

# Production and Nutritional Status of Crossbred Cows are Influenced by Different Herd Size Groups

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## Abstract

A study was conducted with objective to know the influence of herd size on production and nutritional status of cross-bred cow's Maudah block of Hamirpur district of Uttar Pradesh based on primary data which were collected 88 randomly selected animals scattered in 6 villages by personal interview method in different herd size groups and observed that per day milk yield was greater ( $7.7 \pm 0.30$  liter) in small herd size group than medium ( $7.30 \pm 0.26$  lit.) and large ( $6.90 \pm 0.28$  lit.) herd size, significantly ( $p \leq 0.01$ ). The same trend was found in body weight of cross-bred cows. The nutrients (DM, DCP and TDN) requirements were significantly oversize in small herd size ( $10.45 \pm 0.12$ ,  $0.6105 \pm 0.010$  and  $5.578 \pm 0.14$  kg.) than medium ( $10.25 \pm 0.13$ ,  $0.5875 \pm 0.010$  and  $5.404 \pm 0.16$  kg.) and large ( $9.78 \pm 0.15$ ,  $0.5666 \pm 0.012$  and  $5.164 \pm 0.15$ ) herd size. The availability of DM, DCP and TDN were significantly inferior in large herd size ( $8.51 \pm 0.13$ ,  $0.4086 \pm 0.009$  and  $4.724 \pm 0.13$  kg.) than small ( $9.850 \pm 0.10$ ,  $0.5340 \pm 0.009$  and  $5.268 \pm 0.12$  kg.) and medium ( $9.41 \pm 0.11$ ,  $0.4795 \pm 0.010$  and  $5.0680 \pm 0.15$  kg.) herd size groups. It is observed from the study that the production and nutritional status was significantly much poor in large herd size groups than small and medium herd size groups. It is also observed from the study that the productions as well as nutrients (DM, DCP and TDN) availability were decrease with increasing herd size significantly.

**Key Words:** Cross-bred cows, Milk yield, Nutritional status, Dry matter, DCP, TDN

### Introduction

In the global context, India is the oyster of the global dairy industry. The performance of the Indian dairy sector appears impressive in terms of livestock production as well as in quantity of milk production but extremely poor in terms of productivity (*Bhaskar and Gupta 2006*).

### Review of Literature

The Indian dairy industry is poised for dramatic growth in the coming decades. The population growth, high income, elastic demands for milk & milk products as well changing our food habits that are fuelling the increase in milk consumption are expected to continue well into the millennium. As a matter of National policy, the cross-bred cows in India are being propagated for increased milk production because crossbred cows are more productive than most of indigenous cows or buffaloes. As a result, the cross-bred cows which have higher milk yield potential are being preferred by the rural milk producers. The serious constraint faced by the milk producers is the shortage of feeds and fodders (*Bhaskar and Gupta 2017*). In the computation of a ration for them, the first consideration is given to the capacity of the animal for consumption (*Bhaskar and Gupta 2018*). To assess the influence of herd on production and nutritional status of crossbred cows, the first consideration is given to the animal's capacity which measured by the appetite of the animals which measured in the form of total amount of dry matter in the ration which an animal can consume usually, which varies with the live weight of the animal and nature of the production. Milch cows generally 2.5 kg dry matter (DM) per 100 kg live weight. Next important information required is the quantity of digestible crude protein (DCP) and total digestible nutrients (TDN) which the ration must supply. The present studies were, therefore, conducted to assess the production performance, quality of milk produced and nutritional status of crossbred cows influenced by herd size.

### Aim of the Study

The research was conducted to assess the effect of herd size on (i) quantity and quality of milk produced by crossbred cows (ii) body weight of crossbred cows (iii) nutritional status of crossbred cows.

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**Research methodology**

The study was undertaken between November and December 2020 in six selected villages of *Maudah* block of *Hamirpur* district of Uttar Pradesh. After selection of villages, a list of families having crossbred cows was prepared. In all 51 families were selected. There were 88 animals' studies which belong to different lactation numbers and herd size groups. Herd size was divided into three groups designated as (i) small (having one animal) (ii) medium (having two animals) (iii) large (having more than two animals). To estimate and compare the influence of herd size on production, quality of milk produced and nutritional status of crossbred cows. The observations regarding milk yield and nutritional status of these cows were obtained from selected farmers through face to face interviews with help of a well structured and pretested questionnaire and by personal observations. It comprised milk yield, feeding pattern, quantity of feed and fodder offered during 24 hours recording body weight and collection of concentrate, wheat straw and green fodder. Besides this, the amounts of nutrients available to the animals from other fodders were calculated by considering the average nutritive value of the respective fodders (Ranjhan, 1998). Fat percent in milk was determined by the standard Gerber's method as recommended by AOAC (1965) and body weight by the following formula-

$$\text{Body weight (kg)} = \text{Length(cm)} * \text{Heart girth(cm)} * 0.367/A$$

Where, 'A' is equivalent to 22.85 in case of heart girth measurement is below 165 cm. and 21.60 if heart girth measurement is between >165 to 200 cm. The heart girth measurement above 200 cm, the value of 'A' is replaced by 20.30

The milch cow consumes generally 2.5 kg dry matter (DM) / 100 kg live weight. About 2/3 or more dry matters to be consumed should come from the roughages and rest from the concentrate mixture. In case of digestible crude protein (DCP) and total digestible nutrients (TDN), the ration of milch animal is calculated on the basis of extra maintenance requirements plus that for the daily milk yield. The extra nutrients required for milk production also vary with the fat content of milk and level of milk production. The maintenance and production ration of each animal was computed according to the feeding standard suggested by Sen, et.al. (1971) and data were statistically analyzed according to Snedecor and Cochran (1968).

**Findings and Suggestion**

The influence of herd size variation on different components of milk production, quality of milk produced, body weight and nutritional status of crossbred cows were studied in depth and the salient features are abridged hereunder:

The concentrates and the feed and fodders given to the animals comprised the production and the maintenance ration at the farmer's level. The weight of animals was calculated by the formula. Thus the maintenance and production ration were computed for each animal according to standards (Table: 1 & 2) prescribed by Sen et.al.(1971).

**Table-1: Nutrients requirement for maintenance of ruminants.**

| S. No. | Live weight (kg) | Digestible crude Protein (DCP) in kg | Total digestible nutrients (TDN) in kg |
|--------|------------------|--------------------------------------|--|
| 1.     | 150              | 0.102                                | 1.27                                   |
| 2.     | 200              | 0.148                                | 1.66                                   |
| 3.     | 250              | 0.168                                | 2.02                                   |
| 4.     | 300              | 0.197                                | 2.36                                   |
| 5.     | 350              | 0.227                                | 2.70                                   |
| 6.     | 400              | 0.254                                | 3.03                                   |
| 7.     | 450              | 0.282                                | 3.37                                   |
| 8.     | 500              | 0.296                                | 3.69                                   |
| 9.     | 550              | 0.336                                | 3.71                                   |

**Table-2: Nutrients Requirement For Production Per Kg Of Milk To Be Added To The Maintenance Allowance.**

| S. No. | Fat in milk (%) | Digestible crude Protein (DCP) in kg | Total digestible nutrients (TDN) in kg |
|--------|-----------------|--------------------------------------|--|
|--------|-----------------|--------------------------------------|--|

|    |    |       |       |
|----|----|-------|-------|
| 1. | 3  | 0.040 | 0.269 |
| 2. | 4  | 0.045 | 0.316 |
| 3. | 5  | 0.051 | 0.363 |
| 4. | 6  | 0.057 | 0.411 |
| 5. | 7  | 0.063 | 0.458 |
| 6. | 8  | 0.069 | 0.506 |
| 7. | 9  | 0.075 | 0.553 |
| 8. | 10 | 0.081 | 0.602 |
| 9. | 11 | 0.085 | 0.650 |

The data on milk production, quality of milk produced and nutritional status as matters (DM), digestible crude protein (DCP) and total digestible nutrients (TDN) requirements and availability of crossbred cows per day per head are presented (table: 3) evident that body weight of crossbred cows in small, medium and large herd size groups were found to be  $418.20 \pm 6.89$ ,  $409.6 \pm 6.17$  and  $391.30 \pm 5.70$  kg respectively. These results indicated that the body weight decreased with increased herd size significantly ( $p \leq 0.01$ ). It is due to decreasing availability of nutrients with increase in herd size. The average milk yield per day of 88 crossbred cows (28 small, 24 medium and 36 large herd size groups) were  $7070 \pm 0.30$ ,  $7.3 \pm 0.26$  and  $6.90 \pm 0.28$  liters in small, medium and large herd size groups respectively. Our results showed that the milk production was greater in small herd size groups but if we increased herd size, the milk production decreased significantly ( $p \leq 0.05$ ). The average fat percentages were found to be  $3.90 \pm 0.06$ ,  $4.10 \pm 0.10$  and  $4.2 \pm 0.11$  in small, medium and large herd size groups respectively. It is evident that fat percent was increased with increased herd size insignificantly. The table antecedently indicated that dry matter requirement and availability of these cows was found to be  $10.45 \pm 0.12$  and  $9.85 \pm 0.10$ ,  $10.24 \pm 0.13$  and  $9.41 \pm 0.11$  and  $9.78 \pm 0.15$  and  $8.51 \pm 0.13$  kg per day per animal respectively in small, medium and large herd size groups. These data indicated that the dry matter (DM) requirement and availability decreased with increased herd size significantly ( $p \leq 0.01$ ). It is also clear from the study that the dry matter (DM) requirement was higher than that of availability in all herd size groups. It was due to feeding of poor quality roughages and concentrates in the ration to these cows which results in lower milk production. Roughages are the cheaper ingredient to form the bulk of the ration which fulfills the dry matter (DM) requirement of the animals.

The deficit supply of dry matter (DM) indicated that the animals remained under fed which affected their productivity (Table: 3). The table further revealed that digestible crude protein (DCP) requirement and availability of crossbred cows in small, medium and large herd size was found to be  $0.6105 \pm 0.01$  and  $0.5340 \pm 0.009$ ,  $0.5875 \pm 0.011$  and  $0.4795 \pm 0.010$  and  $0.5666 \pm 0.012$  and  $0.4086 \pm 0.009$  kg per day per animal respectively. It is evident from these data that requirement and availability of digestible crude protein (DCP) decreased with increase in herd size groups significantly ( $p \leq 0.05$ ). The results also show that availability of digestible crude protein (DCP) was much lower than actual requirements. The paucity of digestible crude protein (DCP) in the ration of crossbred cows was due to scarce supply of leguminous feeds, fodders and concentrates, which are the exact source of digestible crude protein (DCP). The higher cost of concentrates was a major constraint. The same trends were obtained in total digestible nutrients (TDN) requirement and availability of these animals in all herd size groups. The results further indicated that nutritional status of crossbred cows was significantly ( $p \leq 0.05$ ) affected by herd size variation. Small herd size was better than medium and large herd size groups. The productivity of animals could be increased by feeding adequately with leguminous forage and along with concentrate with increasing herd size.

**Table-3: Nutritional status of crossbred cows**+ Significant  $p \leq 0.05$ , ++ Significant  $p \leq 0.01$ , and - Deficit

| Herd size       | No. of animals | Body weight (kg) | Milk yield/day (lit.) | Fat in milk (%)     | Nutrients requirement (kg) |                   |                                  | Nutrients availability (kg) |                                    |                 | Nutritional status kg |         |        |
|-----------------|----------------|------------------|-----------------------|---------------------|----------------------------|-------------------|----------------------------------|-----------------------------|------------------------------------|-----------------|-----------------------|---------|--------|
|                 |                |                  |                       |                     | DM                         | DCP               | TDN                              | DM                          | DCP                                | TDN             | DM                    | DCP     | TDN    |
| Small           | 28             | 418.20<br>± 6.89 | 7.70<br>± 0.30        | 3.90<br>± 0.06      | 10.45<br>± 0.12            | 0.6105<br>± 0.010 | 5.578<br>±                       | 9.85<br>± 0.10              | 0.5340<br>±                        | 5.268<br>± 0.12 | -0.60                 | -0.081  | -0.31  |
| Medium          | 24             | 409.60<br>± 6.17 | 7.30<br>± 0.26        | 4.10<br>± 0.10      | 10.24<br>± 0.13            | 0.5875<br>± 0.011 | 0.14<br>5.404                    | 9.41<br>± 0.11              | 0.009<br>0.4795                    | 5.068<br>± 0.15 | -0.83                 | -0.108  | -0.54  |
| Large           | 36             | 391.30<br>± 5.70 | 6.90<br>± 0.28        | 4.20<br>± 0.11      | 9.78<br>± 0.15             | 0.5666<br>± 0.012 | ±<br>0.16                        | 8.51<br>± 0.13              | ±<br>0.010                         | 4.724<br>± 0.13 | -1.27                 | -0.158  | -0.44  |
| Overall average | 88             | 404.85<br>± 6.25 | 7.26<br>± 0.28        | 4.10<br>± 0.09      | 10.16<br>± 0.13            | 0.5837<br>± 0.011 | 5.164<br>±<br>5.383<br>±<br>0.15 | 9.26<br>± 0.11              | 0.4086<br>±<br>0.009<br>±<br>0.009 | 5.019<br>± 0.13 | -0.90                 | -0.116  | -0.36  |
| Variance ratio  |                | 5.314**          | 1.981*                | 0.713 <sup>NS</sup> | 4.165**                    | 2.694*            | 6.016*                           | 4.617*                      | 2.319*                             | 4.916**         | 5.169*                | 4.886** | 3.913* |

**Conclusion**

The body weight of crossbred cows was significantly ( $p \leq 0.05$ ) affected by herd size but quality of milk was affected insignificantly. The nutritional status of these animals was also affected by herd size significantly ( $p \leq 0.01$ ). The nutritional status becomes poor with increasing herd size. It can be increased by feeding adequately by feeding leguminous forage and some concentrate and decreasing herd size. According to above results, small herd size was better than medium and large herd size.

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