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Analysis of prospects and problems of goat production in Bundelkhand region

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Abstract
Data on different attributes of goat production were collected from 194 households of 16 selected villages of Hamirpur and Mahoba districts of Bundelkhand region of Uttar Pradesh. Majority of goat keepers were literate (75%), belonging to backward (54%) and schedule caste (37%) communities. Goats were predominately kept by marginal (35%), landless (29%) and small (26%) land holding categories. Goat keeperôs average family size, annual income and contribution of goat in total income was 5.80±0.18, Rs 56725±4408 and 15.5%, respectively in Hamirpur and 6.18±0.28, Rs 48149±3631 and 14.30% in Mahoba district, respectively. Majority (63%) of goat farmers kept goat in mixed livestock farming system with average flock size of 9.17 in Hamirpur and 7.6 in Mahoba district. Goats in medium and large flocks were maintained mainly on range grazing and lopped fodder. Goats in small flocks were predominantly (>65%) reared through contract grazing @ Rs 50-100 per goat per month. Breeding bucks were available with large flocks only. Goats were housed in human dwelling (50%), with cows and buffaloes (32%) and alone in separate verandas/enclosures (18%) in Hamirpur district. Corresponding goat housing type was 45, 39 and 16%, respectively in Mahoba district. The age at first kidding, kidding interval, litter size, lactation length, total milk yield and daily milk yield were 17.3±0.4 months, 8.2±0.2 months, 1.2±0.04, 123±5 days, 59.0±2.6 liter and 0.470±0.04 liter/day in Hamirpur district. Corresponding values were 18.7±0.5 months, 9.3±0.2 months, 1.3±0.5, 129±4 days, 63.5±2.7 liter and 0.51±0.08 liter/day, respectively in Mahoba district. Pneumonia, diarrhea, endo-parasitic diseases, PPR, FMD, abortions were major health problems. Annual mortality in kids (up to 6 months) and adult goats were 17.4 and 13.6%, respectively. Feeding and labour (grazing charges) accounted for 63.39% and 31.21% of recurring cost of goat production. Males (>70%) were sold up to the age of 6 months and mostly (92%) through middleman. Sale of male accounted for more than 64% of income from goat rearing. Goat milk for family consumption was 25.94 and 40.04 percent in villages of Hamirpur and Mahoba. Different constraints for goat production in Bundelkhand region have been highlighted and corrective measures for improvement have been suggested.

Keywords: Bundelkhandi goat, Fodder, Mixed farming, Production system, Prophylactic measures, Rangeland, Strategic feeding

Introduction

Livestock are contributing more than one-fourth of household income and continues to be the main source of draught power, rural transport and human nutrition in Bundelkhand region. Goat is the most common livestock species found with >74% household irrespective of land holding size and has been playing multiple role in livelihood by providing income, employment, nutrition, supporting crop production by allowing purchase of critical inputs and risk aversion in case of crop failure. Physiological adaptability of goat for harsh climatic conditions (Silanikove, 2000) and scarce feeding resources has made these animals critically important for this region. The goats found in this region are Bundelkhandi, named on the basis of their home tract *i.e.* Bundelkhand. These goats are medium to large in body size (70-85 cm). The typical morphological characteristics of Bundelkhandi goats are the black coat colour, pendulous ears of medium size (15-20 cm), slightly convex nose, narrow face, black eyelid, muzzle and bushy hairs of medium length on thighs of hind legs. Long and sturdy legs make them suitable for long walk in the rocky terrain of this region. However, productivity and income from these goats are much less than their actual potential. Realizing potential of goat in livelihood security, a goat based integrated programme was introduced under Sustainable Livelihood Research Project of National Agriculture Innovation Project (NAIP) to improve the livelihood of people of this region. Data were collected on different attributes of goat profile to

address the socio-economic and technical constraints for developing and disseminating improved practices and innovating models for augmenting goat productivity of small holder production.

Materials and Methods

Present study was carried out in Hamirpur and Mahoba districts in Bundelkhand region of Uttar Pradesh. Data were collected through a well-defined pre-tested questionnaire through personnel interviews with 89 households belonging to 8 villages namely Etkor, Barel, Aonta, Sarsai, Chili, Behooni-Khurd, Etora, Bakrai of Rath, Gohand and Muskara blocks in Hamirpur district and 105 household of 8 villages namely Ari, Budhwara, Bamhori-Khurd, Bharwara, Mahoobkanth, Tikaria, Parthania, Sudamapuri of Jaitpur, Panwari and Charkhari blocks of Mahoba district in the year 2010. Data on body weight of goats at different ages was measured with balance. The goat age was determined on the basis on their teeth and goat owner *per-se*. The milk yield of goats was measured at fortnight interval with the help of data enumerators. The statistical analysis was done as per standard procedure (Snedecor and Cochran, 1989).

Results and Discussion

Socio-economic attributes: Goat farming (Table 1) was predominately practiced by people of backward caste (54%) followed by schedule caste (37%) and general communities (9%). The average age, family size and land holding size was 42.19±1.14 year, 5.80±0.18 and 1.56±0.19 hectare, respectively in Hamirpur district. Corresponding values in Mahoba district were 40.24±1.21 year, 6.8±0.28 and 1.52±0.17 hectare, respectively. The level of working knowledge was low in spite of 76 and 75% literacy in Hamirpur and Mahoba districts. Goat keeping households annual income was Rs. 56725±4408 and Rs. 48149±3631 in Hamirpur and Mahoba districts, respectively. Agriculture, goat rearing, other livestock (cow and buffalo) rearing and labour were major sources of income accounting for 32.5, 17.5, 23.20 and 28.4%, respectively of total income in Hamirpur and 22.42, 14.30, 24.59 and 38.47%, respectively in Mahoba district. In Hamirpur district contribution of income through wages decreases with the increase of land holding size which was not observed in case of goat farmers of Mahoba district. Less income through agriculture in villages of Mahoba district might be due to lower cropping intensity and productivity on account of poor irrigation infrastructure in comparisons to Hamirpur district. Main reasons of keeping goat (based on rank) was additional and assured income through sale of kids and milk, less initial and maintenance expenditure, quick return, easiness in management, less risk, support in crop production and providing milk for house hold consumption.

Goat production and management system: Goat production in this region is well integrated with other livestock and crops (Table 1). Nearly 34% households keep goat with cattle and buffaloes followed by cattle alone (15%) and buffaloes (14%) alone. Households keeping only goats were 37 percent. Sheep accounted for 2.8% of livestock population and found in two villages of Hamirpur district only. The average flock size ranged from 2 to 39 with of 9.17±0.78 in Hamirpur and 7.6±0.66 in Mahoba district. Proportion of household with flock size of 1-5, 6-10, 11-15, and >15 goats were 38, 37, 17 and 8%, respectively in Hamirpur district. Corresponding values in Mahoba district were 41, 34, 17 and 8%, respectively. Breeding bucks were available with 1.8% goat keepers *i.e.* only with large flock owners. The villages with good access of biomass in community grazing land had more goat population with higher flock size. Goats were reared in all categories of farmers with respect to land holding though numbers of large flocks were more among marginal and small land holders and landless household. Goats in grazing areas were looked after by girls and women (24%), male children (16), aged people (21%) and youths (39%). Breeding bucks were available with large flocks and stray buck called as *Mata- Ka- Bakra* (a male kid reserved to serve the female goats in the name of village deity) was mostly utilized to cover the village goats. Present goat production systems were in agreement of those reported by Singh *et al.* (2009) in Gujarat.

Goats were reared mainly on grazing (range and harvested crop fields) with little and occasional external inputs. The farmers with large flocks graze their goats by own, whereas, those who keep small flock rear goats on contract grazing. The rate of contract grazing varied from Rs 50 to 100 per goat per month. Contract grazing rate increases in *rabi* season due to sowing of crops in more than 80% of cultivable area. Grazing hours varied from 5 to 8 hrs. Farmers with small flock also kept goats on stall feeding especially in winter (*rabi*) season and also provide grains (barley and bajra) and small amount of green fodder (cultivated and lopped). Supplementation of concentrate was predominately (80%) followed for lactating goat and breeding bucks at the rate of 100-150 gram/goat/day for a period of 75-125 days in a year. The concentrate mixture was mostly fed in winter season

when grazing was not accessible due to cultivation of crops. Green fodder is mostly (>50%) provided in the form of lopped fodder and with an average quantity of 287 and 357 gram per day per goat in Hamirpur and Mahoba district respectively for a period of 90 to 184 days (Table 2). An association between biomass availability (through pasture or cultivable land) and production level exists *i.e.,* maximum goat productivity was recorded in Chillee village of Hamirpur and Aari village of Mahoba district and might be attributed to higher biomass through fodder (crops and their byproducts), bushes and shrubs on nearby hillocks. Area under cultivated fodder crops is < 4.2% of total cultivated area. Moreover, cultivated fodder is provided to buffaloes and high yielding cows on priority basis. Major items fed to goats were crop by-products *i.e.,* straw of different legumes and cereals (Gram, Pea, Pigeon pea, Sesame, Sorghum, Bajra and Wheat) and fodder /top feed collected from grazing range areas such as Bargad, Pipal, Ber, Babool, Pakar, Neem, Mahua, Siris, shrubs and grasses (lampa, kail, dub, sain *etc*). The major source of feeding was grazing and almost 85% goats in rainy and summer season were exclusively kept on range browsing. Moreover, 47% goat keepers maintained goats for entire year under extensive feeding management system. Goat with small flock were mostly kept in human dwelling (45-50%) and with other livestock species (32-39%), however medium and large flocks were provided separate housing. Housing for goats was sub-optimal.

Reproductive performance: Age at first kidding varied from 16 to 26 months with an average of 17.3±0.4 and 18.7±0.4 months in Hamirpur and Mahoba districts, respectively (Table 3). In most of the flocks about 25-30% yearlings got pregnant before attaining optimum age and weight which might be due to mixed sex grazing system. Kidding interval varied from 7.4 to 14.2 months with an average of 8.20±0.2 in Hamirpur and 9.2±0.3 months in Mahoba district. In many flocks (26%) females made pregnant at premature ages and post-partum service interval also kept low, moreover, not supported by adequate feeding thereby resulting in miscarriage, lower birth weight of kids, higher pre-weaning mortality and low milk yield of does.

Production performance: The average body weight of kids and yearlings at 6 and 12 months of age was 10.2±0.2 and 18.1±0.3 kg in Hamirpur district. Corresponding body weights were 10.4±0.2, and 18.5±0.4 kg in Mahoba district (Table 3). The average total milk yield, daily milk yield and lactation length were 59.4±2.6 liter, 0.47±0.1 liter and 123±5 days in Hamirpur and corresponding values were 63.5±2.7, 0.51±0.16 and 129±4 days, respectively in Mahoba district. Better milk yield was recorded in those villages where biomass was optimum and fodder supplementations to goats were common. Highest production performance was recorded in Chillee village of Hamirpur district and this was mainly attributed to better availability of crops by-products and fodder. Similarly performance of goats of Ari village was better within Mahoba district and it was mainly attributed to quality biomass availability in rangelands. Singh (2004) reported that supplementary feeding of concentrate was necessary during late pregnancy as it increases kids' birth weight and survivability, pre-weaning growth rate, goat milk yield and also decreases kidding interval.

Disease incidences and mortality: Common goat diseases recorded in adopted villages were PPR (*Pestedes Petits Ruminants*), FMD (*Foot and Mouth Disease*), Coli-bacillosis (diarrhea), Enterotoxaemia, Orf (Contagious ecthyma), abortion, pneumonia, endo-parasitic diseases, bottle jaw and mastitis (Table 4). Outbreak of PPR and FMD was common phenomenon in the region. Heavy mortality (30-60% of goat strength) reported at regular interval through outbreak of PPR. Pneumonia and diarrhea were common in kids whereas parasitic infestations (Fascioliasis, Coccidiosis, Amphistomiasis and Haemonchosis), were very high in kids and in adult goats, which made goat anemic and pre-disposed for other diseases. Major causes of high endo-parasitic infestations (liver fluke, bottle jaw and diarrhea) were drinking of stagnated and contaminated ponds water and ignorance about deworming. Incidences of mortality in kids were high (20-50%) particularly in large flocks and mainly attributed to overcrowding and unhygienic kids management. Goat keepers do not follow vaccination even for highly endemic and fatal diseases such as PPR and FMD in spite of high economic losses. Annual mortality in kids and adult goats was 17.4 and 13.6 percent of flock strength.

Goat marketing practices: The main heads of running cost of goat production were feeding and labour (grazing charges) and accounted for 63.39% and 31.21%, respectively (Table 5). The grazing charges of a goat ranged from Rs 50-100 depending on villages and seasons. Males were sold mostly (>70%) up to the age of 6 month; through middleman (92%). Females (yearlings) were retained to reproduce and for replacement. Less productive and aged (20-40% of flock strength) goats however, were sold in the onset of winter

(October-November) due to better price during festivals, inadequate housing and scarcity of feeding resources. Yearlings (females) were mostly (82%) sold among goat keepers. The average sale prices of kids at different ages were almost same in both the districts (Table 5). Retaining of goat milk for household consumption or for sale depends upon livestock composition, flock size and goat keeperôs socio-economic condition. Goat milk for house hold retention was 29.9 and 34.0% in the villages of Hamirpur and Mahoba district. Sale of goat milk is not common except large flock and mainly attributed to low milk yield, more labour work and low price.

Constraints: Bundelkhandi breed of goat has huge potential for milk, prolificacy and growth, however, productivity is low and mainly attributed to subsistence production system on account of inadequate feed-fodder and breeding practices. Low cropping intensity, productivity of crop (grain) and crop by-products (straws), less area under fodder cultivation and lack of knowledge of value addition of crop by-products and monsoon herbage create pressure beyond their carrying capacity on common capacity on common resources. Sustainable utilization of community resources (grazing and watering) is on high risk due to overgrazing particularly stray cattle grazing *(Anna Pratha),* lack of management of pasture by stakeholder and government agencies, deforestation and soil degradation. Destruction of bushes and shrubs for fuelwood by villagers put additional pressure on common grazing lands. Enormous energy of goats is spent in seeking feed from scarce vegetation cover and harsh climatic conditions. Moreover, available fodder of this region is deficient in many macro and micro minerals because of deficiency in the soil. Therefore, feed and fodder scarcity (concentrate, fodder, mineral mixture *etc*.) is core livestock problem of the region. Prophylactic and curative measures were very poor for goat. Outbreak of PPR and FMD is endemic and accounted for huge economic loss. Endo-parasitic infestations in goats were on very high scale which causes high abortion, morbidity, mortality and decreases productivity. Knowledge gap for critically important feeding, breeding and health practices and inputs were another major constraint at individual farmerôs level. Less availability of high potential buck provides opportunity to '*Mata Ka Bakra*ô for breeding which might be resulting in negative contribution in genetic

Table 1. Socio-economic profile of goat keepers

Particulars	Hamirpur (N:89)	Mahoba (N:105)
Goat keepers of backward community (%)	62.9	50.5
Goat keepers of schedule caste community (%)	35.9	40.9
Goat keepers from general community (%)	8.9	9.5
Average age of goat farmer (year)	42.19±1.14	40.2±1.22
Average family size (no.)	5.80±0.18	6.18±0.28
Literacy (%)	76.00±0.48	75.00±0.45
Average land holding (ha)	1.56±0.24	1.51±0.17
Herd size of other livestock species		1.70±0.09 (53)
Cow	1.51±0.11 (46)	
Buffalo	1.94±0.09 (53)	1.43±0.12 (45)
Sheep	0.06(4)	nil
Poultry	0.06(5)	0.04(4)
Pig	0.03(3)	0.02(2)
Average gross income/hh/y (Rs)	56725±4408	48149±3631
Average income from Agriculture (%)	32.45±2.44	22.42±1.24
Average income from Goat (%)	15.50±1.45	14.30±1.12
Average income from Large ruminants (%)	23.20±1.15	24.59±1.43
Average income from Labour (%)	28.40±2.54	38.47±1.26
Flock Size according to land size		
Landless	7.2	8.4
Marginal	11.4	8.8
Small	7.9	7.1
Medium	7.8	7.1
Large	4.9	4.5
Average flock size (n.)	9.17±0.84	7.60±0.67

Value in parenthesis in column 2 is number of house hold keeping of other livestock species

potential of this breeds thus less production. Inadequate housing, lack of credit facilities for livestock, un-organized marketing structure for the sale of goat and goat milk and scarcity of clean water for livestock are other important constraints.

Suggestions for improving goat productivity: Goat rearing has an immense potential for improving the income and creating village based employment, however better access of feed, fodder, veterinary services, breeding buck, credit and marketing support are critical besides capacity building of goat keepers on goat production (Singh and Singh, 2012). Improvement of waste lands and community pastures as perennial silvi-pastures and adoption of cultivated fodder through popularization of high yielding fodder varieties is necessary for sustainable goat development (Dixit *et al*., 2012; Rai and Rai, 2010; Yadav *et al*., 2010). Technology for conserving surplus feeds and fodders available during rainy season and its value addition is especially important for the region. Simultaneously capacity building of goat keepers for strategic concentrate or semi-intensive feeding, commercial goat farming (Singh, 2004), establishment of kidô nursery at cluster/block level to produce superior breeding bucks may be very useful for sustainable goat development and to enhance genetic potential of Bundelkhandi breed. Goat based mixed farming models may be developed and popularized with holistic package of production and marketing practices for strengthening livelihood security in the region.

Table 2. Goat feeding systems in adopted villages

Particulars	Hamirpur (N:89)	Mahoba (N:105)
No. of grazing (days/year)	236.53±11	230.87±10
No. of grazing days + straw feeding days/year	162.00±12	144.90±8
Quantity of concentrate(gm)/goat/day	142.39±6	130.21±7
Concentrate fed (days/year)	109.44±7 (39)*	128.51±7 (32)*
Quantity of green/lopped fodder/day (gm)	207.50±18	285.32±28
Green fodder fed (days/year)	179.4±7	145.61±12

N: Number of goat keeping households, * households providing supplementary concentrate

Table 3. Production performance of goats in adopted villages

Particulars	Hamirpur	Mahoba
Age at first kidding (months)	17.3±0.4 (134)	18.7±0.5(112)
Kidding interval (months)	8.2±0.2 (134)	9.3±0.2(112)
Litter size (no.)	1.2±0.04 (134)	1.3±0.05(112)
Average body weight at 6 month (kg)	10.2±0.4(34)	10.4±0.3(42)
Average body weight at 12 month (kg)	18.1±0.3(24)	18.5±0.3(87)
Lactation length (days)	123.6±5(134)	129.0±4(112)
Total milk yield (lit)	59.4±2.6 (56)	63.5±2.7 (74)
Milk yield per day (lit)	0.47±0.05(56)	0.51±0.08(74)

Value in parenthesis is observation on number of goats

Table 4. Morbidity and mortality status of goats in adopted villages

Particulars	Hamirpur	Mahoba
Morbidity (disease incidences)		
Pneumonia	22.07 (117)	16.08 (74)
Diarrhea	14.72 (78)	14.35 (66)
Ecto- parasite diseases	5.28 (28)	6.52 (37)
Endo-parasitic diseases	13.02 (69)	13.26 (61)
Abortion/miscarriage	11.51 (61)	13.48 (62)
Mastitis	4.15 (22)	3.04 (14)
Bottle jaw	5.84 (31)	5.21 (24)
PPR	16.79 (89)	17.17 (79)
FMD	6.60 (35)	10.65 (49)
Mortality incidences		
Kidsômortality up to 6 months (%)	18.3	16.5
Adult mortality (%)	14.2	12.9

Value in parenthesis is disease cases observed in farmers goat flocks

Table 5. Economics and marketing of goat rearing in adopted villages

Particulars	Hamirpur	Mahoba
Average expenditure on feeding (Rs)	523.2±15	499.4±10
Average expenditure on health (Rs)	20.4±1.5	19.7±1.4
Average expenditure on labour (Rs)	201.2±9	198.81±6
Average expenditure on breeding (Rs)	10.3±0.5	16.3±0.6
Average expenditure on others(Rs)	8.5±0.4	14.6±0.7
Total cost per goat/year(Rs)	753.8± 15	736.9±11
Average income/goat/year (Rs)	2446±66	2476±68
Goat sold among farmers (%)	26.9	23.3
Goat sold through middlemen (%)	71.4	68.5
Goat sold through market (%)	1.7	8.2
Retention of milk (%)	29.9	34.0
Sale of milk (%)	11.6	21.1
Milk consumed by kids (%)	53.1	44.9
Average sale price at age of 6 month(Rs)	1206±35	1115±24
Average sale price at age of 12 month (Rs)	2121±56	2004±44
Average sale price at age of18 month (Rs)	2895±72	2906±39
Average sale price of milk (Rs /l)	12.5±0.2	12.8±0.2
Average sale price of meat (Rs/kg)	239±0.3	230±0.3

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