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STUDY ON THE STATUS OF CHOLING YARGAY DETSHEN DAIRY FARMERS GROUP, TASHICHOLING SAMTSE DZONGKHAG

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Abstract: The study was conducted at Singyeagng Chewog on Choling Dairy Yargay Detshen in Tashi Choling Gewog, Samtse Dzongkhag. The objectives were 1) to study the real ongoing status of the dairy farmers group at Singaygang and recommend the findings that will benefit other dairy farmers groups, 2) to conduct an inventory of the group's existing details on its establishment, membership sizes, plans, and potentials, and 3) to study and analysis on the poor and slow performance of the group. Detailed inventory documentations of the group were undertaken, including the history of formation, current status, plan, and problem identification of the group. For this documentation, the primary data were collected from primary group members, and secondary data were supported with the information provided by office bearers of the group, extension agents of the area, and the Dzongkhag Livestock Office. Every household was visited during the interview, providing an ocular vision to gain comprehensive knowledge for better recommendations. Interestingly, it was found that farmers had a good philosophy of cooperating as group members for future development. Many common projects, such as ice cream plants, biogas for each household, and improved pasture development, were seen as appreciable. However, their present stock of cattle was discovered as not to be specific dairy cattle, which have better potential for high-yielding milk. Given this understanding, they committed to buying high-yielding jersey cows and some buffalos. Nevertheless, their limited financial ability hindered this action, which was also attributed to the heavy cost-sharing project for the bio-gas plant and ice cream machine installation.

Keywords: cooperatives, dairy cows, group formations, ice cream, milk production.

1. INTRODUCTION

Bhutan, a predominantly rural kingdom, relies heavily on livestock farming for livelihoods, with over 90% of farmers engaged in subsistence farming (MoAF, 2009). Despite numerous initiatives, including dairy development programs, the sector faces challenges, particularly in achieving sustainable production and profitability (Choden, 2011). Livestock, especially larger ruminants, contribute 7.3% to Bhutan's GDP, with over 77.5% of households owning cattle (RNR Statistics, 2000). However, the dairy industry remains largely family-oriented, with costs often outweighing returns. The need for better market avenues has led to the initiation of farmer's group formation and the exploration of markets to minimize costs and enhance profit margins.

To address these challenges, a long-term master plan is being formulated, emphasizing dairy production intensification. Policies on livestock subsidy, public-private partnerships, and a revolving fund aim to attract private sector investment. The Accelerated Bhutan Socio-economic Development (ABSD) plan identifies the dairy sector as a key means of achieving socio-economic goals, targeting an increase in milk production to 150,000 liters by 2013 in eight western Dzongkhags (NLBP, 2012).

Samtse Dzongkhag, identified as a dairy potential area, currently has eleven registered groups and five cooperatives. In the 10th five-year plan, the dairy sector contributed significantly to the overall livestock sector, with domestic milk production increasing from 66% (2008) to 72% (2011). However, there is a notable gap between national production and the targeted 7897 Mt by 2013 (NLBP, 2012).

Despite the longstanding strategy of forming farmer's groups and cooperatives, performance challenges persist. The "One Gewog Three Products" initiative introduced during the 10th Five Year Plan aimed to boost group formation, with eight Dzongkhags identified as dairy potential areas under the ABSD project. However, the performance of existing dairy farmer groups, including Choling Yargay Detshen in Samtse, remains poor, attributed to inadequate institutional linkage, facilitator competency, and improper business strategies.

While studies on group performance have been conducted in other Dzongkhags, there is a notable gap in understanding the challenges faced by dairy farmer groups in Samtse. The study on the Choling Yargay Detshen group is essential for documenting their experiences, providing insights into their struggles, and formulating recommendations for

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sustainability. The findings could contribute to the development of new policies for group formation and guide other groups facing similar challenges in Samtse and beyond.

2 MATERIALS AND METHODS

2.1 Description of study site

The study was carried out in Choling Yargay Detshen at Singyegang, Tashicholing Samtse. The selection of the study areas was based on the time, resources, and accessibility, all of which featured necessary aspects for the research. Singaygang village, under Tashicholing Gewog, is located at an altitude of about 400 masl, at the foothills of the Himalayas, bordering the Indian State of West Bengal. There were 91 households with a population of 438, with almost equal ratio of males and females. Mixed small-scale subsistence farming was the dominant farming system in the area. Farmers cultivate mainly paddy and maize as cereals crops and areca nut and ginger as cash crops. They also rear livestock such as cattle, buffalos, pigs, chickens, and goats.

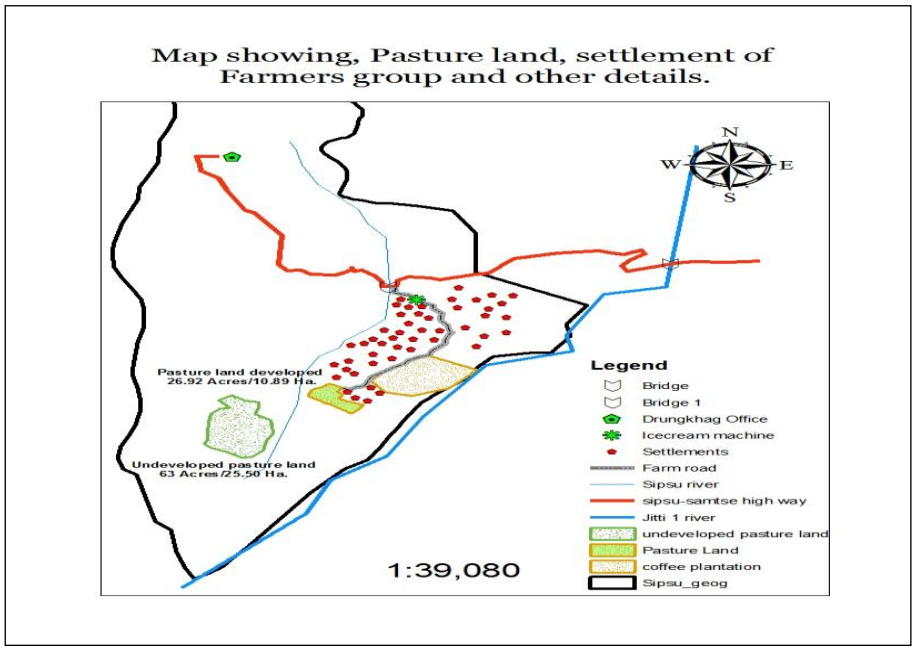

Figure 1: Map showing the study site.

Cattle were predominantly of local breeds, resulting low in production and productivity. They were mostly reared under a free-range system where they were let out free in the morning to graze in the nearby forest and tethered at night. Farmers with sufficient pasture would tether or stall-feed their milking jersey cows. Consequently, the problem of overgrazing and its associated negative impact on the environment was visible. Addressing this issue involves cattle breed improvement, promotion of stall feeding, and the zero-grazing concept, as well as reduction of unproductive cattle population.

2.2 Selection of study area

The study area was selected based on the identification of dairy farmers' groups requiring immediate attention for further growth and development. Confirmation was obtained through consultations with group members to understand the problems and constraints they faced.

2.3 Sampling methods

All the group members participated in the study, undergoing interviews with semi-structured questionnaires. In addition to questionnaires, focused group discussions were conducted with key informants to validate the data and ensure reliability.

2.4 Data collection procedures

Both qualitative and quantitative data, including primary and secondary sources, were collected for this study. Primary data were obtained through a questionnaire focusing on various aspects such as the formation of the group, milk production, membership contributions, government aid, plans, and problems and constraints.

Before interviews, respondents were briefed about the survey, and face-to-face interviews were conducted using questionnaires. Questionnaires were filled out individually, followed by group discussions and observations to ensure comprehensive results. The Dzongkhag Livestock sector head provided necessary support during the interviews. Additionally, Gewog Extension Officers assisted in surveying as per the designed questionnaires and were actively involved in group discussions with dairy farmers.

Secondary data were collected from various sources such as internet search engines, RNR journals, publications, research papers, pamphlets, and relevant organizations including the National Statistical Bureau (NSB), Department of Livestock, Dzongkhag Administration, Ministry of Agriculture and Forests (MoAF), National Livestock Development Program, Dzongkhag head offices, Extension centers in the area.

2.5 Data analysis

The interview data were organized in Microsoft Excel, and descriptive statistics such as figures, percentages, mean, and graphic presentations were used. Data were analyzed using PHstat statistical software and Excel data analysis.

3. RESULT AND DISCUSSION

3.1 General profile of respondents

The sex, education, and age of the respondents in the study group are summarized in Table 1. The results show that overall, 76% (n=25) of the respondents were male and the remaining 24% were female. Unequal gender representation in the interview could be attributed to women being engaged in domestic chores, with men usually being the decision makers (personal observation). The education level of the respondents indicates that 12% (n=25) had attended high school, 40% had primary school, and 48% had no schooling.

Table 1: Sex, education, and age of the respondents

Variables		%
Sex	Male	76
	Female	24
Education	High school	12
	Primary school	40
	No schooling	48
Age	A (< 20 years)	0
	B (20-60 years	92
	C (>60 years)	8

The highest percentage of respondents with no schooling in the result can be attributed to the lack of education facilities in the earlier days, and the educated were outside scope of agriculture activities. The age distribution of the respondent indicates that 92% (n=25) were age between 20-60 years, 8% were > 60 years and 0% were < 20 years of age. The maximum number of respondents was observed in the age group 20-60 years, as individuals in this range are considered economically productive and sound in decision-making.

3.2 Land holding information

Regarding the land holding pattern (n=25), all members of the respondent group owned registered land with varying proportions (Figure 2). The study revealed that 39% were dry land, followed by 37% with wetland, 13 % with orchard, and 11% with pastureland. The mean sizes for dry land, wetland, pasture, and orchard were 1.14 ±0.67, 1.64±0.94, 0.35±0.46 and 0.36±0.26 acres, respectively. The limited land possession among group members could be attributed to the fragmented nature of heredity land among siblings.

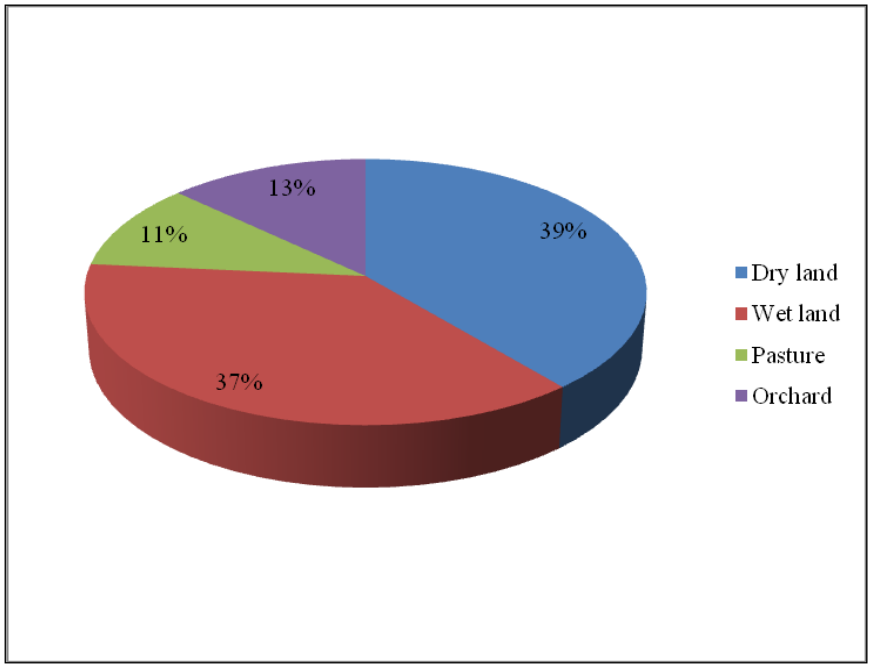

Figure 2: Land-holding patterns

The result agrees with the finding of Tshering (2011), indicating that limited land is due to fragmentation of land among the family members. The higher percentages of dry land among group members were attributed to the irrigation facility for wetland development. This suggests that there is enough land for pasture development. Out of 25 members, 21 households collectively owned 7.4 acres of improved pasture. Lower mean for pasture is due to the focus placed on agriculture, as well as the utilization of common pasture developed on government-leased land.

3.3 Labour force

The percentage of the labor force was 50.7% for males and 49.3% for females. The mean of labor contribution for males and females was 1.4±0.70 and 1.36±0.49 heads, respectively. The results indicate equal participation of men and women in terms of labor contribution. Tshering (2011) reported that females are equally represented in all spheres of development without gender bias, unlike in the past when most information was provided by males.

3.4 Cattle herd information

Most all the respondents own cattle of different breeds. Of the total respondents, 51.5% have local breeds,13.9% have less than 50% jersey cross,10.4% have exactly 50% jersey cross, 10.4% have buffalos, 9.2% have more than 50% jersey cross and 4.6% have mixed breed cattle (Table 2). The results illustrate that the local cattle population ranks highest, primarily due to the presence of bulls in every household for draught power. Tshering, (2011) claims that keeping cattle for draught power is a strategy to overcome the acute shortage of farm labor.

Table 2: Cattle herd composition information

Category of animal	Percentage (%)	No. of heads
Local	51.5	89
>50% JX	9.2	16
50% JX	10.4	18
<50% JX	13.9	24
Mixed Blood	4.6	8
Buffalo (Mirrah cross)	10.4	18

Parantheis JX= Jersey cross

The members of the dairy group believe that Jersey cross bulls are not efficient to use as draught power. Local bulls are still considered strong draught compared to jersey crosses (personal communication). Unlike in other places, this group relies on buffalos for milk production, with 10.4% of the cattle herd composing of buffalos (Figure 3)

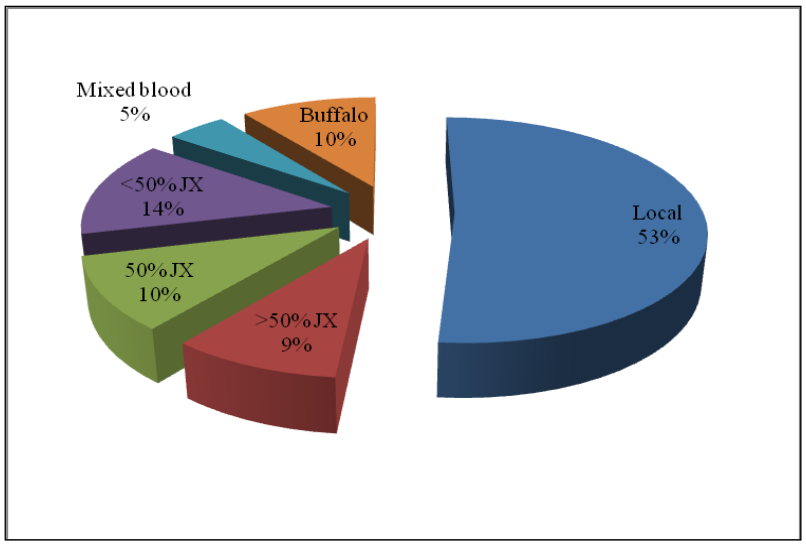

Figure 3: Percentage of cattle herd composition

The 5% of mixed blood cattle could be the result of haphazard crossbreeding unknowingly due to the porous border with India, where common grazing land is shared. Additionally, poor breeding management programs and preference of certain breeds for service, without knowing the pedigree of the baseline breed, may contribute to this occurrence (personal interaction). The minimal population of Jersey cattle could be attributed to the failure to detect heat on time for artificial insemination and the lack of mobile AI services in place.

3.5 Dairy management practices

3.5.1 Feeding practices

The study revealed that 84% (n=25) of respondents feed their cattle with local cereals, 64% feed with formulated feed, and 16% feed with tuber and root crops (Table 3). Based on personal interviews, it was mentioned that feeding of formulated feed was advocated to only milking cows, whereas local cereals and tuber and root crops were given to oxen and the general herd. The decision to provide formulated feed was determined by the purchasing power of the owner and the types of milking, with it being exclusively given to jersey cattle. Phanchung et al., (2002) reported that the utilization of feed resources is influenced by the cropping system, agroecological conditions, and the animals. Additionally, rice straw, barley straw, wheat straw, and maize stovers collectively contribute approximately 13% of their feed during the period of feed scarcity (Phanchung et al., 2002).

Table 3: Feed supplement to dairy cows

Type of feed supplement	%
Formulated feed	64
Local cereals	84
Tuber and root crops	16

4.5.2 Grazing practices

Table 4 summarizes the grazing practices of the dairy group members, revealing 64% (n=25) of the respondents practice free grazing system, 52% tethering, and 8% stall feeding. The high percentage of free grazing percentage attributed to most group members relying on roughage from open forest grazing. Phanchung et al. (2002) revealed that prevalent feed resources accessible to farmers include common property resources (CPRs), forests, cultivated fodder, and resides from crops.

Table 4: Grazing practices

Grazing type	%
Stall feeding	8
Tethering	52
Free grazing	64

It was observed that stall feeding was practiced to jersey cows during lactation, while tethering was applied to small herd sizes, labor shortages, and abundant improved pasture. As per Dorji (2011), farmers practicing stall-feeding fed significantly higher quantities of concentrate to their animals than those practicing free-range grazing. Free grazing might be satisfied with traditional ways of forest grazing.

3.5.3 Breeding practices

The study results indicate that out of 25 households, 11 practiced natural breeding, 7 practiced both (natural and AI), 4 exclusively practiced AI and 3 practiced haphazard/free breeding (Figure 4). The higher prevalence of natural breeding could be due to convenience and the embrace of conventional methods of breeding where knowledge has passed to from parents to offspring. This is also influence by the absence of a mobile AI facility, long walking distance for stationed AI facility, and the availability of a good numbers of Jersey cross bulls for breeding among group members. In the future, with the launch of a mobile AI program, it is anticipated that number of AI users will increase. A study made by Tshering (2011) found that 58% of the households in peri-urban area use AI services, while 58% of households in rural areas rely on natural services with locally available bulls.

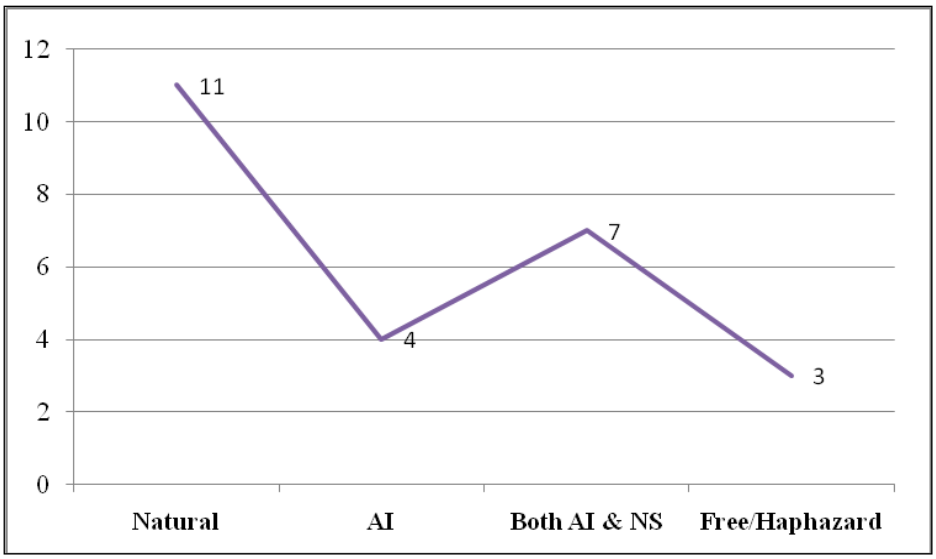

Figure 4: Breeding system practice

The occurrence of free /haphazard breeding is compounded by the sharing of common grazing land where cattle are allowed for open grazing. Another contributing reason could be the lack of a planned animal breeding program, despite possessing adequate knowledge of exotic breeds and preferences. Furthermore, the availability of a high number of bulls as a component of the cattle herd composition adds to the likelihood of unintended breeding. The ratio of males and females in the cattle herd of the dairy group is presented in Figure 5.

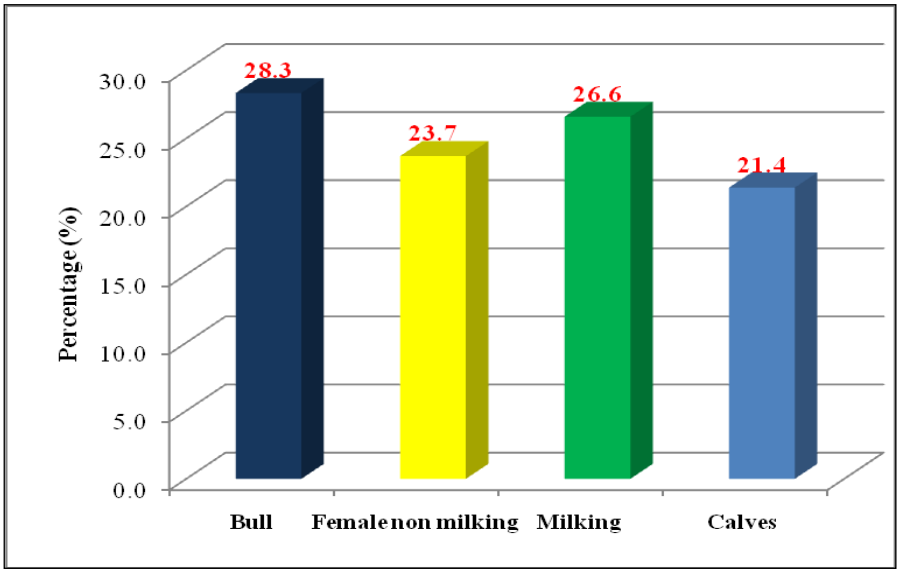

Figure 5: Male and female ratio

The study results illustrate that there were 28.3% of males (n=173), 26.6% of milking cows, 23.7% of non-milking females, and 21.4% of calves. The high populations of bulls in the herd accentuates an increase in the incidence of unwanted breeding. The survey results indicates that 100 % of the farmers were aware of the risk associated with keeping unwanted bulls, which pose a threat to dairying. However, due to their mindset rooted in traditional farming systems and religious stigma, the reduction of cattle heads was not encouraged, despite existing policies. The sterilization campaign of scrub bulls performed in the study area, yet the risk of inbreeding was perceived high. This was mainly because farmers prefer to sterilize bulls when they are fully grown, believing that castration at a young age will impede growth and affect draught efficiency (in-person communication).

3.5.4 Housing system

Almost all the group members of the study area have concrete housing for their animals due to the free supply of shed construction materials under the ABSD project program. They have a cemented floor with CGI sheet and the shed was found to be constructed without any technical specifications and designs in some cases (personal observation). The finding harmonized with the study result of Tshering (2011), the sedentary cattle were provided with minimum shed without any specifications and designs. The simplest housing was with only a rooftop without side walls and flooring.

3.5.5 Reasons for fodder shortage

The focused discussion during the interview centered the reasons for fodder shortage, and the results revealed that 56% cited no irrigation in winter, 44% prioritized agriculture crops, 25% face a general shortage, and 12% experience a shortage of manpower (Table 5). Farmers whose settlements were in vicinity to the Indian border forest were not often willing to develop pasture due to destruction caused by wild animals, particularly elephants (personal interaction). Another contributing reason was management-associated practices in the developed pasture, where farmers executed various methods such as continuous, tethered, or free grazing.

Table 5: Reasons for fodder shortage

% of respondents	Reasons for fodder shortage
56	No irrigation in winter
44	Give priority to crop
25	Shortage of land holding
12	Shortage of manpower

As a consequence, the dairy cows were found underfed, leading to minimal milk production besides their genetic potential. The issue of underfeeding in Bhutanese livestock, both in terms of quantity and quality, leading in low productivity, decreased in immediate production, and compromised lifetime performance, has been reported elsewhere. The main factor affecting production is observed to be the shortage of sufficient feed and fodder. Besides from natural grasslands, forest grazing serves as the most important fodder resource supporting traditional livestock production (Phanchung et al 2002) and contributes 20-40 percent of the total dry matter requirement of livestock in Bhutan (Roder, 2001).

3.6 Milking practices

3.6.1 Milking procedures and sanitation

The dairy group, hand milking of cows occurred twice a day. Calves were allowed to suckle before milking to stimulate milk letdown, a method that aligns with the findings reported by Tshering (2011). The calves were tethered in separate pens and only released during the time of milking. The milk letdown was recognized through sings such as drooling of white bubbles from the calf's mouth while sucking, enlargement of teats, sucking time experienced by the milker, and pausing in butting to cows. During the first two months, they milked 2 quarters of the udder until the calf reached two months of age. After two months or when the calf started consuming roughage/grasses, one quarter was provided as a share to the calf (personal communication).

The udders of the cows were washed with cold water after sucking by the calf for milk letdown and butter was applied on the teats as a lubricant to ease milking. No disinfectants were being used against any disease associated with udder health and hygiene (personal observation).

3.8.2 Weaning and separation of calf

Unlike in many other developed countries, Bhutanese dairy farmers do not practice weaning, attributing this to the strong maternal instinct of native cows. This practice persists even in cases where farmers have a good number of exotic cows. Instead of weaning, farmers tie their calves in separate pens at a distance visible to their dam and release them while milking. This system of rearing calves is maintained throughout the lactation period. It was observed that farmers have heard about the weaning calves, it has not been implemented in their farms so far.

3.7 Milk production, product processing, and marketing

3.7.1 Milk production

The mean milk produced per household per day was 6.2 liters, contributing to a total milk production of 155 liters per day. These productions were exclusive of milk consumed by a calf during induction of milk letdown. The two sample tests for milking cows and milk production showed statistically significant ($p<0.05$) indicated in Table 6.

Table 6: Two-Sample tests for milking cows and milk production

	***t* Test Statistics**	***Df***	**Difference in Sample Mean**	**P-value**
Milking cows vs. milk production	-5.86	48	-4.36	4.11E-07

The test conducted was a blanket test without considering the breed and stages of lactation. Figure 6 below shows the significant positive correlation between average milk production and the numbers of milking cows ($r=0.4933$, $p<0.05$).

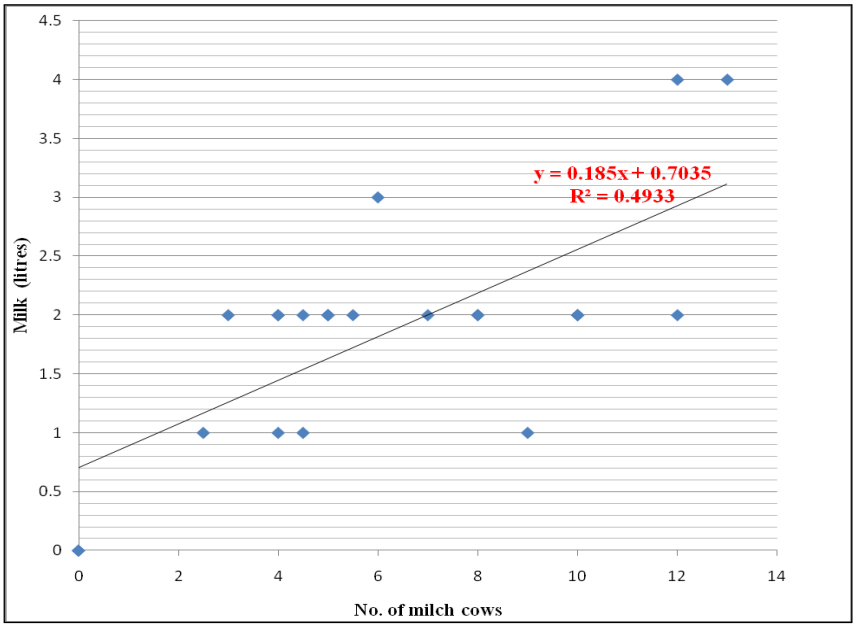

Figure 6: Linear regression for the number of cows and milk production

3.7.2 Milk product processing

With a total milk production of 155 liters per day from 46 milking cows in the group, individual households churned milk every 2-3 days with variation in interval of churning at each household. An estimation made for 8 days revealed that farmers churned approximately 883 liters of milk, producing 46 kgs of butter and 376 balls of cheese in total. A small amount reserved for domestic consumption, and the group accountant produce 150 numbers of ice cream per day for local market only.

3.7.3. Milk and milk production selling

Table 7 shows the scenario of milk and milk product marketing by the study group member households. Out of the daily milk production of 155 liters, 357 liters are sold, along with 376 cheese balls, 46 kgs of butter, and 1200 numbers of ice cream in a week. The milk utilization and marketing varied from household-to-household.

Table 7: Summary of milk and milk production selling in one week.

Particulars	Quantity
Milk (liters)	357
Cheese (balls)	376
Butter (kgs)	46
Ice cream (nos)	1200

Parenthesis cheese 1 ball = 125 g and ice cream = 15 g (approx.)

Currently, minimum quantities of milk were collected within the group, and the maximum quantity of milk is marketed individually outside market outlets. The selling price for milk is Nu.20 per liter, both within the groups and outside. The sole utilization of milk will occur once the ice cream machine is installed. Cheese is sold at Nu.15, and butter is sold at Nu.330 to local markets individually. However, as the group's accountant being the only ice producer at the moment, creamed ice cream is sold for Nu.10 and skimmed milk ice cream for Nu. 5.

3.8 Income of the dairy group members

3.8.1 Income from dairy activities

The mean gross income from dairy products was 1261.2±1393.4 against Nu. 31530/- for 8 days. The results revealed that income from selling butter ranked highest, followed by fresh milk, cheese, and ice cream. Table 8 illustrates the two sample tests' mean for milking cow and income and milk production and income.

Table 8: Two sample tests for income with other variables

Variables	*t* Test Statistics	*df*	Difference in Sample Mean	P-value
Milk Production Vs Income	-4.5	48	-1255	4.27E-05
Milking Cows Vs Income	-4.52	48	-1259.36	4.06E-05
Age Vs Income	4.37	48	1218.12	6.61E-05

The two-sample test mean showed a significant difference between milk and income, milking cows and income, and also the age of respondents and income ($p<0.05$). The study concluded that these variables were closely dependent on total income generation for dairy products. Hu (2008) determined that smallholder dairy farming in China yielded a net annual profit of $ 273, with dairy cow husbandry generating profits 14 times greater than those cultivating crops, especially potato and maize. This indicates that dairy farming holds a significant potential for income generation. A study by Venkataderi et al., (2008) indicated that average income from dairy activities ranges between Rs. 19940 to 34920, mainly derived from milk.

3.8.2 Income from other sources

The annual income of individual group members was assessed to determine the financial capacity of the household. It was concluded that agriculture and livestock play a crucial role in farm household income for their livelihood. Due to the nutritious value of milk and its daily availability, dairy products act as an income regulators and risk management tools for rural households (MoA, 2009). Off-farm activities like business, and petty contract works were also good sources of income. The study revealed that 100% of farmers had income from livestock, 88% from agriculture, 60% from farm activities, and 4% from non-wood forest products. The income from livestock presented here incorporates products from dairy, poultry, pigs, and the sale of live animals. The sheer of income varies from household-to-household as shown in figure 7.

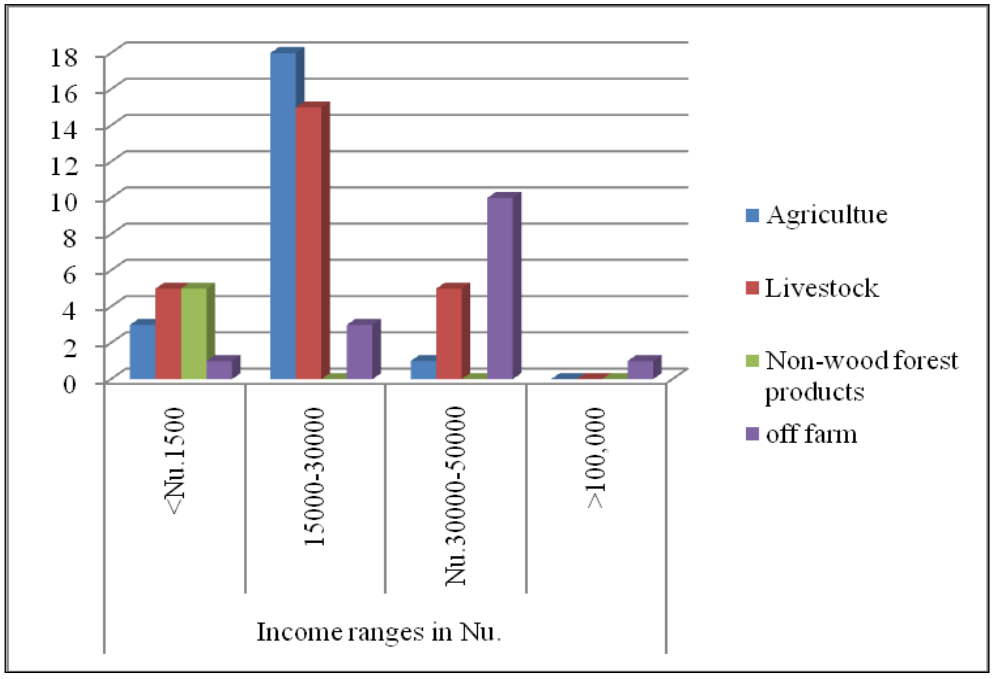

Figure 7: Annual income of the members of the group

The study results displayed that the income rang from Nu.15000 to 30000 was found to be highest in agriculture, whereas livestock was noted to be high in the income range Nu.30000 to 50,000. Overall, it was concluded that income from livestock generates the highest compared to all income-generating activities executed by dairy group members. The current finding of group's income is comparable to the finding of Muriuki et al. (2001) on the significant contribution of dairy farming to household income in Southeast Asian countries and the potential for poverty alleviation.

3. 9 Problems of the Dairy Group

The dairy group of Singaygang was found to be in the juvenile stage, and economic returns at this stage were invisible. The group faces several problems, with key issues highlighted by members such as lack of good stock of dairy cows for milk production, fodder shortage, and a lack of knowledge of dairy cows' management.

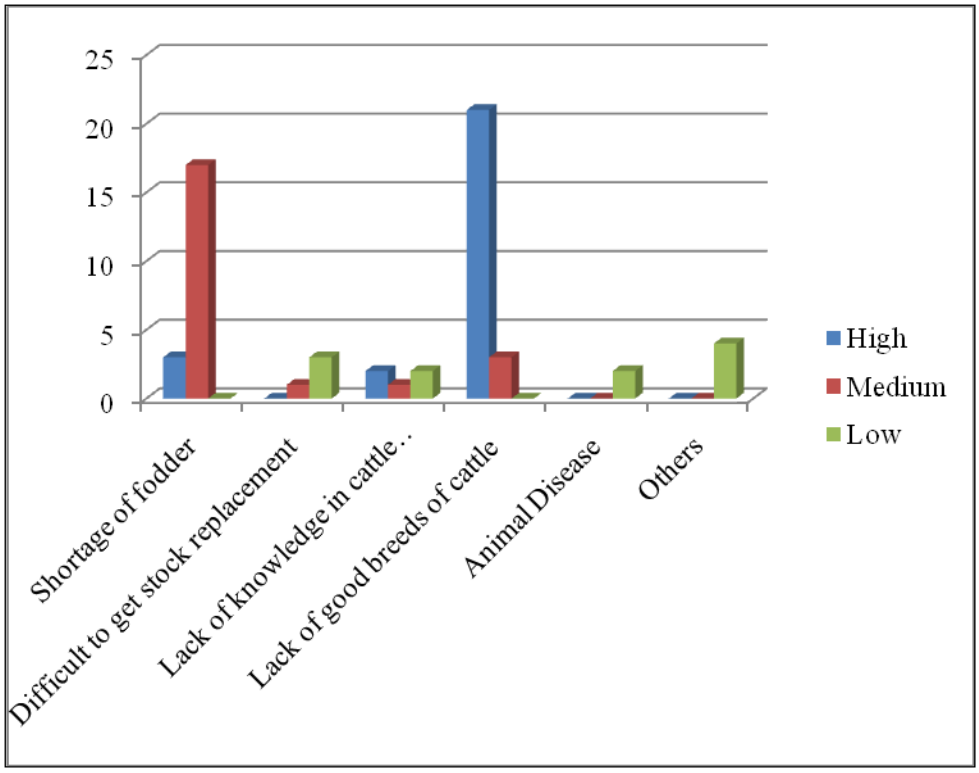

Figure 8: Current problems of the group

The lack of good stock dairy cows was highest percentage of problems (84%) as indicated in Figure 8. To address this issue, the group plans to avail a loan from BDFC on behalf of the group and intends to fully invest in the procurements of good-quality cattle and the construction of a dairy shed separately, which will be maintained as common property. It was reported that they will continue rearing local cattle with hybrids for upgrading. To combat the shortage of fodder, they leased land 90 acres from the government, and are developing a common pasture. Other solutions for animal health and the lack of knowledge in dairy management were significantly apparent.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Smallholder dairy production farming serves as a vital source of livelihood for farming communities, providing an immediate source of income to meet daily household expenses. In addition to being a primary income source, it plays a crucial role in mixed traditional crop-livestock farming. The study revealed that 100% of farmers in the study were benefited from the livestock, ranking it as the leading income source on average. Moreover, the cattle management system showed improvements, particularly in housing and feed/fodder development. Approximately, 11% of the land was developed with improved pasture, excluding 90 acres of government-leased pasture for the group.

The study highlighted the strong community support within the tiny hamlet. The community, motivated to enhance their collective well-being, voluntarily formed the group that made a significant impact by selling milk to a local ice cream producer. The group witnessed an increase in membership and had already invested money, time, and labor, establishing a strong foundation. Given this current scenario, the dairy group holds considerable potential for future growth and development.

4.2 Recommendations

The study primarily focused on the formation and the present status of the dairy group, covering socio-economic contribution, future plans, problems and constraints, and the overall situation of the group. To enhance comprehension, specific areas requiring attention for improvement were identified:

1. Financial institutions need to offer long-term, low-interest loans to support cattle head reduction and enable the purchase of improved for better milk production.
2. Continue leasing government land for fodder production and conduct intensive training for farmers and extension agents on dairy cow feeding management practices.
3. Establish mobile AI, implement a strong policy supporting the sterilization of scrub bulls, and adopt proper breeding management plans.
4. Emphasize proper record-keeping through book-keeping training programs for both the group and its members.
5. Introduce calf weaning systems and promote the use of disinfectant solutions to ensure udder health.
6. Educate farmers on proper feeding practices, emphasizing the technical correctness of the feeding concentrates.
7. Provide capacity building through awareness and training programs for all members.
8. Establish or facilitate linkages with financial service providers to address financial challenges.
9. Increase government subsidies to dairy farmers over the next five years to support infrastructure development.

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References

1. Choden, D.(2011). Factors affecting the sustainability of dairy farmers' groups and cooperatives. *Royal University of Bhutan, College of Natural Resources, Punakha*
2. MoAF (2009). RNR Sector Tenth Five Year Plan (2008-2013). Volume 1, Main Document. *Thimphu: Ministry of Agriculture.*
3. Hu, D. (2009). Smallholder dairy development: Lessons learned in Asia. RAP Publication 2009/02.pp.220to40 FAO, Bangkok Thailand.
4. Muriuki, H.G., Mwangi, D.M., Thorpe, W. (2001) How smallholders dairy system in Kenya contribute to food security and poverty alleviation. Proceeding of the 28th scientific conference of Tanzania Society of Animal Production, (pp-7-9). Morogoro, Tanzania.
5. NLPB, (2012). Progress review and Way forward for Dairy development during 11th FYP, National Dairy Development Centre, Yusipang Thimphu.
6. Phanchung *et al.*, (2001). Sustainable Development of Smallholder Diary Farming in Bhutan.
7. Phanchung, Dorji,P., Sonam,T., and Pelden K.(2002). Small holder dairy in Bhutan. Characteristics, Constraints and Development Opportunities in M. Tulchand, Small holder dairy in mixed farming system of the HKH (PP.22-35) Kathmandu, Nepal: Hill Sede Press (P) Ltd.
8. Roder, W., Wangdi, K., Gyamtsho, P., and Dorji, K. 2001. Feeding the herds:Improving fodder resources in Bhutan. *ICIMOD Publication. Kathmandu, Nepal.*
9. Tshering, G. (2011). Contribution of dairy farming to the household income in peri-urban and rural areas in Chekhor Bumthang, Dongkhag. *Royal University of Bhutan, College of Natural Resources, Punakha.*
10. Tshering, P. (2011). Dung production by different breeds of cattle for manure production. *Royal University of Bhutan, College of Natural Resources, Punakha.*
11. Venkatadri, S., Rani,K.W., & Reddy, G.R. (2008). A study on “improvement on rural livelihoods through dairy farming”. Centre for self- employment and rural enterprises. *National Institute of Rural Development. Ragendranagar, Hydrabad, India.*

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