



## Production performance of goat in field condition: A survey in semi-arid zone of Uttar Pradesh, India\*

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### ABSTRACT

Goats make important contributions to the stability of smallholder farming system by providing financial resources for purchase of farm inputs and household needs, nutritional security, skin and fibers, employment and organic manure. In the recent study, a total of 240 goat farmers of two districts (Firozabad and Mainpuri) of the semi-arid zone of Uttar Pradesh, India were interviewed. Weight of 227 goats ( $\leq 1$  year) were taken by spring balance and information regarding production performance of different traits were collected by interview of goat farmers. Based on the results, goat farmers were classified into three categories viz. landless (25.8%), marginal (54.2%) and small and semi-medium (20%), respectively. Milk yield of Sirohi, Barbari and non-descript breeds were 0.9, 0.6 and 0.8 liter/day, respectively. Jakhrana breed of goat had highest weight irrespective of age and sex, whereas Barbari has lowest among all breeds found in the study area. Dilution of pure breed line and low adoption of recommended management in the study area were important factors for low productivity. Total mortality rate in goat was 21.16% which was highest among 1–3 months old followed by 3–6 months and above 6 months age group, respectively. Age of first kidding, kidding interval and kidding % of non-descript breed in the field were 17.6 months, 11.4 months and 1.29, respectively. There was positive correlation between number of buck kept by farmers and their flock size. Buck of Sirohi breed were most preferred by farmers (72.4%) in study area.

**Key words:** Goat milk yield, Goat mortality, Production performance

India has the highest goat population (18%) in the world (FAO 2012). The goats and their products accounts for about 8.5% to livestock GDP at current price for 2010–11. Major goat leading states in India are Rajasthan (16.03%) followed by Uttar Pradesh (11.53%) as per 19<sup>th</sup> Livestock census. Besides assured income, employment and nutrition, goat-rearing supports the crop production by providing cash for the purchase of critical inputs during financial distress and risk aversion in the case of crop failure. Therefore, goat has one of the most inclusive growth rates among livestock (Singh *et al.* 2013). Goats make important contribution to the stability of smallholder farming system by providing organic manure and financial resources for purchase of farm inputs and household needs. Due to these characteristics, annual growth rate of goat varied from 0.72 (1967–72) to 5.13% (1978–82) with an overall average growth rate of 3.05% during 1951–2003 (Singh *et al.* 2008). Arid and Semi-arid northern region of country is characterized by tropical and sub-tropical climate with low to moderate rainfall with recurring drought. Jamunapari and Barbari are

two important breeds found in this region of Uttar Pradesh. Average meat yield from a goat in India is only 10 kg against about 20 kg in Sri Lanka and 17 kg in Pakistan (FAO 2012). This low productivity may be due to under feeding and faulty management practices (Singhal 1999). Diseases in goats result in mortality which ranges from 5 to 25% in adults and 10 to 40% in kids (Vihan 2009). The actual potential of different goat breeds is yet to be known, as they have not been adequately evaluated in the optimum management conditions. The data on production status for different regions is not available for all breeds on comparable basis as there is no proper recording of goat production performance, husbandry and marketing practices at village level except some attempts that have been made by All India Coordinated Projects (AICRP) on Goat Improvement (Singh *et al.* 2008). Present study intended to know the production performance of goats in field condition. The results of this study will help to prioritize the area and to make need specific technical intervention to enhance the productivity of goats.

### MATERIALS AND METHODS

Present study was conducted in districts Firozabad and Mainpuri, of the zone wherein 4 blocks of each district and 3 villages of each block were selected considering the highest goat population. Further, 10 respondents, owning 5

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or more goats, were selected from each village randomly to make the sample size of 240 respondents. All the goat farmers were classified into 3 categories on the basis of land holding as landless, marginal (<1 ha of land), small and semi-medium (1–4 ha of land). Goats (227) of 0 day to 1-year-old were weighed by spring balance and information about 3,279 goats for different production parameters was collected. Data were collected from semi structured interview schedule. Data collection was done during May to October, 2012. Data were analysed with appropriate statistical methods.

## RESULTS AND DISCUSSION

**Milk yield:** Goat milk contributes about 3% in milk pool of the county and Jamunapari breed of goat is well known for milk production. But, respondents did not prefer to keep Jamunapari goat (2.59% of total goat). Sirohi breed was the major milk producer breed in the field followed by non-descript and Barbari wherein great variation was found (Table 1). The low milk yield of goats was mainly due to poor nutrition, poor breed and relatively high reproductive stress (Rai and Singh 2010). Milk yield of Barbari breed varies from 0.5 to 0.8 litre/day and 0.5 to 1.1 litre/day for non-descript breed in Mathura district of same zone (Rai and Singh 2010). There was a great variation in the lactation length as reported by farmers in study area which may be due to poor nutrition and management. Rout *et al.* (2000) reported that in field condition milk yield of Jamunapari goat at 90 and 150 days was 102 and 145 litres, respectively.

**Body weight at different age:** Birth weight and weaning weight are economically important traits in livestock production. These traits are controlled by polygenes and

are also affected by feeding and management under farm conditions (Banarjee and Jana 2010). Breeds i.e., Sirohi, Barbari, Jakhrana and non-descript, in the field of age group of 0 day to 1 year, were taken in study for body weight. Data in Table 2 showed that among all breeds, Jakhrana had numerically highest weight whereas Barbari had lowest but overall there was no significant difference among all breeds (polled weight of all age group) in terms of weight. It may be due to poor nutrition and management that have hindered to express their phenotypic characters. It may also be due to dilution of pure breed line in the study area. Despite the breeds and age, sex has significant effect on the body weight (Table 3) indicating significantly higher in male than that of female. No significant changes were observed in body weight of the same age group of all the breeds (Table 4). It can be concluded that same sized breed has no effect on body weight in field condition. Significant changes ( $P < 0.05$ ) were observed in different age groups but no significant change was observed in the age group of 6–9 months, and 9–12 months in all the breeds. However, numerically average weight of goat in the age group of 9–12 months was higher than that of 6–9 months. It can be concluded that goat should be marketed between 6–9 months of age for better economics of farm. Body weights of Jamunapari breed in field condition at birth, 3, 6 and 9 months were 2.75 kg, 12.3 kg, 16 kg and 22 kg, respectively (Rout *et al.* 2000). In Sirohi breed, under field condition the least squares means of body weight were  $2.35 \pm 0.04$ ,

Table 1. Milk yield and lactation length of different breeds of goats

| Breed                   | Milk yield (litre/day) | Lactation length (Months) |
|-------------------------|------------------------|---------------------------|
| Sirohi                  | 0.9±0.05               | 5-9.5                     |
| Barbari                 | 0.6±0.1                | 3.5-7.5                   |
| Non-descript and others | 0.8±0.05               | 5-9                       |

Table 2. Breed wise distribution of goats according to their body weight

| Breed                   | No. of observation | Least squares means of body weight (kg) | SE   |
|-------------------------|--------------------|---|------|
| Non-Descript and others | 103                | 17.67 <sup>a</sup>                      | 0.46 |
| Sirohi                  | 95                 | 17.91 <sup>a</sup>                      | 0.46 |
| Barbari                 | 23                 | 16.29 <sup>a</sup>                      | 0.75 |
| Jakhrana                | 6                  | 18.55 <sup>a</sup>                      | 1.54 |
| Overall                 | 227                | 17.5                                    | 0.47 |

Figures bearing superscripts do not differ significantly ( $P < 0.05$ ).

Table 3. Sex wise distribution of body weight of goats

| Sex    | No. of observation | Least squares means of body weight (kg) | SE   |
|--------|--------------------|---|------|
| Female | 136                | 16.17 <sup>b</sup>                      | 0.58 |
| Male   | 91                 | 19.04 <sup>a</sup>                      | 0.59 |

Figures bearing different superscripts differ significantly ( $P < 0.05$ ).

Table 4. Age wise distribution of body weight of goats

| Breed                   | Age group                 |                             |                             |                             |
|-------------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|
|                         | 0-3 months                | >3-6 months                 | >6-9 months                 | >9-12 months                |
| Non-descript and others | 8.4 <sup>cA</sup><br>(10) | 14.37 <sup>bA</sup><br>(30) | 19.66 <sup>aA</sup><br>(43) | 20.74 <sup>aA</sup><br>(20) |
| Sirohi                  | 7.3 <sup>cA</sup><br>(4)  | 14.98 <sup>bA</sup><br>(34) | 20.45 <sup>aA</sup><br>(39) | 22.48 <sup>aA</sup><br>(18) |
| Barbari                 | 8.0 <sup>bA</sup><br>(3)  | 14.3 <sup>bA</sup><br>(9)   | 17.2 <sup>abA</sup><br>(6)  | 19.76 <sup>aA</sup><br>(5)  |
| Jakhrana                | -                         | 16.3 <sup>A</sup><br>(2)    | 18.1 <sup>A</sup><br>(4)    | -                           |
| Overall                 | 8.06 <sup>c</sup><br>(17) | 14.68 <sup>b</sup><br>(75)  | 19.75 <sup>a</sup><br>(92)  | 21.35 <sup>a</sup><br>(92)  |

<sup>a-c</sup>Values in the same row without a common superscript letter are significantly different ( $P < 0.05$ ). <sup>A</sup>Values in the same column without a common superscript letter are significantly different ( $P < 0.05$ ). Figures in parentheses denote number of goats weighed.

12.80±0.19, 16.31±0.21, 19.34±0.25 and 23.27±0.36 kg at birth, 3, 6, 9 and 12 months of age, respectively (Meel *et al.* 2010)

**Mortality pattern:** Mortality patterns in herd depict a useful indicator for assessing the status of herd health and management practices and their efficacy. Many diseases were reported in goats in their different age and production stages. Diseases resulted in mortality ranges from 5 to 25% in adults and 10 to 40% in kids. In addition, morbidity losses resulted into low productivity of the animals (Vihan 2009). Mortality in the study area was found to be 21.16%. This finding was in agreement with the finding of Singh *et al.* (2009) as they reported 24.03% mortality in the same zone. Highest mortality was in 0–3 month age group followed by 3–6 month and above 6 months of age, respectively (Table 5). The young animals up to 3 months and 3–6 months age groups were considered as most critical age periods. Higher mortality rate in these periods could be possibly due to less resistance of young animals to various diseases, poor mothering ability of their dams and other management factors. Maximum mortality (52.8%) occurred in winter (November to February) followed by rainy season and summer, respectively. It may be due cold stress and most important occurring viral disease of goats i.e., PPR. In rainy season, there may be high humidity and extreme temperature variations. Parasitic infestation also increased in rainy season which leads to animal weak, emaciated and death. Singh *et al.* (2009) reported that effect of season of birth was highly significant on mortality of kids. Gastrointestinal (36.71%) and respiratory (23.24%) disorders were predominant causes of mortality in the goats.

Table 5. Mortality pattern of goats based on different attributes

| Attribute                                   | Category                      | Mortality/<br>proportional<br>mortality (%) |
|---|-------------------------------|---|
| Age wise<br>mortality                       | Age group                     | Mortality                                   |
|   | 0-3 month                     | 34.60                                       |
|   | >3-6 month                    | 25.42                                       |
|   | > 6 month                     | 19.78                                       |
|   | Total (mortality)             | 21.16                                       |
| Season wise<br>mortality                    | Season                        | Proportional<br>mortality                   |
|   | November-February<br>(winter) | 52.20                                       |
|   | March- June<br>(summer)       | 13.84                                       |
|   | July-October<br>(rainy)       | 33.96                                       |
| System involved<br>in cause of<br>mortality | System                        | Proportional<br>mortality                   |
|   | Respiratory                   | 23.24                                       |
|   | Gastrointestinal              | 36.71                                       |
|   | Urogenital                    | 8.76  |
|   | Miscellaneous                 | 31.29                                       |

Similar finding was reported by Thiruvankadan and Karunanithi (2007). Jitendran and Bhat (1999) reported that production potential of livestock development programme is plagued in the tropical and subtropical areas due to prevalence of helminthes, which causes tremendous economic losses of millions of rupees every year. Swarnkar *et al.* (2010) also reported the gastrointestinal parasitism is the most important which poses direct threat to the health and productivity of sheep. Urogenital disorders contribute 8.76% in the total mortality and rest part was contributed by miscellaneous type of causes. The overall mortality in village conditions in Jamunapari goat was about 3.7% and is mostly due to diarrhea and pneumonia. The mortality was 3.7, 1.9, 9.8 and 2.0% in 0–3, 3–6, and 6–12 months, and adult goats, respectively, over the years (Rout *et al.* 2000).

Reduction in morbidity and mortality are the foremost targets of farm manager. High survival rate is a key factor to ensure genetic improvement and profit from goat keeping. Higher survival rate ensure replacement to low performing and aged goats thus ameliorate the genetic progress by enhancing selection intensity without decreasing the flock size (Singh *et al.* 2009). Improving kid management and proper care of pregnant and lactating does could minimize the loss due to mortality (Thiruvankadan and Karunanithi 2007). Mortality could also be minimized by adopting timely prophylactics, prompt curative measures and necessary management intervention (Singh *et al.* 2009).

**Reproductive performance of dam:** Age of first kidding of Barbari breed was 14.9 months whereas of Sirohi 17.4 months (Table 6). Similar pattern was also found in kidding interval of all breeds. Kidding rate was highest in Barbari (1.42%) and lowest in Jamunapari breed (1.26%). All reproductive performance indicated that non-descript breed of goat may carry blood of Barbari and Sirohi breed which may be the further area of research to prove the statement. Singh *et al.* (2009) reported that the age at first kidding varied from 11 to 17 months in Barbari and 14 to 26 months in non-descript goats. However, the average age at first kidding varied from 12.8 months to 14.7 months in Barbari goat and from 17.2 months to 19.8 months in non-descript goats. The average kidding rate in Barbari and non-descript goats were 1.48 and 1.31%, respectively.

**Reproductive performance of buck:** The success of a goat farms largely depends upon the kind of buck chosen for breeding. The breeding buck should be the progeny of superior parents and should have potential for rapid growth,

Table 6. Reproductive performance of different breeds of goats

| Breed                      | Age of first<br>kidding (months) | Kidding interval<br>(months) | Kidding<br>rate (%) |
|----------------------------|----------------------------------|------------------------------|---------------------|
| Barbari                    | 14.9±1.6 (10)                    | 10±1.1 (13)                  | 1.42                |
| Sirohi                     | 17.4±1.1 (13)                    | 11.6±1.1 (9)                 | 1.37                |
| Jamunapari                 | 18±1.2 (5)                       | 12±0.6 (5)                   | 1.26                |
| Non descript<br>and others | 17.6±2.5 (25)                    | 11.4±0.8 (29)                | 1.29                |

Table 7. Distribution of respondents on the basis of bucks and goat ratio

| Attributes  | Farmers' categories |                  |                              |                 |
|---|---------------------|------------------|------------------------------|-----------------|
|   | Landless (n=62)     | Marginal (n=130) | Small and Semi Medium (n=48) | Overall (N=240) |
| No. of bucks  | 56                  | 62               | 16                           | 134             |
| No. of farmers posses buck                                    | 34                  | 49               | 11                           | 94              |
| % of farmers keep buck  | 54.8                | 37.7             | 22.9                         | 39.2            |
| No. of goats  | 1083                | 1689             | 507                          | 3279            |
| Goat:buck   | 19.3                | 27.2             | 31.7                         | 24.5            |
| Correlation coefficient between number of buck and flock size | 0.747**             | 0.84**           | 0.926**                      | 0.817**         |

\*\*P&lt;0.01.

higher feed conversion efficiency and excellent meat quality. Normally one buck is sufficient for 25 does (Ramachandran *et al.* 2009). Table 7 depicts that only 39.2% of goat farmers in the study area keep buck. Majority of landless farmers (54.8%) used to keep buck followed by marginal (37.7%) and small and semi medium (24.5%). Similar pattern found in the goat-buck ratio for different categories of farmers. It can be concluded that farmers who owned large size of land were less interested to keep buck. Correlation coefficient between number of buck and flock size was highly significant in all the categories. Majority (34.3%) of bucks in the study area were in age group of 5–6 years followed by 3–4 years (24.6%) and 4–5 years

Table 8. Distribution of bucks on different attributes

| Attribute                              | Category                   | Response                          | Per cent                      |      |
|--|----------------------------|-----------------------------------|-------------------------------|------|
| <i>Age wise distribution of buck</i>   | <i>Age of buck (years)</i> | <i>No. of buck</i>                | <i>Per cent</i>               |      |
|  |                            | 2-3                               | 14                            | 10.4 |
|  |                            | >3-4                              | 33                            | 24.6 |
|  |                            | >4-5                              | 27                            | 20.1 |
|  |                            | >5-6                              | 46                            | 34.3 |
|  |                            | >6-7                              | 9                             | 6.7  |
|  |                            | >7-8                              | 5                             | 3.7  |
|  | Total                      | 134                               | 100                           |      |
| <i>Breed wise distribution of buck</i> | <i>Breed</i>               | <i>No. of buck</i>                | <i>Per cent of total buck</i> |      |
|  |                            | Sirohi                            | 97                            | 72.4 |
|  |                            | Barbari                           | 26                            | 19.4 |
|  |                            | Non descript and others           | 11                            | 8.2  |
|  | Total                      | 134                               | 100.0                         |      |
| <i>Service required for conception</i> | <i>Number of service</i>   | <i>Farmers' responses (N=240)</i> | <i>Per cent</i>               |      |
|  |                            | One                               | 78                            | 32.5 |
|  |                            | Two                               | 162                           | 67.5 |

(20.1%) (Table 8). It also revealed that majority of bucks were of Sirohi breed (72.4%) followed by Barbari (19.4%) and 8.2% were of non-descript and other. Further, majority of respondents (67.5%) were practicing two time service to their goats for conception during heat time followed by 32.5% respondent who were practicing single time service. Rashmi (2010) reported that 75% farmers were providing two services per heat period for goats.

Production performance of different breeds of goats in the study area was not optimum. Due to unplanned breeding, breed characters were diluted in goats. Kidding rate was highest in Barbari and lowest in Jamunapari breed. Mortality was comparatively higher and major cause of mortality related to alimentary ailments. So, planned breeding and health care measures are important requirement to get optimum production of breeds in the study area.

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