6	2.2	1.7	2.0	1.1	4.2
Grand total	16.7	14.6	11.5	11.3	3.5	4.5	4.7	2.9	8.9

Source: Survey data

In both age groups (adult/above one year and young/below one year) female animals outnumbered males. This difference, which is more pronounced in adults than it is in young-stock, confirms the assumption that mature male animals are sold for slaughter whereas females are kept and reared for reproduction and eventual flock enlargement. In urban Hajipur, where goat keepers were mostly landless and purchased feed, the difference between male and female young-stock was especially pronounced (no farmer kept a buck). 'Surplus' male goats are sold as soon as possible to limit feed costs and provide regular income.

Production parameters

The overall reproduction rate within the survey sample was calculated as 1.67 kids per doe and year. This figure may be below the genetic potential of the goats being kept. However, considering the limited fodder base, particularly in the dry season, the unsatisfactory standard animal health service provision and a degree of seasonality in the reproductive cycle, the figure seems reasonable.

Table 7: Reproductive performance

District	Hamirpur		Unnao		Vaishali		East Champaran		Overall
Block	Saraila	Kurara	Sikandapur Karan	Sumer-pur	Hajipur	Patepur	Banjaria	Chiraiya	
kids born / (doe/year)	1.32	1.24	1.76	1.50	1.70	2.15	1.85	1.90	1.67

Source: Survey data, all kids born from all does in 113 households during the last year were considered

Regarding the economic aspects, the number of kids that survive is more important for farming success than the number of kids born; the difference being the mortality among growing kids. Unfortunately, the average mortality rate for young-stock, reported by goat farmers within the study as 37% (Table 8), was especially high, although other sources indicate that this figure is not unusual. Animal husbandry and veterinary staff interviewed during data collection estimated the mortality to be within the same range (even up to 50% in young-stock). Kumar (2007) reports a mortality rate on commercial goat farms of around 23%, despite their far better feeding, housing and animal health care regimes. Some women's groups, visited during the field trip to Hamirpur and Banda districts in early March 2017, estimated the overall goat mortality rate to be around 25%. Although a value chain analysis will not produce widely representative mortality rates, the magnitude of the rates is confirmed by various data sources and emphasises the critical constraint this issue places on successful goat husbandry in the study areas.

Table 8: Mortality rates

District	Hamirpur		Unnao		Vaishali		East Champaran		Total
Block	Saraila	Kurara	Sikandapur Karan	Sumer-pur	Hajipur	Patepur	Banjaria	Chiraiya	
Mortality adults	20% (30)	16% (20)	23% (27)	34% (41)	32% (8)	25% (13)	14% (6)	34% (13)	24% (158)
Mortality young-stock	45% (62)	25% (26)	46% (58)	28% (27)	26% (10)	47% (27)	32% (20)	34% (13)	37% (243)
Total mortality	32% (92)	21% (46)	35% (85)	31% (68)	29% (18)	36% (40)	24% (26)	34% (26)	30% (401)

Source: Survey data; (absolute deaths);
adult mortality rate = adult deaths/(current adult population + adult deaths);
young mortality rate = young deaths/births;
total mortality rate = deaths/(current adult population + adult deaths + births)

In fact, reported mortality rates might actually be an underestimation, as it is a common practice according to the surveyed farmers to quickly sell sick goats to butchers at a lower price to avoid a complete financial loss. On the other hand, mortality rates may vary considerably between years due to epidemic diseases. The specific situation during the survey period could not be ascertained in this study.

Another indication of how mortality is affecting goat farming is its contribution to herd dynamics. Table 9 provides an impression of how the goat flocks included in the study developed over the previous year: In six of the eight blocks, losses due to death were higher than the sales offtake.

Although the overall number of goats in the interviewed households remained more or less stable during the last year, there were considerable differences between sites. The greatest relative decrease was found in Chiraiya, East Champaran while the urban goat farmers in Hajipur increased their herds the most.

Table 9: Animal exits and flock growth during the last year

District	Hamirpur		Unnao		Vaishali		East Champaran		Total
Blocks	Saraila	Kurara	Sikan-dapur	Sumer-pur	Hajipur	Patepur	Banjaria	Chiraiya	
Deaths adults	30 (12)	20 (9)	27 (16)	41 (26)	8 (26)	13 (22)	6 (10)	13 (24)	158 (18)
Deaths young	62 (24)	26 (12)	58 (34)	27 (17)	10 (33)	27 (47)	20 (33)	13 (24)	243 (27)
Deaths total	92 (35)	46 (22)	85 (50)	68 (43)	18 (59)	40 (69)	26 (43)	26 (49)	401 (45)
Sales adult	52 (20)	42 (20)	21 (12)	19 (12)	4 (13)	7 (12)	6 (10)	16 (30)	167 (19)
Sales young	20 (8)	8 (4)	19 (11)	9 (6)	1 (3)	6 (10)	25 (42)	9 (17)	97 (11)
Sales total	72 (28)	50 (23)	40 (23)	28 (18)	5 (16)	13 (22)	31 (52)	25 (47)	264 (29)
Flock-growth	-27 (-10)	6 (3)	2 (1)	0 (0)	15 (49)	5 (9)	6 (10)	-13 (-24)	-6 (-1)

Source: Survey data; [heads (% of flock size 12 months back)]

4.3 Commercial goat farmers

The concept of 'commercial goat farming' has been repeatedly promoted over the last two decades, although a clear definition of this term does not appear to exist. Generally, it is understood to mean a comparatively large herd under semi-intensive or intensive conditions producing high quality animals for slaughter and/or as breeding stock. Intensity refers mainly to the feeding standard, but also includes improved housing, veterinary care and breeds. Often the funds for establishing a commercial goat production unit originate from business activities outside agriculture and quite a number of 'commercial goat farmers' do not have a farming background. On the other hand, the level of formal education is comparatively high amongst these goat entrepreneurs (verbal communication by CIRG scientists 2017).

There are also indications that commercial companies involved in other activities, such as poultry farming, are also taking up commercial goat framing as an innovative business activity. However, reliable data hardly exists. The final report of the 'Ad-hoc Research scheme (2004–2007)' implemented by CIRG concludes that 'only less than one percent of the goat population of the country yet has to come under such production system' (Kumar 2007).

On the other hand, the opportunities for commercialising goat production within existing farming systems seem to be even more limited. A middle-class farmer keeping several cows and buffaloes and intensifying milk production will probably not consider large scale goat production, because the goat has this particular association with poorer segments of the society. Within the study area no commercial goat farm could be identified.

Figure 7: A commercial goat farm focusing on Jamunapari goats, Firozabad district, Uttar Pradesh,

Photo credit: ILRI/ Christoph Weber

5 Marketing and trading of goats

5.1 Farm sales

Altogether, the 113 farmers interviewed over the past 12 months had sold 264 goats. However, this does not appear to support the assumption that goats are providing a major contribution to household income. In Hamirpur, where flock sizes are largest and conditions for crop farming are unfavourable, farmers sold, on average, only 5.1 goats per year (Table 10). On the other hand, farmers in urban Hajipur sold only 0.4 goats per year. So, although peri-urban goat husbandry is gaining popularity and despite better market access, its main emphasis might be, improving the family's diet rather than as a significant source of income, while maintaining its role as an emergency asset. Considering these low sales figures, the common statement that the goat can be viewed as the 'poor man's ATM' appears optimistic. However, the role of goats as an emergency asset, which is sold in times of need seems to be confirmed by the fact that most goats are not sold at their ideal age, which would be around 10 months. A large number of goats are sold too young, before reaching their optimal body size, while a significant number of goats are sold at an age of 1–3 years, meaning they are kept longer than necessary. However, cash expenses in the traditional goat production system are kept at a minimum and are mostly fixed. Therefore, keeping goats until the need for cash income arises is not very costly for these households, as long as labour costs for grazing are low. However, the high share of goats being sold before maturity despite low production costs is a serious limitation to the success of goat production.

Table 10:Goats sold by age and sex and per farmer

District	Hamirpur		Unnao		Vaishali		East Champaran		Total
Block	Saraila	Kurara	Sikan-dapur	Sumer-pur	Hajipur	Patepur	Banjaria	Charyia	
Adult female	30 (42)	13 (26)	6 (15)	6 (21)	-	2 (15)	3 (10)	11 (44)	71 (27)
Adult male	22 (31)	29 (58)	15 (38)	13 (46)	2 (40)	5 (38)	3 (10)	5 (20)	94 (36)
Adult total	52 (72)	42 (84)	21 (53)	19 (68)	2 (40)	7 (54)	6 (19)	16 (64)	165 (63)
Young female	11 (15)	2 (4)	9 (23)	2 (7)	2 (40)	1 (8)	7 (23)	6 (24)	40 (15)
Young male	9 (13)	6 (12)	10 (25)	7 (25)	1 (20)	5 (38)	18 (58)	3 (12)	59 (22)
Young total	20 (28)	8 (16)	19 (48)	9 (32)	3 (60)	6 (46)	25 (81)	9 (36)	99 (38)
Male total	31 (43)	35 (70)	25 (63)	20 (71)	3 (60)	10 (77)	21 (68)	8 (32)	153 (58)
Total sold	72 (100)	50 (100)	40 (100)	28 (100)	5 (100)	13 (100)	31 (100)	25 (100)	264 (100)
Total sold/ (farmer/year)	5.1	3.3	2.7	2.0	0.4	0.9	2.2	1.8	2.3

Source: Survey data, [heads (% of total goats sold)]

Ideally, most of the animals being sold should be adult males followed by adult females and young males with hardly any young females being sold. Generally, the sales figures provided by the study follow this structure, although the share of young females being sold is still 15%. However, as mentioned above these might be distress sales triggered by disease. The fact, that in two blocks most of the animals sold were adult females may indicate a reorientation in regard to goat husbandry.

5.2 Domestic market

Secondary literature frequently mentions that the market for small ruminants is 'completely unorganized', which appears unconvincing, since a number of publications describe the various marketing channels in considerable detail (Pandit 2005). It is likely that the term 'unorganized' refers to the almost complete absence of the public sector in goat marketing and trade and the lack of an effective regulatory framework.

During data collection, the survey team focused on meeting traders at the local level. Information on other higher levels of trade originates from literature sources and from a single large-scale trader near CIRG in Mathura.

Almost all farmers interviewed within this study sold their goats through local 'traders-cum-butchers'. The relations between goat farmers and traders were quite diverse and often specific for certain villages:

- Some farmers have a long-standing relationship to a certain trader, whom they trust and to whom they regularly sell (patron-client relationship).
- The majority of farmers accessed the market through several local itinerant traders ('doorstep-traders'), with price being the main determinant for selecting a trader for each transaction.
- In some villages farmers complained that only one trader was coming regularly, resulting in considerable difficulties in marketing their goats.

Also, a number of farmers complained about the long distance to the major dedicated goat market in that part of Uttar Pradesh at Kalpi/Choura. The main attraction of this market is the higher price level, compared to doorstep traders, although farmers are also aware of the high costs involved in selling a single goat at a distant market.

In general, the price of a goat at sale is not determined directly by its live weight, but by a visual assessment of the buyer taking into account several factors such as age, body condition, appearance and sex. In Banda and Hamirpur districts, NGOs active in the promotion of goat husbandry had supplied spring balances to groups of women goat farmers in order to raise awareness that live-weight is the major determinant of the sales price, even if animals are not weighed.

The typical retail outlet for goat meat is the roadside butcher shop. These are of varying standards and in many cases owned and run by Muslims. Slaughterhouses in some urban agglomerations also cater for small ruminants, but most butchers slaughter in or near the butcher shop.

The owner of a roadside butcher shop sells all meat at a uniform price, irrespective of the particular cut, and specific cuts are normally not available. However, liver and kidneys as well as heads and legs are sold at specific prices. Age and sex of the slaughtered goat do not appear to greatly influence the meat price. Although some supermarket chains also offer—mainly frozen—goat meat, the Indian consumer apparently prefers to buy it fresh at the roadside shop, despite varying hygienic conditions. In rural areas, butcher shops are often integrated into the weekly markets, selling only on the particular market day.

A number of the local butchers also trade goats at the local level. After purchasing goats from farmers, they slaughter as many as they require for their shops and then sell the rest of the animals to larger traders or at a local goat market.

Despite this being a rather general assumption, this study provides no clear indication that smallholder goat producers are 'exploited' by traders, brokers or middlemen. Although traders certainly have better knowledge and more up-to-date information on market conditions, several traders were competing with each other in most places, limiting the potential of market capture. On the other hand, goat farmers in urgent need of cash are in a poor bargaining position and may have to accept any price a trader may be offering.

5.3 Regional and inter-state trade

There are five major goat markets in Uttar Pradesh including Kalpi/Choura, which is considered to be the largest live goat market in Northern India. Although this market was visited, it was not possible to collect any data for this study.

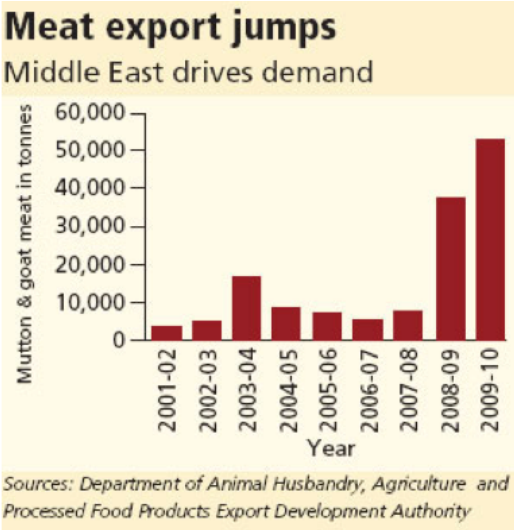
Figure 8: Kalpi/Chaura goat market in Jalaun district, Uttar Pradesh. Often, goats are sorted into 'lots' according to size and/or colour.

Photo credit: ILRI/ Christoph Weber

5.4 Export

Contrary to the expectations expressed in Figure 9, exports of goat and sheep meat in recent years were fairly stable at slightly above 20,000 t per year (financial year 2013/14: 20.425 t, FY 2014/15: 22,827 t, FY 2015/16: 21,635t, source: Agricultural and Processed Food Products Export Development Authority, India). This is about 3% of the total annual production of goat and sheep meat in India. Considering the rise in domestic demand it is unlikely that the share of export will rise significantly. Most exports of Indian goat and sheep meat are destined for the Gulf countries, which are also supplied from a wide range of other producer countries including Brazil, New Zealand, Australia and countries in East Africa.

Figure 9: Mutton and goat meat exports from 2001/02 to 2009/10



However, there is also considerable 'informal' export of live goats to neighbouring Nepal resulting in some complaints about trade imbalances. Indian goats are said to have a higher dressing percentage and 'more tender meat' than goats from Nepal. All goat markets supplying Nepal are situated in northern parts of Uttar Pradesh and in Uttarakhand (Kharel 1997). It appears surprising that there are no major goat markets in northern Bihar supplying neighbouring Nepal (personal communication, Vijay Kumar, CIRG, 2017).

5.5 Market information

No formal market information services for goats exist in the areas studied. However, because of a great variation in live-weight and quality, standard units, which would be required for a formal information system, are difficult to define. Therefore, traders and producers have to rely on word of mouth or on direct market visits to gain information on prices and volumes. However, increased access to the internet and mobile phones appears to have reduced the need for a formalized market information service.

Before annual religious holidays such as Eid-ul-Fitr, Eid-ul-Azr, Dashera, Holi and Diwali, prices for goats increase considerably and goat keepers are generally aware. Where possible they try to adjust their production cycle and sales accordingly.

5.6 Transport services

A large share of the goats being sold reaches the closest market and/or roadside butcher shop by trekking or on a two-wheeler. However, it is also common to load goats on pick-ups or large trucks to transport them to bigger markets or to urban consumer centres.

Figure 10: Goats being loaded on trucks at Kalpi/Choura goat market in Jalaun district, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

6 Conclusions

The dominant goat husbandry found in the study area is a traditional low-input system with common grazing and lopped tree leaves being the major feed sources, supplemented in dry periods by crop-residues and other by-products.

Animal health care services are not reaching most goat farming communities. This situation together with poor feeding regimes can be seen as the major cause for high mortality rates, especially among young stock. Preventive vaccinations against the most important infectious diseases (e.g. PPR, ET, FMD, and HS) would be a first step to efficiently reduce mortality. Most goats kept in rural areas are of the 'non-descript' type but are well adapted to the harsh husbandry conditions. Attempts to improve the genetic potential would make sense only if feeding and health care are improved simultaneously.

Goats are an important livelihood component for landless, marginal and small farmers. They are an essential part of the financial 'safety net' as they can be easily sold in times of need. Goats require only a low initial investment and – kept under the prevailing extensive system with grazing on communal property resources – limited operational costs.

Although the demand for goat meat is expected to continue to rise, productivity in the traditional system remains low. Attempts to stimulate the establishment of 'commercial goat farmers' with large flocks in semi-intensive or intensive systems have so far been only moderately successful.

Marketing and trading of goats is neither interfered with nor supported by the public sector and does not fall under any regulatory framework. Nevertheless, goat farmers are generally well connected to markets through a wide network of traders at local/village, state and inter-state levels. However, since most goat keepers sell only a few animals per year and often only when they are in urgent need of cash, their bargaining position tends to be rather weak.

The high degree of fragmentation in the goat sector would require a considerable amount of extension and advisory effort if individual farmers were to be targeted with intensified outreach programmes. Therefore, some NGOs and development agencies are supporting farmer self-help organisations in order to reach large numbers of smallholder goat farmers. These are mainly women's groups, since it is mostly women who are in charge of goats.

On the other hand, a ready market for goats exists and prices are expected to further increase. Any measure to increase productivity in the traditional goat sector will most likely contribute to poverty alleviation.

Figure 11: Women goat farmers attending a group meeting in Banda district, Uttar Pradesh

Photo credit: ILRI/Christoph Weber

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8 Annex

8.1 Annex 1: Classification of districts in Bihar and Uttar Pradesh

The first step involved identifying potential GIS layers. It started with clipping of Bihar and Uttar Pradesh districts (http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691). Districts were then masked with the poverty rate data (poor people per km2). This data was classified into two quantiles classes: low poverty and high poverty density areas.

Goat density was calculated as follows. Total number of goats was obtained from the 2012 census data (https://data.gov.in/catalog/details-goats-age-sex-and-use-rural-and-urban-combined-livestock-census). District superficies were calculated in ArcMap. Goat density data was then classified in to two quantile classes: high goat density, and low goat density.

The combined tool in ArcMap was then used to combine the goat density and poverty rate to come up with the four categories as indicated on the map.

8.2 Annex 2: Questionnaires

Questionnaires for goat farmers and open-ended forms used for data collection

Questionnaire farmers (Individual interviews)

1st category: marginal, landless/land-poor goat keepers

2nd category: farmers with land and large livestock and goats

3rd category (if they exist in the selected blocks): commercial, specialized goat farmers

Basic information

Name:

Village:

Block:

District:

SC/ST yes no

Who is in charge of the goat business in the household (in the sense of making the decisions): Male Female

Do you own/cultivate any land ? Yes No If yes, how many acres ?

Flock composition

Number of goats you own:

Adults (above 1 year)

Female

Male

Castrates

Youngstock (below 1 year)

Female:

Male

Feeding

How do you feed your goats ?

Grazing

Bye products Which

Purchased feed Which How much did you spend per month

Animal health

How many kids were born last year?

How many died?

Why?

Did any adult goat die last year?

How many?

Why?

Do you buy any drugs in case your goats are sick?

If your goats are sick, do you call for vet/para-vet assistance?

Are your goats vaccinated?

If yes, against what disease?

If not, why not?

Has the size of your flock changed during the last year?

No

More goats (enter number of increase)

Less goats (enter number of decrease)

Breeding

How are your female goats served?

Own buck

Neighbours buck

Village/temple buck

Other _

Marketing

How many goats did you sell last year?

Adult

Female

Male

Castrate

Young stock

Female

Male

Why did you sell your last goat/most recent sale?

Urgent need of cash

Goat was ready for sale

How old was this goat?

What price did you get?

To whom did you sell this goat?

Do you sell regularly to the same trader?

Why?

Why not?

What are the good things in keeping goats? (prioritize from 1 – 3)

What are your main problems with your goats? (prioritize from 1 – 3)

What are your ideas/suggestions to solve these problems?

Butchers

Name: Location:

How many goats do you slaughter per week?

Where do you buy them from?

Traders always the same trader(s)?

farmers

Do you have fixed/regular customers for your goat meat?

Sold to fixed/regular customers % of all meat sold)

Sold to occasional buyers % of all meat sold

Total % should be 100)

Do you supply also meat to hotels/restaurants?

If yes, give details

What do you think are the main problems of goat farmers?

What are YOUR main problems as a butcher?

What are your ideas/suggestions to solve these problems?

Have you ever thought of upgrading your business (better sanitation/hygiene, better display of meat etc.)?

If you would improve the standard of your butcher shop, would you be able to ask for a high price (which would pay for your investments in a higher standard)?

What do you do with the goat skins?

Sell to whom?

At what (average) price)?

What do you do with the slaughtering waste (blood, rumen content, intestines)?

Is there any meat inspection? _____

Animal husbandry/vet department staff at district and block level

This is NOT a questionnaire, but provides you with some key issues you should discuss with animal husbandry staff on district and block level.

Also try to find two more issues:

- Are there any 'commercial' goat farmers in the area (if yes, try to interview at least one of them
- Arte there goat markets in the district, if yes when and where. If there is a goat market in the area, one of you should visit this market and interview traders on this market and collect data/information

Name:

Position/function:

District/block:

Short description of the groups of people keeping goats in the district/block ('Which people are keeping goats?')

Demand for goat meat is increasing in recent years, but supply is not increasing at the same rate resulting in an increase of prices for goat meat. Why is the number of goats not increasing accordingly?

Main problems in goat husbandry

What are your suggestions/ideas to solve these problems?

Do goat keepers call veterinary staff, if their goats are sick?

If yes, is vet staff going to attend these problems?

If no, why not?

Are goats regularly being vaccinated?

If yes, against which diseases

If no, why not?

Estimate of mortality in

Adult goats (above 1 year)

Youngstock (below 1 year)

Main reasons for mortality

Agricultural pharmacies/drug sellers

Try to talk with shopkeepers who sell veterinary drugs to farmers and ask them about goat keepers.

Traders

It seems that there are three levels of traders like

- 'door-step'/village traders/collectors
- 'wholesale' traders
- 'Inter-state' traders

Try to include at least some 'door-step' traders in the focus group discussions in the villages, since these are the traders directly buying from farmers/producers.

Also try to find out more information about the linkages between traders of the different levels, i.e. is a 'door-step' trader always selling to one particular 'wholesale trader' etc. Do the wholesale traders have a number of door-step traders working for them as agents and/or do the wholesale traders even pre-finance the door-step' traders. In essence, is the network of traders more a 'fixed web' or are traders on all levels acting independently from each other?

As we have heard in the village in Vaishali district there are also 'door-step' traders who are at the same time butchers.

Do individual interviews with all three types of traders, covering at least the following issues

How many goats are you buying per week?

From what area?

Your (the traders estimate) : How many goats are sold to you because of:

Urgent need of cash by the goat owner ('emergency sale') % of goats bought

Goat is ready (grown up) for sale/marketing % of goats bought

(Total should be 100%)

To whom do you sell the goats you have bought?

Next level traders

Butchers

Keep immature goats myself until they are grown up/ready for sale

Trade margin between buying and selling (do not ask that directly, but try to find out by several questions and later on in the focus group discussions try to cross-check)

How do you transport the goats you have bought to next level buyer/goat market?

What are the main problems of goat farmers?

What are your main problem as a goat trader?

What are your suggestions/ideas to solve these problems?

Customers/buyers of goat meat

Location: Urban Rural

How often do you buy goat meat per week?

Do you buy goat meat regularly or for special occasions only?

Do you buy/consume more goat meat now than 5 years ago?

If yes, why?

Are you buying regularly from the same butcher?

Why

Why not

Would you be ready to pay a (slightly) higher price for meat from a butcher with improved sanitation/hygiene?

What are your main problems as a buyer/consumer of goat meat?

What are your ideas/suggestions to solve these problems?

8.3 Annex 3: Locations

Table 11: Locations for data collection (places where data has been collected are in italics)

District	Block	Village
Hamirpur	*Kurara*	*Shitapur*
		Balanpur
		Rithari
		Jalokhar
	Sarila	*Paracha*
		Bargawan
	Rath	
Unnao	*Sikanderpur Karan*	*Achalganj*
		Tekali
		Hasanapur
	Sumerpur	*Chachi Raikhora*
		Latauli
		Mankapur
		Chhehdas Khora
		Sarai Manikar
Vaishali	*Hajipur*	*Ishupur*
		Meenapur
		Jathua
		Chaunta
	Patepur	*Nirpur*
		Guara
		Ramauli
		Saidpur Dumra
		Dabaich
East Champaran *(Motihari)*	*Charia*	*Ranpur*
		Raghunathpur
		Balwani
		Nirpur
	Banjaria	*Fulawar*
		Chitha
		Gramhariya

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