

Socio-economic profile of farmers and performance of crossbred dairy cattle reared under the dairy cooperative's societies in Khasi and Jaintia Hill districts of Meghalaya

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Abstract

A study was conducted on socioeconomic profile of dairy farmers and performance of crossbred dairy cattle reared under dairy cooperative's societies in Khasi and Jaintia hill districts of Meghalaya. Data were collected from 120 dairy farmers from two districts, Khasi hill (60 farmers) and Jaintia hill (60 farmers), under 20 dairy cooperative societies, with 6 farmers from each society, based on the number of dairy animals, years of rearing and quality of milk sold to dairy cooperative societies. The data were primarily collected from the dairy farmers in the study area. The study found that majority (81.70%) of the dairy farmers were male, 42.50 per cent of the respondents were middle-aged (30-50 years) which had a medium (3-7) size family (63.30%) and 30.80 per cent were educated up to middle school. Majority (75.80%) of farmers hold marginal (0.5-1 ha) land holding and nearly all of them (91.70%) engaged in agriculture and animal husbandry as their primary activity and 50.80 per cent of them earn less than Rs 53,281 annually. The mean peak milk yield, daily milk yield and lactation yield were 13.30 ± 0.21 , 7.94 ± 0.20 and 2660.66 ± 42.86 L, respectively with the lactation length of 301.84 ± 1.49 days. The mean calving interval and service period were 407.02 ± 2.13 and 105.18 ± 1.59 days, respectively. The mean age at first calving was 31.37 ± 3.49 months and service per conception was 2.12 ± 0.03 numbers.

Keywords: Dairy farmers, Herd size, Production, Reproduction, Socio-economic

Highlights

- Majority of the dairy farmers belonged to the middle age group
- Most of the dairy farmers were found medium herd size
- Large herd size dairy farms show higher yields than those in small and medium herd size farms
- Age at first calving in small herd category was younger than that of the other categories

INTRODUCTION

Meghalaya is basically agrarian state as it is rural based with agriculture playing a predominant role of the state's economy (19th Livestock Census, GoI, 2012). Livestock sector in Meghalaya is the most feasible solution to address the challenges of accelerating farm income and sustaining the agricultural development in the state (NSSO, 2003). Since, more than 70.00 per cent of the state's population depends on agriculture, employment and income generation also depends on agricultural development activities to a great extent (GOM, 2020).

Meghalaya total milk production was 89.14 thousand metric tonnes in 2020 - 21 which was 1.89 per cent more than the previous year 2019 - 20 of 87.48 thousand metric tonnes, out of which 99.01 per cent

come from bovine and out of which milk from crossbred cattle contributed 59.13 per cent and 39.88 per cent from the indigenous cattle and the remaining 0.90 per cent came from buffalo. The average yield of cow in milk of crossbred cattle in Meghalaya was 9.01 kg per animal per day, but the local cows and buffalo are low yielders, i.e., 0.77 and 1.86 kg per animal per day respectively. Meghalaya makes up 0.80 per cent of the nation's overall milk production (BAHS, 2023).

The current study was conducted to investigate the socio-economic profile of farmers and performance of crossbred dairy cattle reared under cooperative societies in the districts of Khasi and Jaintia Hills in Meghalaya.

MATERIALS AND METHODS

The study was carried out in the Khasi and Jaintia

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Hill districts of Meghalaya. Based on the number of dairy animals, years of rearing, and quality of milk sold to dairy cooperative societies. The method of sampling used was multi-stage sampling and the period of data collection duration was 8 months. Data were collected from 120 dairy farmers from two districts, Khasi hills (60 farmers) and Jaintia hills (60 farmers), under 20 dairy cooperative societies, with 6 farmers from each society. The data were collected from the dairy farmers with the help of predesigned and pretested organized interview schedule. The data were analyzed with the help of ANOVA, frequencies, percentage, mean and standard error methods by the help of SPSS Software and MS Excel.

RESULTS

Socioeconomic profile of dairy farmers

Age: Based on the results of this study (Table 1), the majority of dairy farmers (42.50%) were in the middle (35-50 years) age, while 32.50 and 25.00 per cent belonged to young (under 35 years) and old (over 50 years) age group respectively. The respondent's age was calculated in years from birth to the time of the interview. The individual age determined the persons level of exposure, experience and maturity level.

Gender: As per the data in Table 1, majority of respondents (81.70%) were male and 18.30 per cent were female. Gender refers to the socially constructed traits and standards, behaviors, duties and responsibilities assigned to men and women in their families, societies and cultures.

Family size: The present study concluded that majority (63.30%) of the farmers, belonged to medium (3 to 7) family size while 19.20 and 17.50 per cent belonged to small (<3) and large (>7) family size respectively (Table 1). The period of time available for home duties depending on the size of the family. As per the census of India 2011, in Meghalaya, majority of the family belonged to family size of 6 to 8 members (GOM, 2018).

Occupation: The data collected during the study (Table 1) revealed that majority (91.70%) of the dairy farmers were engaged in dairy farming in addition to agriculture and 5.80 per cent have business as their primary source of income, 1.70 per cent had private jobs and only 0.80 per cent were employed by the government. Any regular activity that a person engaged in as their major or normal line of employment, especially one that enables them to sustain themselves, is regarded as their occupation. It established the income-generating activities of the farmers and their degree of participation in these activities. As per census of India 2011, around 30.00 per cent of the total workers in Meghalaya were engaged in agricultural work.

Educational qualification: As per Table 1, the study revealed that majority (24.20%) of respondents were in middle school, followed by illiterate (20.80%), secondary school (16.70%), graduate and above (15.80%), primary school (13.30%) and higher secondary school (9.20%). Education is the process of imparting knowledge or learning a habit through study or teaching. Meghalaya literacy rate as per census of India, 2011 was 74.43 per cent.

Annual income: The present study revealed that majority (50.80%) of the dairy farmers were having low (Up to Rs 53,280) annual income while 25.80 and 23.40 per cent have high (Above Rs 78,907) and medium (Rs 53,281- Rs 78,907) annual income respectively (Table 1). Income is the money that one gets from working. It is total amount of money that a respondent earned each year, from the sale of cow, milk and manure was taken into consideration.

Land holding capacity: The results of the study revealed that 75.80 per cent of the respondents were marginal farmers (<1 ha) followed by small (1-2 ha) (11.70%), semi-medium (2-3 ha) (6.70%) and large (4-5 ha) (5.80%) land holding capacity (Table 1). Land is an important and critically scarce component of

Table 1. Socio-economic profile of different categories of dairy farmers

S.N	Particulars	Categories	Small herds farmers (10)	Medium herd farmers (95)	Large herd farmers (15)	Overall (120)
			N (%)	N (%)	N (%)	N (%)
1	Age	Young (<35)	4 (40.00)	31 (32.60)	4 (26.70)	39 (32.50)
		Middle (35-50)	1 (10.00)	43 (45.30)	7 (46.70)	51 (42.50)
		Old (>50)	5 (10.00)	21 (22.10)	4 (26.70)	30 (25.00)
2	Gender	Female	1 (10.00)	19 (20.00)	2 (13.30)	22 (18.30)
		Male	9 (90.00)	76 (80.00)	13 (86.70)	98 (81.70)

Cont. Table 1.

Table 1., Cont. ...

S. N	Particulars	Categories	Small herds farmers (10)	Medium herd farmers (95)	Large herd farmers (15)	Overall (120)
			N (%)	N (%)	N (%)	N (%)
3	Family size	Small (<3)	1 (10.00)	20 (21.10)	2 (1.67)	23 (19.17)
		Medium (3-7)	6 (60.00)	62 (65.30)	8 (6.67)	76 (63.33)
		Large (>7)	3 (30.00)	13 (13.70)	5 (4.17)	21 (17.50)
4	Occupation	Agri + A.H	7 (70.00)	89 (93.60)	14 (93.30)	110 (91.70)
		Govt. Sector	0 (0.00)	1 (1.10)	0 (0.00)	1 (0.80)
		Private Sector	1 (10.00)	1 (1.10)	0 (0.00)	2 (1.70)
		Business + Agri + A.H	2 (20.00)	4 (4.20)	1 (6.70)	7 (5.80)
5	Educational qualification	Illiterate	2 (20.00)	22 (23.20)	1 (6.70)	25 (20.80)
		Primary	0 (0.00)	13 (13.70)	3 (20.00)	16 (13.30)
		Middle	1 (10.00)	25 (26.30)	3 (20.00)	29 (24.20)
		Secondary	4 (40.00)	12 (12.60)	4 (26.60)	20 (16.70)
		Higher Sec.	1 (10.00)	9 (9.50)	1 (6.70)	11 (9.2)
		Graduate	2 (20.00)	14 (14.70)	3 (20.00)	19 (15.80)
6	Annual income	Low (< ¹ 53,280)	5 (50.00)	50 (52.60)	6 (40.00)	61 (50.80)
		Medium (¹ 53,281- ¹ 78,907)	2 (20.00)	25 (26.30)	1 (6.70)	28 (23.40)
		Large (> ¹ 78,907)	3 (30.00)	20 (21.10)	8 (53.30)	31 (25.80)
7	Land holding capacity	Marginal (0.5-1 ha)	7 (70.00)	75 (78.90)	9 (60.00)	91 (75.80)
		Small (1-2 ha)	1 (10.00)	8 (8.40)	5 (33.30)	14 (11.70)
		Semi-Medium (2-3 ha)	1 (10.00)	7 (7.40)	0 (0.00)	8 (6.70)
		Medium (3-4 ha)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Large (4-5 ha)	1 (10.00)	5 (5.30)	1 (6.70)	7 (5.80)

Table 2. Herd size of dairy farmers

Category	Small herd farmers (<3)	Medium herd farmers (3-17)	Large herd farmers (>17)	Overall
Herd size	10 (8.33%)	95 (79.17%)	15 (12.50%)	120 (100%)

production. Operating land holdings are a good measure of a rural household's financial soundness.

Herd size: The findings of the present study as shown in the Table 2, revealed that the majority of respondents (79.17%) had medium herd size (3-17), followed by 12.50 and 8.33 per cent of the respondent which were having a

large (>17) and small herd size (<3) respectively. The number of animals kept together, fed or grazed, as well as other activities taking place in a farmer's herd, were referred to as the herd size.

Production performance of the dairy cattle

Average daily milk yield (lit): The data revealed that the average daily milk yield of small, medium and large herd categories of farmers was 7.92 ± 0.88 , 7.87 ± 0.22 , and 8.43 ± 0.58 L respectively. The overall average milk yield of crossbred cattle was 7.94 ± 0.20 L (Table 3). The daily milk yield of crossbred cattle in

Table 3. Production performance of the dairy cattle

Sl. No.	Parameter	Small herd farmers (Mean $\pm$ SE)	Medium herd farmers (Mean $\pm$ SE)	Large herd farmers (Mean $\pm$ SE)	Overall (Mean $\pm$ SE)	P value
1	Average daily milk yield (lit)	7.92 $\pm$ 0.88	7.87 $\pm$ 0.22	8.43 $\pm$ 0.58	7.94 $\pm$ 0.20	0.67 ^{NS}
2	Peak yield (lit)	11.96 ^a $\pm$ 0.42	13.13 ^a $\pm$ 0.22	15.31 ^b $\pm$ 0.72	13.30 $\pm$ 0.21	<0.01**
3	Lactation length (days)	303.33 $\pm$ 1.36	300.68 $\pm$ 1.44	308.20 $\pm$ 7.66	301.84 $\pm$ 1.49	0.24 ^N
4	Lactation yield (lit)	2391.67 ^a $\pm$ 84.30	2625.57 ^a $\pm$ 44.86	3062.25 ^b $\pm$ 144.09	2660.66 $\pm$ 42.86	<0.01**

SE=Standard Error; NS= Not Significant, ** Significant at 1% level; Means bearing different superscripts in a row differ significantly (P<0.01)

Table 4. Reproductive performance of the dairy cattle

Sl. No.	Parameter	Small herd farmers (Mean±SE)	Medium herd farmers (Mean±SE)	Large herd farmers (Mean±SE)	Overall (Mean±SE)	P value
1	Age at 1st Calving (M)	28.71 ^a ±0.57	31.44 ^b ±3.54	32.69 ^b ±3.53	31.37±3.49	0.02*
2	Service period (days)	105.17±6.43	104.93±1.82	106.85±3.44	105.18±1.59	0.92 ^{NS}
3	Service per conception (number)	2.33±0.15	2.11±0.03	2.11±0.09	2.12±0.03	0.12 ^{NS}
4	Calving interval (days)	408.50±6.27	405.60±2.10	415.05±9.91	407.02±2.13	0.34 ^{NS}

SE= Standard Error; NS = Not Significant * Significant at 5% level; Means bearing different superscripts within a row differ significantly (P<0.05)

India was 8.55 kg (BAHS, 2023).

Peak milk yield (lit): As per the data (Table 3), the peak milk yield (L) of crossbred dairy cattle for small, medium and large herd category of farmers was 11.96±0.42, 13.13±0.22 and 15.31±0.72 L respectively, while the overall peak yield was 13.30±0.21 L. The peak yield of crossbred cattle was 25-30 litres (Thomas *et al.*, 1991).

Lactation length (days): According to present study (Table 3), the average lactation length (days) of crossbred dairy cattle in the small, medium and large herd categories of farmers were 303.33±1.36, 300.68±1.44 and 308.20±7.66 days respectively, whereas the overall lactation length was 301.84±1.49 days. The lactation length of Holstein Friesian cattle was 279-392 days (Thomas *et al.*, 1991).

Lactation yield (lit): As per the data (Table 3), the average lactation yield of crossbred dairy animals of small, medium and large herd category of farmer was 2391.67±84.30, 2625.57±44.86 and 3062.25±144.09 L respectively. Whereas the overall average lactation yield was 2660.66±42.86 L. The lactation yield of crossbred cattle was 2242-3128 L (Thomas *et al.*, 1991).

Reproductive performance of the dairy cattle

Age at first calving (months): The study revealed that, the average age at first calving of crossbred dairy cattle of small, medium and large herd category of farmers were 28.71±0.57, 31.44±3.54 and 32.69±3.53 months respectively. Whereas the overall average age at first calving was 31.37±3.49 months (Table 4). The age at first calving of crossbred cattle was 879-1027 days (Thomas *et al.*, 1991).

Service period (days): The present study found that the average service period of crossbred dairy animals of small, medium and large herd category of farmer was 105.17±6.43, 104.93±1.82 and 106.85±3.44 days,

respectively whereas the overall average service period was 105.18±1.59 days (Table 4). The service period of crossbred cattle was 105-122 days (Thomas *et al.*, 1991).

Service per conception (number): As per data (Table 4) of present study, average number of services per conception of crossbred animals of small, medium and large herd category of farmers were 2.33±0.15, 2.11±0.03 and 2.11±0.09 respectively, whereas the overall average number of services per conception was reported to be 2.12±0.03.

Calving interval (days): The present research revealed that calving interval (days) of crossbred animals of small, medium and large herd farmers were 408.50±6.27, 405.60±2.10 and 415.05±9.91 days respectively, whereas the overall calving interval was found to be 407.02±2.13 days (Table 4). The calving interval of crossbred cattle was 384-400 days (Thomas *et al.*, 1991).

DISCUSSION

The age of farmers during the present research revealed that 42.50 per cent of farmers were in the middle (35-50 years) age (Table 1). This could be due to limited prospects for reliable government or private sector employment at that age. The findings of Ram *et al.* (2018) during their study in Junagadh district of Gujarat reported that majority of the respondents (62.50%) were middle (39-55 years) age and also the findings of Girish *et al.* (2020), Gupta *et al.* (2020), and Singh (2022) reported similar results. On the contrary, Pradeep (2022) reported that in Manipur, 46.91 per cent of the dairy farmers belonged to old (>45 years) age group.

The gender of the farmers during the present research recorded that majority of respondents (81.70%) were male (Table 1). This is because in the tribal areas of Meghalaya, the people live in a matrilineal society. Almost all the land and property

owned by the women, but the man managed the farm and performed almost all of the activities such as washing, cleaning, feeding, and grass cutting. Tamang *et al.* (2023) studied at Topatoli village of Kamrup Metropolitan district of Assam found that majority of the respondents (85.71%) were male and the findings were also found to be in agreement to that of Rahman and Gupta (2015), Kalaivani *et al.* (2017) and Sasidharan *et al.* (2023). On the contrary, Singh (2022) during his study in Manipur reported that majority of the farmer (56.70%) were female.

The study revealed that majority (63.33%) of the farmers were having a medium (3 to 7) family size (Table 1). This may be due to the reason that the people of Meghalaya followed matrilineal society which means that when people get married the husband will be staying in the wife house and also in the village area, every member of the siblings left their home except the youngest daughter who will take care of the parents and also the respondents in the study area do not live in a joint family which is why majority of the farmers were having a family size of 3-7 members. Gupta *et al.* (2020) during their study in the Surguja district of Chhattisgarh found that 85.83 per cent of respondents belonged to the medium (>3 to 7) family size and also the conclusions were consistent with those of Ram *et al.* (2018) and Singh (2022). On the contrary, Vekariya *et al.* (2016) studied in South Saurashtra region of Gujarat concluded that majority of the dairy farmers (47.50%) belonged to large family size.

The occupation status in the study area found that the majority (91.70%) of the dairy farmers were engaged in dairy farming plus agriculture work (Table 1). This was due to the reason that the majority of respondents with a moderate or low level of education chose agriculture and other animal husbandry activities as a source of income. Singh (2022) during his survey in Manipur found that majority of the respondents (89.20%) works under agriculture along with animal husbandry and also the findings of Ram *et al.* (2018) and Gopi *et al.* (2020) were in consistent to the present study.

The education level of the present study shows that 24.20 per cent of respondents were in middle school (Table 1). This is because the groups of people with moderate or lower levels of education contained a higher concentration of farmers. Dairy farming was only practiced by low or middle-literate farmer groups in the study areas since individuals with higher levels of education had more employment opportunities. The study reported by Singh (2022) in Manipur stated that the education level of majority (30.80%) of the dairy

farmers was middle school and similar findings were reported by Sharma *et al.* (2012) and Girish *et al.* (2020). On the contrary, Vekariya *et al.* (2016) during their studies in South Saurashtra region of Gujarat and concluded that majority of the dairy farmers (40.83%) were educated up to secondary standard.

Income level for majority of the dairy farmers belonged to low (Up to Rs 53,280) annual income (Table 1) because most of the farmers owned marginal land holdings (<1ha) and made only minimal money from farming, return from milk and dung due to owning lesser number of animals and other endeavors. This could be the cause of the low annual income level. Pandu *et al.* (2022) conducted their study in Telangana, Nalgonda district and found that majority (89.48%) of the dairy farmers had low (Rs 30,000 - Rs 1,70,000) annual income and similar conclusions were also reached by Prasad *et al.* (2017) and Saurav *et al.* (2023). On the contrary, Vekariya *et al.* (2016) in South Saurashtra region of Gujarat concluded that majority of the dairy farmers (59.17%) were having a medium annual income.

The land holding capacity of the dairy farmers in the study area shows that 75.63 per cent of the respondents were marginal farmers (<1 hectare) (Table 1) because majority of the respondents belonged to low socio-economic class, which may be the cause of their majority having marginal land holdings. Singh (2022) in Manipur reported that the majority (96.70%) had marginal (below 1 ha) size of land and the findings of Prasad *et al.* (2017), Kalaivani *et al.* (2017) and Girish *et al.* (2020) share similarities with the results of the present study. On the contrary, Vekariya *et al.* (2016) in South Saurashtra region of Gujarat concluded that majority of the dairy farmers (32.50%) were landless.

The study revealed that 79.17 per cent of the dairy farmers had medium herd size (3-17) (Table 2) because during the time of study it was observed that most farmers had marginal size land which makes it difficult for them to maintain the large herd size of milch animals. The findings of Kumar *et al.* (2020) during his survey in Karnataka reported that 52.00 per cent of dairy producers had medium herd size (4-9 cattle) and also share similar results to findings of Rahman and Gupta (2015) and Singh (2022). On the contrary, Prajapati (2016) conducted a study in south Gujarat reported that majority (59.00%) of the farmers were having a large (>10) herd size.

The overall average daily milk yield observed was 7.94 ± 0.20 L that in study area (Table 3). The average daily milk yield varies in different herd size because

various management strategies were employed, as well as the manner they feed and water their dairy cows. The present study's results were consistent with Meena *et al.* (2015), who reported that overall daily milk yield was 7.55 ± 0.74 L in Uttar Pradesh. On the contrary, the findings recorded by Bairwa *et al.* (2016) in Chittorgarh District of Rajasthan tends to be 8.91 ± 2.80 L.

The average peak milk yield for farmers with large herds was 15.31 ± 0.72 L (Table 3) which was significantly ($p < 0.01$) higher than small (11.96 ± 0.42 L) and medium herds (13.13 ± 0.22 L) farmer because majority of farmers in the large herd category were graduate, well-educated and focus more on better management of their dairy animal and engaged less on agriculture works. So, the milk production, especially peak yield was higher than in other categories. Farmers with either small, medium or large herds have different average peak yields due to difference in management techniques as well as the feeding and watering methods in dairy cows. The present results were comparable with Manjusha *et al.* (2016), who stated that the average peak yield was 13.78 ± 4.80 L and Meena *et al.* (2017), who stated that the peak yield typically tends to be 13.59 ± 4.27 L.

Lactation length in the study area, was observed that the farmers usually dry their cattle either 7 months from the day of conception or 10 months from the day of calving and the overall lactation length was 301.84 ± 1.49 days (Table 3). Wondifraw *et al.* (2013) in Maharashtra and Sathisha *et al.* (2018) in Karnataka reported that the average lactation length of dairy cattle was 296.80 ± 2.29 and 295.51 days respectively which were in agreement with the present study.

The overall average lactation yield observed in the study area was 2660.66 ± 42.86 L (Table 3). The average lactation yield for dairy farmers with large herds category was significantly ($p < 0.01$) larger than the small and medium herds because in large herd category the farmers have better management practices as compared to other categories. The present study's results were in agreement with that of Manjusha *et al.* (2016), who revealed that average lactation yield of cross-bred cattle was 2598.98 ± 78.06 L in Haryana and Meena *et al.* (2017) was 2717.65 ± 853.42 litres in non-adopted areas in Haryana.

The age at first calving was observed in the study area that the farmers with medium (31.44 ± 3.54 months) and large herds (32.69 ± 3.53 months) was significantly ($p < 0.01$) higher than for those with small herds (28.71 ± 0.57 months) (Table 4). This might be due to the fact that the farmers in medium and large herd skipped the first heat of heifer but in case of small herd farmers, they bred the heifer during the first heat. The

age at first calving depends on various factors like the breeds of animal, feeding, heat detection, animal health, breeding method etc. Two and half years were considered as ideal for a crossbred cow to calve for first time (Manjusha *et al.*, 2016). Result of present study were in the line with earlier findings of Manjusha *et al.* (2016), who found that the age of first calving was 31.41 ± 2.06 months in Karnal, Haryana.

The overall average service period was 105.18 ± 1.59 days (Table 4). It was observed that in study areas, the longer service period might be attributed to poor estrus detection in milch animals or due to non-availability of insemination facilities in the vicinity (Kale *et al.*, 2018). The present results were similar with that of Kale *et al.* (2018), who reported that the service period of crossbred cattle was 105.71 ± 11.10 days in Haryana.

The overall average number of services per conception was reported to be 2.12 ± 0.03 (Table 4). The research area observed that farmers promptness in taking the animals to insemination at the right time of heat, variation in the skill of the inseminator and quality of semen contributed to the service per conception. The present result was in the line with earlier findings of Manjusha *et al.* (2016) and Kale *et al.* (2018), who reported that service per conception of crossbred cattle in Haryana was 2.44 ± 0.58 and 2.24 ± 0.78 , respectively.

The study found that overall calving interval was found to be 407.02 ± 2.13 days (Table 4). The study observed that factors like the time of estrous, quality of semen and skill of inseminator, the variation in availability of feed and green fodder, nutritional and health status of animals, particularly the conditions that influence the conception rate in dairy animals, which in turn, effects the duration of calving interval in dairy animals. On the contrary, the earlier findings reported that calving interval of crossbred cattle reported by Manjusha *et al.* (2016) in Haryana, Meena *et al.* (2017) in Uttar Pradesh and Kale *et al.* (2018) in Haryana was 389.46 ± 13.49 , 391.57 and 398.54 ± 26.15 days, respectively.

The study concluded that majority of farmers were middle-aged men, educated up to middle school, belonged to medium-sized family, had a marginal amount of land and agriculture or animal husbandry as their primary occupation which they earned for less than Rs 53,281 per year. Productive performance of dairy animals in large herd category of farmers was better than small and medium herd categories of farmer whereas reproductive performance of dairy animals was found to be similar in small, medium and large herd

farmers in the Khasi and Jaintia hill districts of Meghalaya.

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Author's contribution: ES: Involved in investigation,

data collection, preparing original draft; GK, RG, SR, FAA, SP: Engaged in conceptualization, methodology, supervision and final editing; JKC: Involved in editing, technique and statistical analyses

Data availability statement: The data placed in this article will be available from the corresponding author on request.

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